

Sustainable Energy Awareness: Communicating the Benefits of Electrification in New Zealand

By: Andreas Keating, Tue Lac & Ben Marsh



Sustainable Energy Awareness: Communicating the Benefits of Electrification in New Zealand

An Interactive Qualifying Project Report Submitted to the Faculty of Worcester Polytechnic Institute In partial fulfillment of the requirements for the Degree of Bachelor of Science In cooperation with Ara Ake and Rewiring Aotearoa

Presented By:

Andreas Keating Tue Lac Ben Marsh

Date:

May 7th, 2025

Report Submitted To:

Worcester Polytechnic Institute Professor Kinicki Ara Ake Rewiring Aotearoa







This report represents the work of WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its website without editorial or peer review. For more information about the projects program at WPI, see http://www.wpi.edu/Academics/Projects

Abstract

New Zealand's shift to clean energy relies on widespread household electrification. This project supported this transition to electric appliances by creating a website to inform and motivate the public about the benefits and steps towards electrification. The team interviewed experts and community members, conducted surveys, and analyzed five international websites to identify key motivators and effective design strategies. Cost savings, environmental impact, visual clarity, and step-by-step guidance emerged as top priorities for effective communication. The team then developed the Aotearoa Electrification Hub, featuring comparisons, clear visuals, and practical guides. A user study yielded positive feedback on design and usability and identified gains in user knowledge and motivation.

Executive Summary

Introduction

Global warming is one of the biggest challenges facing humanity. Electrification is the process of replacing fossil fuels with electricity as a power source. Governments, industries and households have adopted electrification as a primary strategy to lower carbon emissions and mitigate climate change at a global level. Electrification can lower energy prices, improve air quality, and strengthen energy security, amplifying its environmental benefits.

These benefits are significant in New Zealand because most of its electricity generation comes from renewable sources. For the country to take advantage of these benefits, individuals need to electrify their machines, including water and space heaters, vehicles, and cooking appliances. With support from Ara Ake and Rewiring Aotearoa, the team designed and built a website that communicates the benefits of electrification to the New Zealand public to motivate them toward a cleaner, more sustainable future.

Methods

This project designed an educational website that motivates New Zealanders to adopt electrification by presenting information in a clear, engaging, and accessible manner. The team followed a three-part research approach: investigate and research methods to convey the benefits of electrification; develop a website that motivates the public to take action on electrification; and gather feedback on how effectively the website motivates the public.

To discover how best to communicate the benefits of electrification, the team conducted 14

expert interviews, two community interviews, and 50 public surveys. These interviews and surveys identified key motivators and shaped our early design concepts. The team also reviewed five international energy-related platforms to evaluate their layouts, accessibility features, and content strategies that could inform their website.

To evaluate the website's effectiveness, the team conducted a user study using pre- and post-surveys distributed through the sponsor's network. The team used similar questions to assess motivation and understanding before and after experiencing the website, and gauged the difference in motivation and understanding between the two surveys. We also included two questions only in the post-survey to assess users' navigability, clarity, and overall appeal of the site.

Interviews Results

Expert and community interviews revealed that cost savings and new technology were both key motivators for electrification (see Figure 0.1).



Figure 0.1: Interview Motivation Results

Participants also emphasized the need for simple explanations, clear visuals, and relatable stories in a public-facing website (see Figure 0.2).



Figure 0.2: Interview website design result.

Community Survey Results

In addition, the public survey confirmed these themes and showed strong preferences for side-by-side comparisons, interactive content, and step-by-step guides (see Figure

0.3).



The Percentage of People Who Selected The Feature

Figure 0.3: If you were to visit a website about electrification in New Zealand, which of the following features would make you more likely to explore or take action?

In contrast to the interviews' results, Figure 0.4 indicates that survey participants feel most motivated about reducing environmental impact. However, they still ranked cost savings as the second most motivating factor.



Average Likert Scale Rating (1 = Really Not Motivating, 5 = ...

Figure 0.4: Which of the following would most motivate or support you in taking the first step toward electrification

Case Study Results

The team analyzed five international websites to identify the best features for structure, clarity, and usability. The most effective sites contained clean layouts, section-based navigation, consistent data formatting, and interactive features like hoverable graphs and expandable content. These findings shaped the project's layout, visual design, and content strategy by reinforcing the importance of intuitive navigation, visual clarity, and layered information delivery.

Website Design and Implementation

After considering website builders and pre-made templates, both of which limited

development flexibility, the team chose to code the website from scratch. This method offered full customization and easier integration with the sponsor's existing systems, though it required more time and therefore limited the number of features that the team could complete.

Website User Study Results

А user study employing preand post-surveys demonstrated that the website enhanced participants' knowledge and understanding about residential electrification. Specifically, participants' agreement with statements regarding their knowledge about residential electrification increased, and their understanding of potential cost savings also saw a significant improvement. Motivation and intention to adopt electrification saw larger even improvements (see Figure 0.5).



Figure 0.5: Pre- and Post-Survey Average Responses

Users also rated the website highly for its ease of navigation, appealing design, and

clarity of visuals, confirming the effectiveness of its user-centered approach (see Figure 0.6).



Figure 0.6: Diverging Stacked Bar Graph for Post-Survey Website Traits Statements with Likert scale choice

Aotearoa Electrification Hub

Thefinalwebsite(households-hub.onrender.com)contains aHomepage, a Cost Savings page, a StartYour Journey page, and a Strengthen OurFuture page.

The *Homepage* (see Figure 0.7) presents a summary of electrification in New Zealand and divides the other pages into three cards to avoid overwhelming the user. Clicking on these cards takes the user to an associated web page.



Figure 0.7: Aotearoa Electrification Hub Homepage

The *Cost Savings page* (see Figure 0.8) presents the financial case for electrification. In addition to the summary in the bottom left and the graph in the top right, the four cards on the bottom left expand into a sidebar with more information.





The *Start Your Journey page* (see Figure 0.9) provides step-by-step guidance for transitioning to electric appliances. The four cards link to machine-specific guides hosted on rewiring.nz, as requested by the sponsor.



Figure 0.9: Start Your Journey page

The *Strengthen Our Future page* (see Figure 0.10) emphasizes environmental outcomes and community actions. Three of the cards on the bottom right expand into sidebars with more information, while the Community Groups card opens a sidebar with a button to help users find their local community projects.



Figure 0.10: Strengthen Our Future page

Future Work

To improve accessibility and engagement, future development will focus on integrating real-time data, enhancing mobile and offline usability, and adding full Māori language support. These improvements aim to create a more inclusive, dynamic, and widely accessible platform for users across Aotearoa.

Conclusion

This project aimed to design a website that clearly and effectively promoted electrification to the New Zealand public. The team developed a platform focused on public needs, sponsor goals, and user-friendly design. They hope the final website and the findings behind it will strengthen future outreach efforts and support the sponsors in accelerating household electrification across New Zealand. A key insight was that survey respondents believe environmental concerns matter, but experts believe users are often more moved to act by tangible cost savings and practical guides. Future campaigns may benefit from building on this insight and expanding content to include more interactive and community-driven features. These improvements aim to create a more inclusive, dynamic, and widely accessible platform for users across Aotearoa.

- EECA. (n.d.). *Electrifying Aotearoa: The Consumer Perspective*. Energy Efficiency and Conservation Authority (EECA). Retrieved March 31, 2025, from <u>https://www.eeca.govt.nz/insights/eeca-insights/electrifying-aotearoa-the-consumer-persp</u> <u>ective/</u>
- Ellison, J., Thorn, D., Pawson, M., & Griffith, D. S. (2024). *Electric Homes: The energy,* economic, and emissions opportunity of electrifying New Zealand's homes and cars.
 Retrieved February 21, 2025, from <u>https://www.rewiring.nz/electric-homes-report</u>
- Griffith, D. S., Ellison, J., Pawson, M., & Conway, P. (2024). Investing in Tomorrow: The Electrification Opportunity. Ara Ake. Retrieved February 21, 2025, from https://www.rewiring.nz/tomorrow

Acknowledgments

Our team would like to sincerely thank the following individuals and organizations for their significant assistance, direction, and contributions throughout the project's completion:

- Thank you, WPI advisors Michael Miller, Robert Kinicki, and Ingrid Shockey, for your continuous guidance and assistance in executing our project and report.
- Ara Ake and Rewiring Aotearoa, especially Daniel Gnoth and Jenny Sahng thank you for your support and guidance.
- Library Research & Instruction Services for their help with the report.
- Thank all the participants in our interviews, both experts and community members, for generously sharing their time, insights, and experiences.

We appreciate your sharing your time, energy, and knowledge with us. It was essential to our project's success.

Authorship

Section	Author(s)	Editor(s)	
Abstract	Andreas Keating Ben Marsh	Andreas Keating	
Executive Summary	Andreas Keating Tue Lac Ben Marsh	Ben Marsh Tue Lac	
Executive Summary Reference	Tue Lac		
Acknowledgments	Tue Lac		
Meet the Team	Andreas Keating Tue Lac Ben Marsh	Andreas Keating	
1. Introduction	Andreas Keating	ng Tue Lac Ben Marsh	
2. Background			
2.1 Our Sponsors	Andreas Keating		
2.2 Benefits of Electrification	Andreas Keating	Ben Marsh	
2.3 Specific Electric Machines	Ben Marsh		
2.4 New Zealand's Opportunity	Tue Lac		
2.5 Literature Review Summary	Tue Lac		
3. Methodology			
3.1 Objective 1: Investigate and research methods to convey the benefits of <u>electrification.</u>	Ben Marsh Tue Lac	Tue Lac	
<u>3.2 Objective 2: Develop a website that</u> <u>motivates the New Zealand public to take</u> <u>action on electrification.</u>	Tue Lac	Ben Marsh	

3.3 Objective 3: Gather feedback on how effectively the website motivates the New Zealand public to take action on electrification.	Andreas Keating	
4. Results & Analysis		
4.1 Objective 1: Investigate and research methods to convey the benefits of <u>electrification.</u>	Tue Lac	
4.2 Objective 2: Develop a website that motivates the New Zealand public to take action on electrification.	Tue Lac Ben Marsh	
4.3 Objective 3: Gather feedback on how <u>effectively the website motivates the New</u> <u>Zealand public to take action on</u> <u>electrification.</u>	Andreas Keating	
5. Final Website Design	Ben Marsh	
6. Conclusion	Ben Marsh	
7. References	Andreas Keating Ben Marsh Tue Lac	
Appendix A: Expert Interview Consent Form	Ben Marsh	Andreas Keating
Appendix B: Expert Interview Questions	Ben Marsh	Andreas
Appendix C: Non-Expert Interview Consent Form	Tue Lac	
Appendix D: Non-Expert Interview Questions	Tue Lac	
Appendix E: Non-Expert Survey Questions	Andreas Keating	Tue Lac
Appendix F: Pre-User Survey	Andreas Keating	
Appendix G: Post User Survey	Andreas Keating	

Appendix H: User Manual	Tue Lac Ben Marsh	Ben Marsh
Appendix J: Website Maintenance and Update Guidelines	Tue Lac Ben Marsh	Ben Marsh
Appendix K: Notes from Case Studies	Tue Lac	
I. Dave Karl & Bryony Lane Transcript	Andreas Keating	
II. Chris Pye Transcript	Andreas Keating Tue Lac	
III. Euan White Transcript	Tue Lac	
IV. Josh Ellison Transcript	Tue Lac	
V. James Scott Transcript	Tue Lac	
VI. Christian Judge Transcript	Tue Lac	
VII. Mark Unwin Transcript	Tue Lac	
VIII. Karen Berger Transcript	Tue Lac	
IX. Kristen Osterwood Transcript	Tue Lac	
X. Anonymous A Transcript	Tue Lac	
XI. Lyn Dawson Transcript	Andreas Keating	
XII. Simon Neale Transcript	Andreas Keating	
<u>XIII. Jaydan Salzke Transcript</u>	Tue Lac	
Appendix M: Community Interview Transcr	ipt	
I. Steve Charles Transcript	Tue Lac	
II. Tony Stephens Transcript	Andreas Keating	
Appendix N: Email Templates	Tue Lac	
Appendix O: <u>Atlas.ti</u> AI analyzed	Tue Lac	

Table of Contents

Abstract	ii
Executive Summary	iii
Executive Summary References	viii
Acknowledgments	ix
Authorship	Х
List of Figures	xix
List of Tables	xxiii
Meet the Team	xxiv
1. Introduction	1
2. Literature Review	3
2.1. Sponsors	3
2.2. Benefits of Electrification	3
2.2.1. Economic Benefits	4
2.2.2. Cost and Energy Efficiency	4
2.2.3. Emissions	5
2.2.4. Environmental and Public Health Benefits	5
2.2.5. Energy Security and Grid Resilience	5
2.3. Electrification Opportunities	6
2.3.1. Space Heating Appliances	7
2.3.2. Water Heating Appliances	7
2.3.3. Electric Vehicles	7
2.4. New Zealand's Electrification Opportunity	8

2.4.1. Renewable Energy Capacity and Grid Readiness	8
2.4.2. Residential Sector: Cost Savings and Energy Security	9
2.4.3. Commercial and Industrial Sector: Efficiency and Competitiveness	10
2.4.4. Agricultural Sector: Sustainable Energy Solutions	11
2.4.5. Economic and Policy Considerations	12
2.5. Summary	13
3. Methodology	14
3.1. Objective 1: Investigate and research methods to convey the benefits of electrific	cation.15
3.1.1. Expert & Community Interviews	15
3.1.2. Community Surveys	17
3.1.3. Case Study of Existing Websites	19
3.2. Objective 2: Develop a website that motivates the New Zealand public to take a	ction on
electrification.	20
3.2.1. Wireframing and Prototype Design	20
3.3. Objective 3: Gather feedback on how effectively the website motivates the New	Zealand
public to take action on electrification.	20
3.3.1. User Study	21
3.4. Thematic Analysis	21
4. Results & Analysis	23
4.1. Objective 1: Investigate and research methods to convey the benefits of electrific	cation.23
4.1.1. Expert & Community Interviews	23
4.1.1.1. Stakeholder Interview Distribution	23
4.1.1.2. Motivation for Electrification	24

4.1.1.3. Website Design Preferences	26	
4.1.2 Community Survey Analysis	28	
Demographic	28	
Awareness, Trust, and Confidence	29	
Motivations to Act on Electrification	31	
Perceived Challenges and Concerns	32	
Information-Seeking Behavior	33	
Preferred Website Features	34	
4.1.2. Case Study Analysis of Similar Websites	35	
India Climate & Energy Dashboard	36	
Clean Energy Wire Website	38	
Energy Efficiency and Conservation Authority Website	39	
International Energy Agency (IEA) Regional Dashboard	41	
Climate Momentum Monitor	42	
Case Study Summary	45	
4.2. Objective 2: Develop a visual website that motivates the New Zealand public to take		
action on electrification.	47	
4.2.1. Determining Implementation Method	48	
4.2.2. Layout and Content Options	48	
4.2.3. Website Prototype	49	
4.2.4. Hosting Issues and Solutions	51	
4.2.5. Design and Implementation Summary	52	
4.3. Objective 3: Gather information concerning the effectiveness of the website product as a		
motivational instrument for the New Zealand public.	52	

XV

	4.3.1. Pre- and Post-User Surveys Analysis	52
	User Motivation	53
	Effectiveness of Website Design Features	54
5.	Final Website Design	56
	5.1. Electrification Homepage	56
	5.2. Cost Savings Page	57
	5.3. Start Your Journey Page	59
	5.4. Strengthen Our Future Page	61
	5.5. Future Work	63
	5.5.1. Real-Time Data Integration	63
	5.5.2. Mobile and Offline Availability	63
	5.5.3. Māori Language Support	64
6.	Conclusion	65
Re	eferences	66
Ap	ppendixes	70
	Appendix A: Expert Interview Consent Form	70
	Appendix B: Expert Interview Questions	71
	Appendix C: Non-Expert Interview Consent Form	73
	Appendix D: Non-Expert Interview Questions	74
	Appendix E: Non-expert Survey Questions	76
	Appendix F: User Study Pre-Survey	80
	Appendix G: User Study Post Survey	83
	Appendix H: User Manual	84

Appendix J: Website Maintenance and Update Guidelines	86
Appendix K: Notes from Case Study	88
1. India Climate & Energy Dashboard (ICED) – NITI Aayog	88
2. Germany – Clean Energy Wire	88
3. New Zealand – EECA Insights	89
4. IEA – Regional Dashboard (World Energy Outlook 2024)	90
5. Australia – Climate Momentum Monitor (Climate Council)	90
Appendix L: Expert Interview Transcript	92
I. Dave Karl & Bryony Lane Transcript	92
II. Chris Pye Transcript	139
III. Euan White Transcript	161
IV. Josh Ellison Transcript	185
V. James Scott Transcript	211
VI. Christian Judge Transcript	229
VII. Mark Unwin Transcript	244
VIII. Karen Berger Transcript	270
IX. Kristin Osterwold Transcript	292
X. Anonymous A Transcript	295
XI. Lyn Dawson Transcript	321
XII. Simon Neale Transcript	339
XIII. Jaydan Salzke Transcript	362
Appendix M: Community Interview Transcript	391
I. Steve Charles Transcript	391

II. Tony Stephens Transcript	402
Appendix N: Email Templates	412
1. NZ Greetings and sign-offs	412
2. NZ Expert email sent out to the expert and community interviews	412
3. NZ Expert Time Available Respond	414
4. USA Expert email sent out	414
5. Community Survey Social Media Post	416
6. Community Survey email sent out:	417
7. User Survey email sent out:	418
8. User Survey follow-up email sent out:	419
Appendix O: Atlas.ti AI analyzed	421

List of Figures

Figure 0.1: Interview Motivation Results	iv
Figure 0.2: Interview website design result.	iv
Figure 0.3: If you were to visit a website about electrification in New Zealand, which of the	
following features would make you more likely to explore or take action?	iv
Figure 0.4: Which of the following would most motivate or support you in taking the first step	р
toward electrification	v
Figure 0.5: Pre- and Post-Survey Average Responses	v
Figure 0.6: Diverging Stacked Bar Graph for Post-Survey Website Traits Statements with Lik	ert
scale choices	vi
Figure 0.7: Aotearoa Electrification Hub Homepage	vi
Figure 0.8: Cost Savings page	vi
Figure 0.9: Start Your Journey page	vi
Figure 0.10: Strengthen Our Future page	vii
Figure 2.1: A typical New Zealand household's electricity consumption (Khan et al., 2019).	6
Figure 3.1: Project flow chart	14
Figure 3.2: Two versions of the survey flyers used for the community survey.	18
Figure 3.3: Two versions of the survey flyers used for the user testing survey.	21
Figure 4.1: Expert Interview Distribution by Sector	24
Figure 4.2: Theme Frequency during Interviews	25
Figure 4.3: Interview Website Design Coding.	27
Figure 4.4: What is your age range?	29
Figure 4.4: Stacked Bar Graph for Survey Statements with Likert scale choices	30
Figure 4.5: Which of the following would most motivate or support you in taking the first step	р

xix

Figure 4.6: What concerns or challenges do you associate with electrification?	32
Figure 4.7: How often do you look online for information about home upgrades, energy, or	
sustainability?	33
Figure 4.8: If you were to visit a website about electrification in New Zealand, which of the	
following features would make you more likely to explore or take action?	34
Figure 4.9: Interactive graphs on the India Climate and Energy Dashboard	37
Figure 4.10: Screenshot of the India Climate and Energy Dashboard (ICED) menu navigation,	
showcasing the categorized energy data structure by source and usage type.	37
Figure 4.11: Screenshot of the Clean Energy Wire homepage,	38
Figure 4.12: A static chart from Clean Energy Wire showing final electricity consumption by	
consumer group in Germany (1990–2023).	39
Figure 4.13: Screenshot from EECA's "Warmer Kiwi Homes".	40
Figure 4.14: Screenshot of the IEA Regional Dashboard presenting regional energy trends usir	ng
stacked graphs.	42
Figure 4.15: Homepage of the Climate Council's Momentum Monitor.	43
Figure 4.16: Example of a thematic section "Transport".	44
Figure 4.17: Interactive content expansion within the Transport section.	45
Figure 4.18: A wireframe of the homepage of the Aotearoa Electrification Hub	50
Figure 4.19: A wireframe of a content page of Aotearoa Electrification Hub	5
Figure 4.20: Non-optimized website with 3.181s before the background loaded (webpagetest.c	org)
	51
Figure 4.21: Optimized website with 0.583s before the background loaded (webpagetest.org)	51

Figure 4.22: Stacked Bar Graph for Pre-Survey Knowledge and Understanding Statements with

	55
Figure 4.23: Stacked Bar Graph for Post-Survey Knowledge and Understanding	g Statements with
Likert scale choices	53
Figure 4.24: Stacked Bar Graph for Pre-Survey Motivation Statements with Lil	cert scale choices
	54

Figure 4.25: Stacked Bar Graph for Post-Survey Motivation Statements with Likert scale choices

Figure 4.26: Stacked Bar Graph for Post-Survey Website Traits Statements with Likert scale	
choices	55
Figure 5.1: Screenshot of Homepage on Aotearoa Electrification Hub with cost savings hove	r
text activated	56
Figure 5.2: Screenshot of Cost Savings Page on Aotearoa Electrification Hub	57
Figure 5.3: Screenshot of Space Heater section in Compare Machines sidebar from Cost Savi	ngs
Page	58
Figure 5.4: Screenshot of Water Heater section in Compare Machines sidebar from Cost Savi	ngs
Page	58
Figure 5.5: Screenshot of Start Your Journey Page	59
Figure 5.7: Screenshot of rewiring.nz space heating and cooling guide	60
Figure 5.8: Screenshot of Strengthen Our Future Page on Aotearoa Electrification Hub	61
Figure 5.10: Screenshot of Air Quality Index sidebar from Strengthen Our Future Page	62
Figure 5.11: Screenshot of rewiring.nz Communities Page	63
Figure O.1: Example of Atlas.ti AI analyzed tools without any modifications.	421
Figure O.2: Example of Atlas.ti AI suggested themes without any modifications.	421
Figure O.3: Example of Atlas.ti code manager.	422

53

54

List of Tables

Table 3.1: Expert Interview Information	16
Table 3.2: Community Interview Participants and Backgrounds	17
Table 3.3: Summary of Case Studies Websites Reviewed	19
Table 4.1: Summary of Case Study Findings and Website Design Implications	46

Meet the Team

Andreas Keating

Hi there! My name is Andreas Keating. I'm a computer science major from Barcelona, Spain, minoring in Interactive Media and Game Design. Working on this project has been extremely fulfilling, and I'm excited that our work will help make electrification more accessible to people across New Zealand.





Tue Lac

Hi! My name is Tue Lac. I'm a Mechanical Engineering student at WPI from Ho Chi Minh City, Vietnam. Being able to work on a project that supported sustainability efforts was an incredibly rewarding experience. Traveling to New Zealand was unforgettable, and I love that our work contributes to the global push for a greener future.

Ben Marsh

I'm a computer science student from Lincoln, Massachusetts, with a minor in Chinese. Having immersed myself in New Zealand's landscapes and culture, I'm passionate about supporting its decarbonization efforts. My time here has deepened my understanding of sustainability challenges and strengthened my commitment to helping build a cleaner, more resilient future.



1. Introduction

Global warming is one of the greatest challenges that worldwide communities face. As carbon emissions continue to drive climate change, many countries are working to reduce their reliance on coal, oil, and natural gas. Many are opting to reduce emissions and improve energy sustainability through electrification: replacing fossil-fuel-powered systems with electric alternatives.

Achieving full electrification in New Zealand will require both more renewable power generation and less fossil-fuel-burning machinery in homes, companies, and industries. Though many people and organizations are still hesitant to electrify because of the high upfront cost, New Zealand's considerable renewable-energy capacity provides a good starting point.

In New Zealand, organizations such as Ara Ake and Rewiring Aotearoa host online resources that highlight the economic and environmental benefits of electrification, helping to build public awareness and momentum for change. Yet many New Zealand households still lack clear, motivating information that connects national decarbonization goals to the practical benefits they can realize at home.

Despite various efforts to promote electrification, there remains a gap in delivering intuitive, accessible, and motivational data to New Zealand residents. While some progress has been made, our sponsors believe an interactive online resource can accelerate adoption by clearly showing the public why electrification matters, how they can contribute, and motivating them to take action. Consequently, an opportunity exists to develop a centralized, interactive resource that clarifies the personal and collective advantages of electrification, encouraging people to take informed actions that will ultimately push New Zealand toward a more electrified and decarbonized future.

Sponsored by Ara Ake and Rewiring Aotearoa, the project team addressed these absences by creating a website that communicates accurate and motivating information about

electrification to the New Zealand public, inspiring action towards a cleaner, more sustainable future. The project focused on three main objectives:

- 1. Investigate and research methods to convey the benefits of electrification.
- 2. Develop a website that motivates the New Zealand public to take action on electrification.
- Gather feedback on how effectively the website motivates the New Zealand public to take action on electrification.

This project responded to the need for more individuals taking action towards electrification. By building a website centered on public interests and concerns, the team aimed to bridge the gap between national climate targets and everyday decisions. The project employed a mixed-methods approach, including expert and community interviews, public surveys, and analysis of international case studies to inform website design and content.

Key design findings indicated strong public preferences for clear visuals, interactive elements, practical guidance, and simplified language. Important motivation findings included cost savings, reducing environmental impact, and interest in new technologies. By conducting a user study, the team found that the website effectively increased user motivation and understanding regarding household electrification, with particular strengths in visual appeal, ease of navigation, and clarity of information presented. The team aimed to inspire individuals across New Zealand to take informed steps toward electrification through this project.

2. Literature Review

This literature review provides background on the broader context of electrification in New Zealand. Starting with section 2.1, the team introduces the sponsors. Section 2.2 outlines the four primary sectors, residential, commercial, industrial, and agricultural, where electrification offers general benefits. In addition, this section looks at its advantages for public health, energy security, emissions lowering, and energy efficiency. Section 2.3 examines specific machines, both the traditional and electrified versions to understand what machines have the greatest impact and how that impact is determined. The chapter concludes with a discussion of the policy and economic factors shaping electrification and sets the foundation for the research methods and website development tools.

2.1. Sponsors

The team worked on this project in collaboration with two sponsors, Rewiring Aotearoa and Ara Ake. Rewiring Aotearoa is a non-profit group focused on clean energy, climate solutions, and electrification. They work on reducing reliance on fossil fuels and helping communities across New Zealand switch to sustainable energy. Their support for the project aligns with their mission to spread awareness and make electrification more accessible to everyone.

The team's second sponsor, Ara Ake, is a government-funded organization that works to improve New Zealand's energy sector. They focus on developing new energy technologies, connecting experts, and supporting projects, such as this one. Their technical knowledge guided our research to be relevant and make a contribution to New Zealand's sustainable future.

2.2. <u>Benefits of Electrification</u>

Electrification, replacing fossil fuels with electricity as the primary energy source, offers a path forward for New Zealand by tackling rising energy costs, improving air quality, and

ensuring energy security in the long run. According to *Electric Homes* (Ellison et al., 2024) and *Investing in Tomorrow* (Griffith et al., 2024), swapping out gas heaters, petrol cars, and other fossil-fuel appliances and tapping into the nation's renewable grid can save families over 1,000 NZD a year and cut emissions by 70–90%. These benefits go beyond just lowering utility bills: switching to electric alternatives reduces harmful pollutants, keeps households safer from global price swings, and boosts resilience during severe weather or other disruptions. Viewed from financial, environmental, or infrastructure perspectives, electrification is a powerful strategy in decarbonization and a more secure future for New Zealand residents.

2.2.1. Economic Benefits

As energy prices outpace inflation, New Zealand's annual spending on fossil fuels hovers around 20 billion NZD, most of which the country brings in from overseas (Griffith et al., 2024). By switching to electric alternatives, families can cut their yearly bills by hundreds, or even thousands, of dollars. *Electric Homes* notes that replacing gas/Liquefied Petroleum Gas (LPG) appliances and petrol vehicles alone can save more than 1,000 NZD per household each year, thanks to efficiency improvements and the customers' reduced exposure to volatile fossil fuel markets (Ellison et al., 2024). Meanwhile, *Investing in Tomorrow* projects that large-scale electrification could save the nation about 10.7 NZD billion per year by 2040, underscoring its significant economic advantages (Griffith et al., 2024).

2.2.2. Cost and Energy Efficiency

In addition to cutting household expenses, widespread electrification significantly increases overall energy productivity. *Investing in Tomorrow* points out that electric heat pumps, induction cooktops, and electric vehicles, especially when coupled with rooftop solar and battery storage, often deliver lower lifetime ownership costs than their fossil-fuel counterparts (Griffith et al., 2024). This efficiency advantage also improves New Zealand's trade balance by reducing

the billions of dollars spent on imported coal, gas, petrol, and diesel. Meanwhile, the *Delivered Cost of Energy* paper demonstrates that distributed generation (such as rooftop solar) can reduce transmission losses and postpone costly infrastructure upgrades, thereby enhancing cost-effectiveness across the entire energy system (Ellison et al., 2024b).

2.2.3. Emissions

Multiple studies show that replacing fossil fuels in transportation, heating, and cooking can dramatically lower emissions (Ellison et al., 2024; Griffith et al., 2024). Relying on gas-fired water heaters and petrol vehicles locks in high carbon output for years to come. Because New Zealand's grid is largely powered by renewables, switching these systems to electricity can slash emissions by 70–90% (Griffith et al., 2024).

2.2.4. Environmental and Public Health Benefits

Electrifying cooking and heating not only improves indoor and outdoor air quality, but these changes also curb the pollutants that worsen asthma and other respiratory issues. By replacing gas appliances, especially in kitchens, households can significantly reduce health risks, which is an important consideration for families with children or people prone to respiratory problems (Ellison et al., 2024). Beyond individual homes, curbing fossil fuel use lowers greenhouse gas emissions in neighboring communities, yielding widespread health benefits. This progress includes cutting down on particulate matter, toxic residues, and other harmful byproducts that contribute to better overall well-being.

2.2.5. Energy Security and Grid Resilience

By moving away from imported fossil fuels, New Zealand can enhance its energy security and reduce its exposure to volatile global oil and gas prices. *Investing in Tomorrow* notes that generating power locally (especially through rooftop solar paired with batteries) offers households a reliable fallback during severe weather or other grid disturbances (Griffith et al.,

2024). Meanwhile, the *Delivered Cost of Energy* report indicates that widespread adoption of home-based generation relieves stress on the grid during peak demand and curtails transmission losses, ultimately improving overall system performance (Ellison et al., 2024). In times of storms or during the numerous earthquakes in New Zealand, this access to on-site renewable power and storage not only limits outages but also speeds recovery.

2.3. <u>Electrification Opportunities</u>

To better understand the demand side of the energy sector in New Zealand, this section examines the use of appliances throughout the country. Figure 2.1 shows water and space heating's combined usage percentage represents almost half of a typical New Zealand household's total energy demand. The following sections will explore the potential energy and cost savings of proven technologies for space heating and cooling, water heating, and electric vehicles.



Figure 2.1: A typical New Zealand household's electricity consumption (Khan et al., 2019).

2.3.1. Space Heating Appliances

Based on sampling done by Machine Count, wood is the primary fuel source of space heaters in New Zealand (J. Sahng, personal communication, March 19, 2025). The sustainable alternative is ground-source heat pumps (GSHPs) (Barr & Talwar, 2025), appliances that transfer heat to or from the ground. GSHPs are one of the most energy-efficient and cost-effective ways to manage air temperature. Transitioning from air-source heat pumps to GSHPs reduces monthly running costs from 340 to 170 NZD due to their lower electricity consumption (Barr & Talwar, 2025). Additionally, installing modern building insulation can further enhance efficiency and reduce carbon emissions.

2.3.2. Water Heating Appliances

Water heating represents another 30% of household energy demand in New Zealand (see Figure 2.1). Currently, approximately 80% of New Zealand's water heaters are electric, with natural gas accounting for about 16% of installations. Although the water heaters are electric, the majority are electric resistance water heaters (ERWH). Replacing the ERWHs with heat pump hot water (HPHW) systems offers significant financial advantages. This transition would save the typical consumer about 600 NZD per year and reduce energy consumption by about 2.4 MWh per year (Armstrong, 2013).

2.3.3. Electric Vehicles

Light vehicles account for 11.6 % of greenhouse gas emissions in New Zealand (EECA, n.d.). To reduce these emissions, the adoption of electric vehicles is critical. Over 15 years, driving an average of 42 kilometers per day, a mid-sized gas-powered car will produce 51.6 metric tons of carbon dioxide, while a mid-sized battery-powered car will produce 20.7 metric tons, a 60% reduction in emissions (IEA, 2024). In addition, electric vehicles offer savings for

the consumer. The lifetime cost of owning a petrol car is, on average, 11,184 NZD more than an electric car charged by the grid (Ellison et al.).

2.4. <u>New Zealand's Electrification Opportunity</u>

New Zealand has great potential for complete electrification with its many renewable energy sources, dependable infrastructure, and friendly laws. Still, financial, technological, and behavioral restrictions delay the process. Residential (including houses, apartments, and condominiums), businesses, and farms faced unique challenges in fully benefiting from electrification. This section discusses key electrification possibilities along with their financial and environmental benefits, as well as the specific problems governments, businesses, and local communities must solve to guarantee a transition with the least disturbance.

2.4.1. Renewable Energy Capacity and Grid Readiness

By using mostly hydroelectric, geothermal, and wind energy sources, New Zealand produces 80% of its electricity from renewable sources (EECA, n.d). This solid power infrastructure makes electric energy sources a low-emission, sensible option. Still, renewable energy sources are only part of the solution; the infrastructure must be ready to meet the growing demand for extensive electrification.

Ara Ake (2024) points out that most of New Zealand's present decarbonizing efforts center on supply-side solutions meant to increase the capacity for renewable energy sources. Nevertheless, guaranteeing a consistent power source requires a more comprehensive strategy, including demand control as well. Load management programs, time-of-use costs, consumer-level energy storage, and energy efficiency technologies help lower peak energy demand and minimize system overload. These instruments help to promote a better electrification process by minimizing wasteful energy use and increasing demand-side efficiency, therefore relieving the general burden on the system.

Reducing reliance on centralized power plants by employing distributed energy resources such as rooftop solar and battery storage technologies will provide system flexibility (Ellison et al., 2024). Utilizing smart grid technologies will enable New Zealand to increase electrification while keeping grid dependability and cost-effectiveness, hence enhancing the energy system. While electrification depends on new engagement from people in residences, companies, and the agricultural sector, strengthening the electrical infrastructure prepares the way for a successful path that addresses climate change.

2.4.2. Residential Sector: Cost Savings and Energy Security

Through electrification, homes throughout Aotearoa, New Zealand, may reduce costs and improve energy security. Especially when combined with rooftop solar and home battery storage, Griffith et al. (2024) contend that replacing fossil-fuel-based appliances and cars with electric alternatives will significantly lower national energy consumption. These savings result from better efficiency, decreased dependence on fossil fuels, and smart energy system applications. Features like time-of-use pricing, which charge different rates depending on the time of day, more evenly distribute power demand and lower peak load costs.

Though the long-term savings promise to be substantial, high upfront costs discourage many homeowners from converting to heat pumps, induction stoves, and electric water heaters. Policymakers can help more families make the change and raise adoption rates by extending access to government incentives and funding choices. Long-term electrification guarantees more stable and safe household energy consumption and shields customers from erratic fossil fuel pricing. Smart technology (e.g., timers and sensors) and local energy storage assist in controlling demand and stopping increasing residential electrification from taxing the grid.

In this regard, flats and condos offer special difficulties and possibilities. Unlike single houses, these multi-unit residences generally depend on common infrastructure and choices

made by property managers or owners' organizations, which thus hinder retrofitting attempts. Upgrades are more challenging to carry out given the limited roof space for solar panels, the antiquated electrical infrastructure, and the necessity of several inhabitants' shared consent. These structures, however, provide the possibility for large-scale coordinated electrification as well. Centralized energy management, EV charging, and heating could provide notable advantages. Ensuring that renters and condo owners engage in a sustainable energy transition is mostly dependent on government initiatives and revised building standards addressing multi-unit housing.

Residential electrification includes a variety of home styles. Widespread adoption across all types of housing can facilitate Aotearoa, New Zealand's more general clean energy targets. The commercial and industrial sectors, meanwhile, have much more potential for increasing energy efficiency and lowering emissions.

2.4.3. Commercial and Industrial Sector: Efficiency and Competitiveness

The electrification transition in New Zealand primarily depends on the proactive participation of companies and industrial activities. Reaching national decarbonizing targets relies deeply on involvement from industrial energy consumers and industry leaders. Although New Zealand's pleasant weather lowers the desire for air conditioning and heating in many commercial buildings, especially in comparison with countries with high temperatures, industrial sectors such as manufacturing, transportation, and heavy industries nevertheless use large amounts of energy for heating. In the warmer northern areas of New Zealand, where cooling demand is still rising, many buildings include internal heating systems that also function as air conditioning systems.

Turning from fossil fuels to electric substitutes improves global competitiveness, decreases business expenses, and boosts efficiency. According to the Energy Efficiency and

Conservation Authority (EECA, n.d.), switching to electric alternatives for diesel-powered industrial boilers greatly reduces expenditures and emissions. However, fully implementing electrification presents several challenges, such as managing peak electricity demand, upgrading infrastructure, and maintaining grid stability. Furthermore, New Zealand's seismic risks have led to rigorous construction regulations, which create challenges for integrating modern energy systems into commercial buildings.

While the current New Zealand government has indicated resistance to providing significant financial incentives for this shift, existing tax credits and energy efficiency rules help electrification (Ara Ake, 2024). Without obvious legal direction, companies must be proactive in creating electrification plans that match environmental objectives and budgetary limits. But motivating action requires more than legislation; it calls for involvement and awareness. Powerful motivators might be tools such as interactive dashboards, which display energy usage, cost savings, and emissions reduction. These tools can enable industrial decision-makers to appreciate the value of early and proactive investment in energy transformation by making the advantages of electrification clear and quantifiable.

2.4.4. Agricultural Sector: Sustainable Energy Solutions

In 2024, agriculture contributed about 6% to New Zealand's GDP and employed a significant share of the country's workforce (Statistics New Zealand, 2024). Though economically significant, the industry is still somewhat dependent on fossil fuels for transportation, irrigation, dairy processing, and agricultural equipment. The Ministry for Primary Industries (MPI, 2023) reports that diesel and petrol remain the main energy sources on farms. Without sacrificing output, electrification offers a hopeful road to lower emissions.

The shift to electric substitutes is complicated in rural regions by the limited availability of dependable energy. Certain Māori villages, among other isolated areas, have varying access to
power. Tracking fossil fuel-powered equipment use on farms, the Machine Count project (Ara Ake, 2024) looks for ideal locations for electrification. By identifying these sites, stakeholders could create focused, feasible energy solutions that meet the actual demands of farming activities.

Investing in rural charging infrastructure, boosting on-site renewable energy generation, and offering financial assistance for equipment modifications would help stakeholders promote agricultural electrification. Engaging directly with farmers through cooperatives, trade groups, and local networks keeps electrification initiatives relevant, accessible, and aligned with real-world needs. Policymakers will need to rely on data-driven insights to guide progress, especially given recent findings that the government has avoided offering substantial financial incentives for this transition (Ara Ake, 2024). By collaborating, farmers, technology providers, financial institutions, and lawmakers can develop practical, industry-specific energy solutions.

2.4.5. Economic and Policy Considerations

Reaching widespread electrification in Aotearoa New Zealand calls on the government to solve important problems concerning cost, infrastructure development, and fair access to power. While some laws seek to facilitate this change, lawmakers must consider present issues before choosing a sensible course of action.

Studies point to the most urgent issues being low public knowledge, large upfront expenses, and needed grid improvements. Reera et al. (2023) find that companies and consumers still see financial constraints as the main hurdle to embracing electrification. Emphasizing the need to invest in demand-response technology, energy storage solutions, and smart grids to keep the system dependable, Ara Ake (2024) and Griffith et al. (2024) emphasize the importance of public education to raise consumer acceptability and knowledge of the long-term advantages of electrification.

12

2.5. <u>Summary</u>

This chapter investigates the prospects, advantages, and difficulties of electrification across New Zealand's residential, commercial, industrial, and agricultural sectors. By substituting electricity for fossil fuels, especially given the nation's great renewable energy base, electrification presents an effective approach to lower long-term energy prices, reduce emissions, and enhance energy security.

Researchers highlight major financial and environmental benefits, including household savings of over 1,000 NZD annually, less susceptibility to global fuel price volatility, and emissions reduction of up to 90%. Electrification boosts public health, enhances grid resilience, and improves air quality as well.

However, several factors have slowed development. Ongoing obstacles for wider adoption are high initial costs, poor infrastructure, and little knowledge, particularly in the industrial and agricultural sectors, which need more significant energy system modifications. Dealing with these issues calls for concentrated tactics based on facts, available technologies, and genuine economic incentives.

Advancing electrification in New Zealand requires not only technological feasibility but also active engagement with those most affected by the transition. The following chapter presents the approach the project team developed and executed to engage key stakeholders, deliver relevant data, and guide informed decisions that drive meaningful progress toward a more sustainable energy future.

13

3. Methodology

This project attempted to develop a website that communicated motivating information about electrification to the New Zealand public. The goal was to present information about electrification in New Zealand in a way that motivates individuals to take action. The project goal was to accurately, motivationally, and interestingly show New Zealand's advancement toward universal electricity. The objectives to accomplish this were:

- 1. Investigate and research methods to convey the benefits of electrification.
- 2. Develop a website that motivates the people to take action on electrification.
- 3. Gather feedback on how effectively the website motivates the New Zealand public.

The study used a mixed-methods approach by integrating historical research, expert interviews, user testing, and public surveys (see Figure 3.1). The project team evaluated the performance of the website, focusing on its capacity to assist users' grasp of national electrification initiatives and the information presentation clarity. The team chose these strategies to address the project objectives under the project time constraints. This chapter discusses the methods the team implemented for each of the three project objectives.



Figure 3.1: Project flow chart

3.1. <u>Objective 1: Investigate and research methods to convey the benefits of electrification.</u>

The original goal of Objective 1 was to identify metrics that could measure the progress of electrification in New Zealand. Early research and expert input showed that simply presenting data would not be enough to drive public engagement. In response, the objective shifted toward understanding how to frame the benefits of electrification in ways that are clear, compelling, and accessible.

The team conducted 14 expert interviews and 2 community interviews to explore which benefits are most motivational and how to visualize the information in the most accessible ways. The team also collected 50 surveys to gather the public's viewpoint and ensure the website would be clear and relevant to daily users.

The team also examined five international websites focused on sustainability, electrification, or energy education. These case studies offered insights into how other platforms combine design and messaging to turn technical content into motivating public narratives. Based on this research, the team prioritized layout strategies, interactive features, and visual explanations that encourage user engagement and action, rather than focusing solely on quantitative indicators.

3.1.1. Expert & Community Interviews

Expert interviews are beneficial for the analysis of complex decision-making processes where large amounts of information are involved. To explore perceptions about the implementation of the electrification transition, the project team employed snowball sampling and collaborated with Ara Ake and Rewiring Aotearoa by interviewing their colleagues and additional experts they recommended. Table 3.1 provides information about the 14 interviewed.

Name	Email	Туре	Sector	Date of interview	
Dave Karl	dave.k@rewiring.nz	In person	Energy	April 7th	
Bryony Lane	bryony@rewiring.nz	In person	Energy	April 7th	
Chris Pye	c.pye@clelands.net.nz	Online	Construction	April 9th	
Euan White	euan@forestlodge.nz	Online	Agriculture	April 11th	
Josh Ellison	josh@rewiring.nz	Online	Energy	April 11th	
James Scott	james@localenergy.nz	Online	Energy	April 15th	
Christian Judge	christianjudge@yahoo.com	Online	Communication	April 15th	
Mark Unwin	mark.unwin@mll.co.nz	Online	Energy	April 16th	
Karen Berger	karen.berger@rochester.edu	Online	Education	April 16th	
Kristen Osterwood	kcosterwood@wpi.edu	Email	Education	April 16th	
Anonymous A	N/A	Online	Energy	April 16th	
Simon Neale	Simon.Neale@eranz.org.nz	In person	Energy	April 17th	
Lyn Dawson	lyndee580@gmail.com	Phone Call	Energy	April 17th	
Jaydan Salzka	jay@rewiring.nz	Online	Communication	April 17th	

Table 3.1: Expert Interview Information

At the beginning of each interview, the team explained the purpose of the project, covered confidentiality procedures to participants, and secured informed consent (see Appendix A). Two team members conducted the interviews in person or via conference call, with one member asking questions and the other taking notes. With consent, the interviewers recorded each session, which lasted between 45–60 minutes. The project team structured the interviews around prepared questions while leaving room to explore additional topics and ask follow-up questions. Our team designed the questions so that experts could share their insights on electrification and propose motivational topics and design features (see Appendix B). The questions that address objective one are B.8 through B.12.

Additionally, community or non-expert interviews are valuable for understanding how individuals perceive and experience the electrification transition in their homes, neighborhoods, and daily lives. These interviews help illuminate personal motivations, barriers, and levels of awareness that may not be visible through technical data alone. The project team used convenience and snowball sampling to engage with community members, including university students, renters, homeowners, and residents across different living situations. Table 3.2 provides information about the non-experts interviewed during this phase of the project.

Name	Email	Туре	Date of interview	
Steve Charles	steve@charles.net.nz	Online Interview	April 10th	
Tony Stephens	thstephens1@gmail.com	In-person Interview	April 15th	

Table 3.2: Community Interview Participants and Backgrounds

Similar to the expert interviews, both community interviews started with a short project description, confidentiality policies, and a request for informed consent (see Appendix C). Two members of the project team conducted one of these interviews in person and the other one via video conference. Tailored to represent the community viewpoint on electrification, the talks were informal and followed a reduced version of the expert interview protocol (see Appendix D).

The interviews ran roughly 30–45 minutes and focused on perceptions of electric appliances, daily energy use, barriers to change, and community-level motivations. Since there were only two community interviews, this report merges the results and analysis from both the expert and community interviews into a single section in the next chapter.

3.1.2. Community Surveys

In addition to expert and community interviews, the project team conducted 50 public surveys. Reflecting important topics from the community interviews, these surveys asked about home energy usage, attitudes toward electric appliances, adoption obstacles, and electrification motivation. This agreement guaranteed uniformity across data sources and enabled more involvement.

To reach a more diverse and representative sample of the New Zealand public, the team used two recruitment strategies: street outreach and social media promotion. A team member posted flyers on advertising walls around central Wellington, including Cuba Street and the waterfront area. They also collected responses in person using Qualtrics Offline on an iPad. In addition, the team shared the survey through local online community groups not affiliated with the project sponsors (see Figure 3.2). Online respondents accessed the survey through QR code.



Figure 3.2: Two versions of the survey flyers used for the community survey.

The survey took 3–5 minutes to complete and captured a wide range of perspectives from people with varying demographics and levels of electrification awareness. While the team used convenience sampling, they reached individuals without strong backgrounds in electrification, which helped reduce bias. Out of 50 responses, 37 came from man-on-the-street outreach and 13 from online sharing. The team conducted in-person surveys during the Anzac weekend in busy public areas around Cuba Street and the waterfront, targeting afternoons and early evenings when foot traffic was high.

To encourage continued participation, the final survey question asked if respondents were willing to complete a follow-up user testing survey. The team collected email addresses through open-ended responses and later sent the testing survey to those who agreed. They analyzed the survey results to identify recurring themes that either supported or challenged the interview findings, enriching the project's understanding of public attitudes toward electrification. A more detailed qualitative analysis of responses is provided in Section 3.4.

3.1.3. Case Study of Existing Websites

The team conducted a case study of five international websites that focus on energy use, electrification, and sustainability. Each of the five websites came from a different country and provided information meant for that country's general audience (see Table 3.3). The study evaluated layout design, ease of navigation, accessibility, visual communication, and how effectively each platform translated complex metrics into clear, understandable insights.

Country	URL	Description
India	https://iced.niti.gov.in	Offers national, state-level energy and climate indicators, focusing on emissions and energy trends.
Germany	https://www.cleanenergywire.org/factsheet s/germanys-energy-consumption-and-pow er-mix-charts	Provides interactive charts detailing Germany's power mix, renewable energy share, and energy use.
New Zealand	https://www.eeca.govt.nz/insights/eeca-ins ights/electrifying-aotearoa-the-consumer-p erspective/	Shares consumer perspectives and data on electrification progress across New Zealand.
Australia	https://www.climatecouncil.org.au/resourc es/momentummonitor/#home	Tracks Australia's transition to clean energy, providing visual updates on energy trends and targets.
Multiple	https://www.iea.org/reports/world-energy- outlook-2024/regional-dashboards	IEA regional dashboard showing key energy metrics for Africa, China, Eurasia, European Union, India, Japan, Korea, Latin America, Middle East, Southeast Asia, and the United States.

Table 3.3: Summary of Case Studies Websites Reviewed

3.2. <u>Objective 2: Develop a website that motivates the New Zealand public to take</u>

action on electrification.

This objective focused on investigating and creating a website that properly notifies the public about New Zealand's progress with electrification. Based on the previous findings from objective one, the team designed a wireframe on canva to visualize the layout. The Final Website chapter details each page of the final design.

3.2.1. Wireframing and Prototype Design

Informed by insights from the case study analysis, expert interviews, and community interviews and surveys, the team initiated the design process by creating wireframes and developing an interactive prototype to communicate the benefits of electrification. Wireframing allowed the team to explore layout options and structure the website in a clear and accessible way. After discussions with the sponsor and evaluating available tools based on ease of use and collaboration features, the team selected Canva to produce the wireframes.

Once the team identified a general development path and produced a wireframe, the sponsor reviewed it on April 29th, marking the transition from planning to prototyping. This wireframing process laid the groundwork for the general layout of the website. Full implementation details are in the next chapter.

3.3. <u>Objective 3: Gather feedback on how effectively the website motivates the</u> New Zealand public to take action on electrification.

To address the third objective, the team conducted a user study to evaluate the effectiveness of the website as a motivational and informative tool. This study measured key factors such as usability, clarity, and motivation, using aligned pre-survey and post-survey questions. By aiming to simply and effectively convey New Zealand's decarbonization progress at the time of data collection, the user study attempted to determine if the website truly resonated with New Zealand residents regarding electrification.

3.3.1. User Study

The team used the sponsors' networks (including newsletters) to distribute digital flyers containing both a QR code and a URL link to the online pre- and post-surveys (see Figure 3.3). By Integrating "skip-logic" into questions regarding the user's age, residency, and device type, the team was able to ensure that all survey participants were aged 18 or over, currently resided in New Zealand, and were not using mobile devices. Participants first completed a pre-survey (see Appendices F); then they interacted with the website; and afterward they took a post-survey (see Appendices G). To link each participant's responses, the team assigned a unique, anonymous identifier on both surveys, which enabled us to compare individual user "before-and-after" data and assess if the website has shifted the users' motivation and understanding of electrification.



Figure 3.3: Two versions of the survey flyers used for the user testing survey.

3.4. Thematic Analysis

The thematic analysis process involved systematically coding transcripts from the 16 one hour long interviews. A team member coded each transcript, initially employing Atlas.ti (ATLAS.ti, n.d.), an AI-assisted qualitative analysis software. The software automatically identified recurring words, phrases, and concepts, generating preliminary themes around motivations, barriers, and perceptions related to electrification. Rather than loading a preset codebook, the team entered a series of prompts to guide Atlas.ti toward the desired themes. The software then surfaced candidate codes by scanning each transcript, sometimes assigning several overlapping labels to the same quotation. They carefully analyzed each excerpt and manually reassigned or merged codes to ensure the final set of themes was accurate and meaningful. The team manually corrected misclassifications and refined themes through discussion to keep results relevant and consistent across interviews. The team also standardized the coding approach for both expert and community sessions, carefully accounting for slight differences in their question sets during review. Appendix O shows a typical Atlas.ti output that illustrates the initial thematic categorization.

4. Results & Analysis

This chapter presents the results the team gathered and analyzed to assess the development and impact of the Aotearoa Electrification Hub. The team organized the resultss around the project's three objectives and used data from expert and community interviews, public surveys, international case studies, and user testing. In Section 4.1, the team first analyzed insights from 14 expert interviews and two community interviews, then examined responses from a community survey. Section 4.2 supports Objective 2, the team compared development methods, selected a custom-coded approach, and based design choices on feedback from interviews, surveys, and case studies. This section also describes how the team addressed technical challenges related to performance and navigation. Section 4.3 considersObjective 3. The team conducted pre- and post-surveys with 16 participants to assess changes in knowledge, motivation, and user experience. Each section explains how the team used research results to inform decisions, structure the website, and evaluate its impact on public understanding and motivation.

4.1. <u>Objective 1: Investigate and research methods to convey the benefits of</u> <u>electrification.</u>

4.1.1. Expert & Community Interviews

This section presents the results from the 14 expert interviews and 2 community member interviews that the project team conducted. The analysis focuses first on the factors that influence electrification decisions and then continues by discussing the interviewees' viewpoints on preferred strategies for designing an effective public website that presents current electrification efforts.

4.1.1.1. <u>Stakeholder Interview Distribution</u>

Figure 4.1 shows the breakdown of the expert interviews into five groups of stakeholders including experts in energy, education, construction, agriculture, and communication. However,

both community interviewees were affiliated with Rewiring Aotearoa which is a biased sample of the public as they have a strong interest and understanding in clean energy issues.



Expert Interview Distribution by Sector

Figure 4.1: Expert Interview Distribution by Sector

4.1.1.2. <u>Motivation for Electrification</u>

Figure 4.2 presents the frequency of motivational themes mentioned across all 16 interviews, including both experts and community members. The results came from a coding process that counted each time a participant referenced a concept related to one of the five identified themes, even if mentioned multiple times within a single interview. Cost savings emerged as the most frequently cited motivator, followed by interest in new technology. Environmental impact, community influence, and energy control appeared less frequently but still mentioned in several interviews.



Figure 4.2: Theme Frequency during Interviews

Quotes from the interviewees reinforced the importance of financial considerations. Euan White, an orchard operations manager, said, "*Money is the big factor here. Is it cheaper to run? Am I going to save myself money by doing this? Yes or no?*" Similarly, Chris Pye noted that upgrading to hybrid construction vehicles was cost-prohibitive: "*The jump to go from our current fleet up to hybrid was about 55,000 [NZD] up to 90,000 [NZD]. It just didn't make sense.*" Here Mr. Pye is considering the replacement of internal combustion vehicles with hybrid alternatives for commercial use.

Josh Ellison pointed out that, beyond total cost, the manner in which a website presents these costs can also shape public willingness to switch. Josh Ellison referred to this as "cost framing", explaining that offering details about monthly payment plans could improve adoption: *"If you're paying for your vehicle like a Netflix subscription, most people would probably already be driving electric vehicles."* This suggests that making electrification options feel familiar and financially manageable within one's monthly budget (e.g., through subscription-style or financing models) could improve uptake, particularly for price-sensitive consumers.

In addition to cost, six participants emphasized how electrification offered control and independence. Tony Stephens, a community member explained, "*It just feels so good to have the control in my hands. I'm not paying the utility company, and I haven't visited a petrol station in a year and a half.*" His experience illustrated how financial autonomy and energy resilience, rather than upfront cost savings alone, can also motivate household electrification.

Taken together, these results indicate that financial viability and technological appeal were the most widely shared motivators across interviewees. However, other factors including cost framing and personal energy control also played a role for several individuals. Public messaging should therefore highlight both dominant motivators and secondary concerns to resonate with a broader range of users.

4.1.1.3. <u>Website Design Preferences</u>

During the second half of each interview, the team asked participants to reflect on what features an electrification website should include to make it informative, trustworthy, and engaging. Figure 4.3 shows the results when the team coded responses into five themes, using a count-based method where each interviewee contributed at most one mention per theme. Since this question targeted a specific part of the conversation and produced a smaller volume of data than earlier themes, the counts in this figure are lower than those in Figure 4.2.



Figure 4.3: Interview Website Design Coding.

Eight out of sixteen interviewees emphasized the need for simple explanations. Seven participants noted the importance of clear visuals and the use of testimonial-style storytelling. Four interviewees supported the inclusion of side-by-side comparisons, while another four mentioned videos or media as useful for capturing attention and making information more engaging.

Four interviewees stated that testimonials created stronger connections than technical data alone. Steve Charles remarked, "I think numbers and graphs work for some people, but the rest need a compelling story." He added that messaging needs to feel human: "You don't want it to feel like it's from the government."

Others reinforced the need for visual simplicity and interactivity. For example, Karen Berger, Associate Professor at the University of Rochester in the US, said, "It has to be quite visual. Not too much detail. And it's always nice if it's interactive, like if you can mouse over something and it adds a bit more detail." She also supported the use of contextual visuals over raw numbers, noting that graphics should translate abstract data into real-world meaning: "Try to take numbers and convert them into images... like stick figures missing school because of asthma linked to fossil fuel pollution".

The website's aesthetics also emerged as a recurring topic. Jaydan Salzke from Rewiring Aotearoa emphasized that design attractiveness matters: "Things just need to look pretty... I love what Tesla does. The visuals don't always tell you something new, but they make you want to come back to the app."

These results indicate that participants valued five key design features: simple explanations, clear visuals, testimonial storytelling, side-by-side comparisons, and visual/media elements. These features guided website development to ensure both accessibility and emotional engagement.

4.1.2 Community Survey Analysis

The section analyzes the results of the participants' responses to the community survey.

<u>Demographic</u>

Figure 4.4 reveals that when you combine the 18-24 and the 25-34 age ranges, 60 percent of the survey respondents were between 18 and 34 years old which indicates a substantial representation of younger voices in the survey. Though younger respondents answered more often online and by QR code, older people demonstrated more interest during the in-person street surveys. They typically were more thoroughly engaged with the subject when the team asked them to participate.



Figure 4.4: What is your age range?

This age distribution provides important context for interpreting the survey results. Younger individuals may be more familiar with electrification technologies due to their exposure to sustainability messaging and comfort with emerging tools. However, middle-aged groups (35–54), who are more likely to own homes or apartments and have decision-making power over household appliances, were underrepresented in the sample. Future research should aim to better capture the perspectives of this group, as their choices will likely have the greatest near-term impact on household electrification.

Awareness, Trust, and Confidence

Figure 4.4 presents responses to five Likert scale statements designed to assess participants' awareness of electrification, trust in information sources, confidence in decision-making, and willingness to adopt electric technologies. Each bar shows the distribution of answers, ranging from "strongly disagree" (dark red) to "strongly agree" (dark green), with the average response marked by a black line.



Figure 4.4: Stacked Bar Graph for Survey Statements with Likert scale choices

Most of the respondents agreed or strongly agreed with the phrase "*I believe electrification is important for New Zealand's future*", showing general support for the energy transition of the nation. A similar trend applied for "*I would consider switching to electric appliances, tools, or vehicles*", implying readiness for personal change when circumstances allow.

Trust in information sources was also relatively high. Most respondents expressed confidence in information coming from government or science-backed sources. However, qualitative interviews revealed that while institutional trust exists, messaging that feels too official may still be perceived as distant or impersonal. Participants like Steve Charles preferred messages that felt more relatable and less *"like it's from the government."* This suggests that the

website should combine credible sources with familiar, human-centered delivery methods, such as simple visuals, relatable quotes, and independent comparisons.

The lowest average agreement was for the statement "*I feel confident making decisions about home energy upgrades*." Responses to this item were more varied, with a significant portion selecting neutral or somewhat disagreeing. This finding suggests that even when people are supportive of electrification in principle, they may lack the knowledge or resources needed to take action. The website should therefore not only motivate users but also guide them through the decision-making process with clear explanations, cost comparisons, and step-by-step options.

Motivations to Act on Electrification

Question 5 of the survey (see Appendix E) asked, "Which of the following would most motivate or support you in taking the first step toward electrification?" Participants rated eight different motivators on a five-point Likert scale ranging from "Very Not motivating" to "Very motivating." Figure 4.5 summarizes the average ratings for each potential motivator.





Average Likert Scale Rating (1 = Really Not Motivating, 5 = Very Motivating)

Figure 4.5: Which of the following would most motivate or support you in taking the first step toward electrification?

The respondents rated reducing environmental impact and saving money over time as the two most motivating factors. While these results suggest that long-term environmental and

financial benefits are key drivers of public interest in electrification, this does not match up with the expert opinions from Figure 4.2 where environmental impact shows up less frequently.

Although respondents rated simple guides or checklists, examples from others, and seeing others in their community make the switch slightly lower, all averaged above the neutral midpoint. These findings suggest that while social influence and practical resources may not drive decisions on their own, they can still provide useful support when included in outreach strategies.

Perceived Challenges and Concerns

Survey question E.6 (see Appendix E) was a multiple-response question that asked *"What concerns or challenges do you associate with electrification?"*. The question provided multiple choices where the respondent could select more than one concern. Figure 4.6 shows that high upfront cost is by far the most frequently cited issue, with respondents selecting this concern 74% of the time This result echoed the interview results, where participants repeatedly pointed to cost as the primary obstacle for individuals and organizations alike.



What concerns or challenges do you associate with electrification?

Percentage of Respondents Selecting Each Concern

Figure 4.6: What concerns or challenges do you associate with electrification?

In addition, 36% of respondents selected lack of information, and 34% chose concerns about performance. These responses indicated that informational gaps and doubts about technical reliability continued to limit public engagement. The project team identified these concerns as critical barriers to address through clear messaging and website content.

A small portion of respondents (10%) selected "*Other*" and provided additional comments. These included concerns about the availability of charging stations, a sense that electrification is merely swapping energy sources without reducing overall consumption, and the view that electricity prices in New Zealand are high and unstable. One participant noted: *"Electricity prices here are quite high relative to the rest of the world and are prone to rapid ups and downs."*

These results suggest that while financial concerns top the list, a combination of performance doubts, system-level limitations, and perceived affordability continues to limit public action.

Information-Seeking Behavior





Figure 4.7: How often do you look online for information about home upgrades, energy, or sustainability?

Figure 4.7 presents the distribution of responses of survey question E.7 (see Appendix E) asked participants, *"How often did you look online for information about home upgrades, energy, or sustainability?"*. Over half of respondents (52%) stated they searched for information

once a month or less, while 32% reported they never searched online for this type of content. Only 14% indicated that they looked more frequently, either a couple of times a month or weekly.

This outcome mattered because the proposed website functioned as an online-only tool. At least one-third of respondents reported behavior suggesting they would likely never encounter the website through typical online searches. This finding emphasized the need for sponsors to explore additional outreach methods beyond the Internet, such as printed guides, public seminars, store signage, or direct community engagement, to reach people who were less digitally connected.

Preferred Website Features

Question E.8 (see Appendix E) asked, "*If you were to visit a website about electrification in New Zealand, which of the following features would make you more likely to explore or take action*?" Respondents could select multiple options. Figure 4.8 shows the percentage of people who selected each feature.

If you were to visit a website about electrification in New Zealand, which of the following features would make you more likely to explore or take action?

(N = 50)



The Percentage of People Who Selected The Feature

Figure 4.8: If you were to visit a website about electrification in New Zealand, which of the following features would make you more likely to explore or take action?

Side-by-side comparisons (e.g., electric vs. gas) received the highest support, with 78% of respondents selecting this feature. Clear visuals such as charts, diagrams, and icons followed

closely at 74%. These two results stood out by a wide margin and indicated a clear public preference for direct comparison tools and easily digestible visual content.

These results reinforced earlier results from expert and community interviews, where participants emphasized the importance of simplicity and clarity in design. While other features received some support, these top choices highlighted that the website should prioritize visual clarity and side-by-side comparisons between electric machines.

Though they mentioned significant upfront costs, uncertainty, and performance issues as main obstacles, participants generally expressed great interest in electrification. Motivated by long-term savings and environmental advantages, they favored online material that was visually appealing, useful, and simple to compare. These revelations guided the team's design goals and assisted in matching the last website structure to public expectations and demands.

4.1.2. Case Study Analysis of Similar Websites

The team investigated and evaluated five foreign websites to determine each platform's positive and negative aspects (see Table 3.3). Focusing on qualities that improve usability, engagement, and clarity for general audiences, the aim was to find characteristics in these websites that inform the design of the electrification website. The team chose these sites about sustainable energy activities, as their goals match those of the website project.

The team created a set of five website criteria (based on interview and survey results) to use in the case study as evaluation components across the five websites, which included:

- 1. Key Features What functionalities or tools does the website offer?
- Layout & Navigation How does the website structure information and how easily can the user access this information?
- 3. Visual Design How does the website's aesthetics support usability and understanding?
- 4. Interactivity How can users engage with content or customize their experience?
- 5. Content Clarity How does the website communicate key messages and data ?

35

Appendix K provides notes the team compiled during the case study for the five sites using these five evaluation criteria. This section now reviews each of the five websites.

India Climate & Energy Dashboard

NITI Aayog (National Institution for Transforming India) created the India Climate and Energy Dashboard (ICED) as a consolidated platform for obtaining national and state-level climate and energy data in India. Developed to assist public knowledge and policy decision-making, the website is a storehouse of combined data sets that the website presents via interactive charts and visualizations.

One key takeaway from the ICED website is its intuitive approach to visualizing data (see Figure 4.9). The site enables users to filter results by geographical level (national or state), data type, and time range, so they can adjust what they see based on specific interests. This flexibility encourages deeper exploration and accommodates varied information needs.





Figure 4.9: Interactive graphs on the India Climate and Energy Dashboard

ICED maintains a consistent visual structure across datasets, making it easier for users to compare data without adjusting to different layouts (see Figure 4.9). This uniformity supports accessibility and reduces cognitive load during navigation (see Figure 4.10).

👚 Energy 🗕 Elect	tricity 🝷 Climate	& Environment 🔻	Economy & Demo	ography 👻 State	Report Analytics	Portals 🔻	Q
Energy Overview → The energy sector has been an important driver of industrial growth over the past century, providing fuel to power the rest of the economy.	Coal Reserve Import Offtake Production Consumption Pricing Transport	Dil Reserve Crude Supply Products Supply Pipeline Consumption Pricing	Exerce Reserve Supply Pipeline Consumption Pricing	Solar Resource Potential Irradiance Pricing	Wind Resource Potential Wind speed-Hub Height Pricing		
	Hydro Resource Potential Technology Reservoir Turbine Type Source Of Water	Nuclear Fuel Types Reserves Technology Type	Others Bio Energy • Biofuels • Biopower Potential Small Hydro Potential Storage	End Use Industry Building Transport Agriculture			

Figure 4.10: Screenshot of the India Climate and Energy Dashboard (ICED) menu navigation, showcasing the categorized energy data structure by source and usage type.

The team identified several design features from ICED that were directly applicable to the website project, including: interactive graphics with adjustable filters, consistent visual formatting across all datasets, and layered navigation to progressively reveal detailed content. The team prioritized these elements in the website design to improve usability, support

side-by-side comparisons, and maintain user engagement through a clean, coherent interface.

Clean Energy Wire Website

Developed in Germany, the Clean Energy Wire website presents energy transition data using a straightforward structure and clearly labeled content blocks. The site features static charts and factsheets on topics like power mix, energy consumption, and renewable growth, offering a reliable source for general audiences to learn about Germany's energy trends (see Figure 4.11).



Figure 4.11: Screenshot of the Clean Energy Wire homepage,

The platform organizes its content by category, such as renewable energy share, historical energy use, and generation by source, which enables users to follow logical storylines through the data. While the site does not offer interactive filters or dynamic tools, the consistent formatting and minimalist design help users digest information efficiently. However, the site provides limited explanatory text to accompany its visuals. For example, static charts like the one in Figure 4.12 present data without interpretation, which may leave non-expert users unsure how to act on or contextualize the information.



Figure 4.12: A static chart from Clean Energy Wire showing final electricity consumption by consumer group in Germany (1990–2023).

This website demonstrated that pairing a clean, logical layout with strong explanatory support is essential when designing for public engagement. While visual clarity can draw users in, explanatory content facilitates their understanding of website content.

Energy Efficiency and Conservation Authority Website

Created by the New Zealand Energy Efficiency and Conservation Authority (EECA), their website offers several tools and materials to raise public knowledge of energy consumption and electrification in New Zealand. Although the main site addresses a broad spectrum of subjects, the "Insights" section and the "Warmer Kiwi Homes" initiative particularly seek to target customers by offering facts and advice in a relevant and non-technical manner.

The EECA platform prioritizes narrative content and real-world framing over technical jargon or interactive complexity. For example, instead of detailed datasets or metrics, the

"Warmer Kiwi Homes" page highlights stories and statistics tied to household energy decisions, offering visitors clear reasons to electrify based on comfort, affordability, and health (see Figure 4.13).



"It made a huge difference, just being warm"

1 minute

Chloe talks about the difference getting a heat pump installed through Warmer Kiwi Homes made.



1 minute

Amanda talks about how getting insulation and heating installed benefited her family.



Figure 4.13: Screenshot from EECA's "Warmer Kiwi Homes".

The site structures its content around typical household concerns such as appliance efficiency, cost savings, and barriers to upgrading. This framing allows visitors to quickly recognize the personal relevance of electrification choices. However, EECA's design relies heavily on static imagery and text-based explanations, offering limited interactivity and minimal use of visualizations compared to more data-driven websites.

Review of this website highlights the importance of user-centered framing when engaging the public. EECA's success in making electrification relatable to the average New Zealander reinforced the team's decision to prioritize clarity, context, and behavioral framing in the website design.

International Energy Agency (IEA) Regional Dashboard

Featured in the World Energy Outlook 2024, the International Energy Agency (IEA) Regional Dashboard is a thorough digital tool for investigating worldwide energy trends. The world regions covered by this platform include Africa, China, Eurasia, the European Union, India, Latin America, and Southeast Asia. The visually simple and clear arrangement of complex material was the most significant aspect of this website. Users may choose a certain area and immediately see important statistics, including energy consumption, power generation, CO₂ emissions, and investment forecasts. Every regional component has interactive graphs with hover capabilities that facilitate users' investigation of data points more thoroughly without cluttering the visual interface.

While our project focuses solely on New Zealand, the IEA dashboard provided a useful example of how geographic categorization and clear data segmentation can support users in interpreting information more effectively. However, just like the Clean Energy Wire website, the team noted that graphs had limited explanations, which can create barriers for non-expert users trying to interpret the data (see Figure 4.14).





The ability to filter and present data by region and topic guided the team's thinking on how to structure electrification metrics by household category or usage type. Although mobile responsiveness is outside of the project scope, this dashboard's desktop design offered strong examples of how to present large datasets in a clear and user-friendly manner.

Climate Momentum Monitor

Developed by the Climate Council of Australia, the Climate Momentum Monitor is an interactive website tracking the country's progress toward renewable energy objectives (see Figure 4.15). Targeting a broad audience, the website conveys national accomplishments in energy, transportation, and industry using visually appealing summaries and straightforward explanations. Particularly in the context of electrification and sustainability, the team believes that its design is a paradigm for best practices in public education through data.



Figure 4.15: Homepage of the Climate Council's Momentum Monitor.

When evaluated against the team's five case study criteria, this website stood out for its use of summary metrics, thematic navigation, and a layered content structure. Rather than presenting a long scrolling page, the website lets users drill down into specific topics using buttons that expand additional content. This offers users both high-level overviews and the option for deeper exploration.

The website organizes each of its sections by theme, such as "Transport," "Energy," or "Industry," with clear visual separation between categories. For example, the Transport section presents statistics on electric vehicle adoption, fuel usage, and public transit, all accompanied by infographics and concise narrative context (see Figure 4.16).



Figure 4.16: Example of a thematic section "Transport".

Although interactivity is limited to simple click-throughs rather than data filtering, the interaction model remains effective. Users can reveal expanded explanations or view new content blocks without being overwhelmed by information all at once (see Figure 4.17). This method supports users who prefer quick browsing while encouraging further reading from those who seek more detail.

Fortunately, solutions shared and active tra cheaply. This work is picking u initiatives like the sin drawing up a new Pu

CLEANING TRANSPOR

Transport is Australia's second bi pollution after electricity. Cleanin our fastest rising source of pollut outcomes like asthma, respirator weight.

Helping more Australians use shared often – like walking, riding, electrified is the best and fastest way to clean u quality, community safety, and traffi

TRANSPORT

68% of Australians live in cities in high density and travelling shorter distances than those in rural areas, which presents a huge opportunity to do more.

Fortunately, solutions are available now, and all levels of government are jumping on board to improve shared and active transport infrastructure so people have better options for getting around easily and cheaply.

This work is picking up speed, with most states and territories in the midst of significant shared transport initiatives like the single biggest ever investment in public transport in Perth (<u>Metronet</u>), South Australia drawing up a new <u>Public Transport Action Plan</u> to improve connections, <u>Brisbane</u> and <u>Western Sydney</u> improving their bus services, and <u>Australia's largest electric bus depot</u> under construction in Sydney's Northern Beaches.

HOW DO WE BUILD MORE MOMENTUM?

We can build on this work by stepping up the availability, frequency and reliability of shared and active transport.

We all want to live in places with clean air and great public spaces, where we can move around in ways that suit our needs, and feel safe on our streets.

Click the button below to see our plan to provide better access to shared transport to everyone in our cities.

Read more about our plan here

Figure 4.17: Interactive content expansion within the Transport section.

Overall, the Climate Momentum Monitor demonstrated how intuitive structure,

approachable language, and visual simplicity can effectively engage users and inform a broad

audience.

 $\langle \! \! \bigtriangledown \! \! \rangle$

?

Case Study Summary

The team analyzed five public-facing energy-related international websites to inform the structure and design of the Aotearoa Electrification Hub. The team evaluated these case studies using five criteria: layout and navigation, visual design, interactivity, key features, and content clarity. Table 4.1 summarizes key observations from each site and their corresponding implications for the team's website.

Website Key Observations		Design Implications for Website		
India Climate & Energy Dashboard	Offers dynamic, interactive graphs with filters by region and timeframe, and visual consistency across datasets.	Incorporate layered, interactive data visualizations with consistent structure.		
Clean Energy Wire	Clear layout and labeling; however, graphs lacked explanations, which limited accessibility for non-experts.	Combine a structured layout with simple, accessible explanations for all graphs.		
Energy Efficiency and Conservation Authority	Focused on real-life examples and consumer behavior. Minimal visual elements and interactivity.	Use relatable, narrative-based content with improved visuals and interactivity.		
International Energy Agency Regional Dashboard	Used regional segmentation with hoverable interactive graphs. Lacked explanatory context.	Segment content by user category or topic. Include hoverable elements with clear visuals.		
Australia Momentum Monitor	Strong visual design, plain language, and thematic structure. Interactive buttons revealed deeper content.	Model visual and structural design on this website: clean, interactive, and easy to navigate.		

Table 4.1: Summary of Case Study Findings and Website Design Implications

Three of the five websites: India Climate & Energy Dashboard (ICED), the International Energy Agency Regional Dashboard (IEA), and Australia's Momentum Monitor, used section-based layouts organized by topic (e.g., energy, transport, industry). This structure helped guide users through content logically and avoided overwhelming them with continuous scrolling or unstructured information.

Visual clarity was a common strength among the most effective websites. For example, Australia's website consistently used bold icons, plain language, and thematic blocks, making it accessible to a general audience. Similarly, ICED and IEA maintained consistent layouts and data formatting across sections, which improved usability.

Interactive elements also played a role in user engagement. Platforms like ICED and the IEA dashboard incorporated hover effects, expandable content, and summary buttons to allow deeper exploration without presenting too much information at once. Although not all websites included these features, those that did encouraged users to engage further with the content.

Finally, the team found that websites relying heavily on static charts or dense text without adequate visual support, such as Clean Energy Wire, were less engaging for a general audience. In contrast, platforms that balanced visuals, brief explanations, and interactive options appear to be better suited for non-expert users.

These case study results directly informed the structure of the Aotearoa Electrification Hub, particularly in its emphasis on clear layout, targeted content sections, moderate interactivity, and audience-friendly explanations.

4.2. <u>Objective 2: Develop a visual website that motivates the New Zealand public</u> to take action on electrification.

This section outlines the full design and implementation process behind the Aotearoa Electrification Hub. Section 4.2 compares different development methods and explains why the team chose to build the site from scratch. The next section details how expert interviews, community surveys, and international case studies shaped layout and content decisions. Section 5.3 explains how the team used research insights to create a wireframe that directly shaped the structure and design of the website prototype. The last section addresses technical challenges such as hosting choices that consider load times and routing errors, along with their solutions.
4.2.1. Determining Implementation Method

The team initially scoped the project as a dashboard but later chose to build a website to better meet its functional and communication goals. A dashboard, in its narrowest technical sense, implies a condensed visual tool for data display, typically suited for internal or real-time monitoring. However, the project's short time frame did not allow for the integration or maintenance of real-time data systems. More importantly, the project's communication goals required a platform that could combine data visualization with public-facing content, including step-by-step guides, background information, and interactive features. A website structure provided the necessary flexibility to meet these needs. Framing the dashboard as a multi-page website better aligned with the sponsor's outreach objectives and prioritized user-friendliness as a key design goal.

The team evaluated three main methods for developing a website: using a website builder, modifying an HTML template, or coding a website from scratch. The first option was a website builder like Webflow, Wix, or Squarespace. This option saves significant time and effort, but limits customization. The second approach involved modifying a pre-built HTML template. Although also a timesaving scheme, the team identified two main issues with this method: it restricted custom TypeScript functionality and required extensive documentation review. Ultimately, the team chose the third option, writing the program from scratch. This allowed full customization and alignment with the sponsor's website format and thereby simplifying a future handover. However, this path demanded substantial time and effort and meant that the team's development could not include all desirable features.

4.2.2. Layout and Content Options

The team evaluated layout design options using expert interviews, community surveys, and an international case study. The case study, particularly the Australian Climate Momentum Monitor website, influenced the overall website structure, including section-based layouts, thematic divisions, and collapsible content (See Table 4.1). Expert interviews primarily guided

48

the selection of content page topics. These interviews revealed that cost savings, new technologies, and environmental benefits were the strongest motivators for electrification (see Figure 4.2). Consequently, the site includes dedicated pages for financial impact, future-focused outcomes, and guides for adopting specific electric power machines. Community survey responses strongly influenced how the team presented information (See Figure 4.8). Respondents had a clear preference for visual clarity, step-by-step explanations, and interactive features that reveal more detail on demand.

4.2.3. Website Prototype

The team built most of the site from scratch but cloned a household energy calculator from the sponsor's GitHub repository to simplify handover. This approach facilitated the adoption of the sponsor's routing structure, styling conventions, and React framework, which the team evaluated and adapted for the project. After analyzing the framework, the team removed unnecessary content files, while keeping all routing and most styling intact, to keep the codebase clean. The team developed the wireframe on Canva based on insights derived from the case study, interviews, and survey results. The team began developing the layout and interface with placeholder content, using the wireframes shown in Figures 4.18 and 4.19 as a guide. Although the prototype used filler content, it featured all key elements: intuitive navigation, reactive components, and sidebars for additional content.



Figure 4.18: A wireframe of the homepage of the Aotearoa Electrification Hub



Figure 4.19: A wireframe of a content page of Aotearoa Electrification Hub

4.2.4. Hosting Issues and Solutions

To meet Objective 3, the team needed public hosting for evaluation and review. After asking the sponsor to handle hosting, and after the sponsor took ownership of the GitHub repository, they made the site live. Using preliminary testing, the team saw that accessing the website yielded long load times. To investigate, the team used *webpagetest.org*, which showed a 3.181-second delay before background loading began (see Figure 4.20).

Page Performance Metrics (Based on Median Run by:						• Note: Metric available	ailability will vary
First View (Run 2)							
Time to First Byte	Start Render	First Contentful Paint	Speed Index	Largest Contentful Paint	Cumulative Layout Shift	Total Blocking Time	Page Weight
.765 s	2.776 s	2.786 s	2.875 s	3.181 s	.001	.026 s	255 KB
When did the content start downloading?	When did pixels first start to appear?	How soon did text and images start to appear?	How soon did the page look usable?	When did the largest visible content finish loading?	How much did the design shift while loading?	<i>Was the main thread blocked?</i>	How many bytes downloaded?

Figure 4.20: Non-optimized website with 3.181s before the background loaded (webpagetest.org)

The team identified two main issues: a third-party font delayed rendering, and the fact that our original image file sizes were too large. Preloading the font slightly improved performance. Compressing PNG images into MozJPEG significantly reduced load times. Figure 4.21 shows a significant improvement in load time (compared to Figure 4.20) until the page became visually usable.

Page Performance Metrics O Note: Metric availability will van							
Time to First Byte .105 S	Start Render	First Contentful Paint	5peed Index .661 S	Largest Contentful Paint	Cumulative Layout Shift	Total Blocking Time	Page Weight
When did the content start downloading?	When did pixels first start to appear?	How soon did text and images start to appear?	How soon did the page look usable?	When did the largest visible content finish loading?	How much did the design shift while loading?	<i>Was the main thread blocked?</i>	How many bytes downloaded?

Figure 4.21: Optimized website with 0.583s before the background loaded (webpagetest.org)

Additionally, navigation testing revealed consistent "Not Found" errors when accessing routes directly or using browser navigation. The issue stemmed from React Router's BrowserRouter, which depends on server-side rewrite rules unsupported by the hosting provider. To solve this, the team switched to React Router's HashRouter. This method stores routing information in the URL hash (e.g., /#/about), preventing separate server requests for sub paths and restoring reliable navigation across browsers.

4.2.5. <u>Design and Implementation Summary</u>

Section 4.2 documents the technical decisions behind designing and developing the Aotearoa Electrification Hub. The team opted for custom development to maximize flexibility and match the sponsor's infrastructure. Using wireframes, the team built a prototype using placeholder content based on predefined wireframes. To improve performance, the team preloaded fonts and compressed image files and resolved routing inconsistencies by switching to HashRouter.

4.3. <u>Objective 3: Gather information concerning the effectiveness of the website</u> product as a motivational instrument for the New Zealand public.

To evaluate the website's effectiveness as a motivational tool, the team conducted a post-website community survey, gathering 16 responses as of today through online outreach surveys. The goal was to understand whether the website increased participants' motivation to explore or adopt electrified solutions.

4.3.1. Pre- and Post-User Surveys Analysis

The team gathered a total of 16 complete responses for the pre-survey and post-survey through online outreach. From these 16 survey responses 11 came from completely randomly selected follow-ups from our community survey, and 5 came from respondents from the sponsor's newsletter. Due to time constraints, the team was not able to conduct *"man-on-the-street"* surveys. The non-demographic survey questions posed to all respondents asked them to please indicate their level of agreement or disagreement with each statement using the standard Likert scale t response options: *"Strongly Disagree," "Disagree", "Neutral," "Agree,"* and *"Strongly Agree."*.

Figures 4.22 and 4.23 provide pre and post responses to the Likert scale questions. The average response to *"I feel knowledgeable about residential electrification"* increased from 3.44 in the pre-survey to 3.87 in the post-survey which is a 0.43 point improvement. Similarly, the statement *"I understand the potential cost savings my household could achieve by electrifying"*

52

rose from 3.56 to 4.27, marking a 0.71 point gain. These results demonstrate that the website had a positive impact on participants' knowledge and understanding of household electrification.



Figure 4.22: Stacked Bar Graph for Pre-Survey Knowledge and Understanding Statements with Likert

scale choices



Figure 4.23: Stacked Bar Graph for Post-Survey Knowledge and Understanding Statements with Likert scale choices

User Motivation

Figures 4.24 and 4.25, indicate that the average response to "*I feel motivated to adopt electrification in my own home*" jumped from 3.25 to 4.13, an increase of 0.88. Likewise, the statement "*I intend to replace fossil-fuel machines with electric alternatives*" rose from 3.00 to 3.80, reflecting an improvement of 0.80. These results suggest that the website had a positive effect on motivating users toward adopting electrified solutions in their own lives.



Figure 4.24: Stacked Bar Graph for Pre-Survey Motivation Statements with Likert scale choices



Figure 4.25: Stacked Bar Graph for Post-Survey Motivation Statements with Likert scale choices

Effectiveness of Website Design Features

Figure 4.26 combines results from three post survey Likert scale questions. It indicates that the user study participants rated the website highly across three criteria. The statement "*The website was easy to navigate*" received an average score of 4.14; "*The website's overall design was visually appealing*" scored 4.07; and "*The graphs, charts, and diagrams were clear and easy to understand*" averaged 3.93. This feedback indicates that the website's design successfully met our goal of providing an accessible and visually engaging user experience.



Figure 4.26: Stacked Bar Graph for Post-Survey Website Traits Statements with Likert scale

choices

5. Final Website Design

After completing the design and implementation stages, the team delivered a functional prototype titled Aotearoa Electrification Hub on April 29th. The site presents economic, environmental, and practical insights on New Zealand's electrification. It includes four main pages: Homepage, Cost Savings, Start Your Journey, and Strengthen Our Future, that present motivational data in an engaging manner. The following sections use screenshots to explain each page in detail and highlight the website's functionality. This hyperlink points to the current website: https://households-hub.onrender.com/

5.1. Electrification Homepage

The *Homepage* sets the scope through a full-width banner featuring a New Zealand landscape (see Figure 5.1), with the site title and mission overlay. Below the mission overlay are three cards that represent three pages, *Cost Savings*, *Start Your Journey*, and *Strengthen Our Future*. Hover interactions trigger tooltips summarizing each page's content and prompting further engagement.



Figure 5.1: Screenshot of Homepage on Aotearoa Electrification Hub with cost savings hover text activated

5.2. Cost Savings Page

The *Cost Saving* page (see Figure 5.2) presents the financial case for electrification, the most motivational topic according to expert interviews (see Figure 4.2). A short text block introduces the topic, while a line chart in the upper right compares household costs before (red line) and after (blue line) electrification. The page contains four clickable cards: Average Household Savings, Fossil Fuel Imports, What are my options, and Why did they switch? Figure 5.3 and 5.4 provide two images of the screen when the user clicks on the card that indicates the ability to Compare Machines. This opens a *Compare Machines* sidebar with interactive side by side comparisons of cost and detailed analysis of specific machines, the sidebar is scrollable to include multiple machines (as Figure 5.4 demonstrates).



Figure 5.2: Screenshot of Cost Savings Page on Aotearoa Electrification Hub



Figure 5.3: Screenshot of Space Heater section in Compare Machines sidebar from Cost Savings

Page



Figure 5.4: Screenshot of Water Heater section in Compare Machines sidebar from Cost Savings

Page

5.3. Start Your Journey Page

Returning to the *Homepage* in Figure 5.1, this section goes through website activity once the user clicks on the *Start Your Journey* card. Figure 5.5 provides a screenshot of the *Start Your Journey* page. The intent of this page is to give step-by-step guidance for transitioning to new electric technologies. The website includes this topic because new technologies are the second most motivational user topic according to experts (see Figure 4.2) and step by step guides are the third most requested design feature from survey respondents (see Figure 4.8). The text summary at the bottom left introduces the topic. The page includes a bar graph showing potential 15-year savings of specific machines (see Figure 5.6). The page contains four interactive cards: Electric Vehicles, Electric Stoves, Space Heating & Cooling, and Water Heaters. Clicking on any of these cards takes the user to machine-specific guides (see Figure 5.7) hosted on rewiring.nz, (as the sponsor requested). This structure gives the user actionable steps to electrify their machines.



Figure 5.5: Screenshot of Start Your Journey Page



Figure 5.6: Screenshot of bar graph on Start Your Journey Page



Figure 5.7: Screenshot of rewiring.nz space heating and cooling guide

5.4. Strengthen Our Future Page

Starting again from the *Homepage*, clicking on the *Strengthen Our Future* card takes the user to the *Strengthen Our Future page* (see Figure 5.8). This page emphasizes environmental outcomes and community actions because environmental emission reduction is the most motivational topic according to community surveys (see Figure 4.5). A line chart shows emissions reductions based on Global Electricity Review data (see Figure 5.9). Users can drill down by clicking on one of four cards: Clean Energy Generation, Air Quality Index, How does every machine make a difference, and Find Community Groups, to access content on policy, public health, technologies, and local initiatives. For example, clicking on the *Air Quality Index* card yields the *Air Quality Index* sidebar (see Figure 5.10). The *Find Community Groups* card encourages participation in New Zealand's net-zero transition by linking to a resource with location specific information (see Figure 5.11).



Figure 5.8: Screenshot of Strengthen Our Future Page on Aotearoa Electrification Hub



Figure 5.9: Screenshot of interactive line chart showing New Zealand's emissions over time



Figure 5.10: Screenshot of Air Quality Index sidebar from Strengthen Our Future Page



Figure 5.11: Screenshot of rewiring.nz Communities Page

5.5. Future Work

While this project delivered a functional, desktop-first website to visualize electrification benefits in Aotearoa, several improvements could significantly enhance user engagement, accessibility, and inclusivity.

5.5.1. Real-Time Data Integration

Currently, the site relies on static data. With additional development time, the team would implement live data updates to reflect real-time machine counts and usage trends. This would make the website more interactive and trustworthy for users monitoring progress. A backend service would supply this data from the machine count database, while the frontend would automatically refresh as new information becomes available, creating a smoother, more dynamic user experience.

5.5.2. Mobile and Offline Availability

The design is currently desktop-focused. A mobile-first redesign would allow the site to dynamically adapt to smaller screens and improve access for users on tablets and smartphones.

We would also implement offline functionality, allowing users in areas with poor internet connectivity, particularly rural communities, to view crucial statistics and functions without a continuous connection.

5.5.3. Māori Language Support

To increase inclusivity and cultural sensitivity, future releases would include full Māori language translations. This would include translating all user interface text and allowing users to switch between English and te reo Māori. Translations would be respectful and accurate, with attention to ensure they are to the highest standards, worked on in collaboration with fluent speakers. This would increase screen reader user accessibility, following best practice web accessibility standards. Cumulatively, these additions, real-time data, cell phone compatibility, offline availability, and language coverage would make the platform more user-friendly, and accessible everywhere in Aotearoa.

6. Conclusion

As our team has seen through background research, electrification offers significant benefits for New Zealand. To advance electrification, individuals need to be motivated to transition their machines from fossil fuels to electricity. Our project's goal was to design a website that communicates accurate and motivating information about electrification to the New Zealand public. The team conducted expert interviews, a case study, and a survey to identify motivational topics and engaging design layout features. After creating the website, they conducted pre- and post-surveys, which indicated that the website increased individuals' understanding of the benefits of electrification and their motivation towards electrifying their machines. Our research identified key design and content features that increase motivation to electrify. We hope aspects of our website and results help our sponsors improve their ability to electrify New Zealand.

References

- Angjeli, K., Burns, T., DeMartino, E., & Reera, O. (2023). Barriers preventing an equitable uptake of sustainable energy innovations in New Zealand. Retrieved February 21, 2025, from <u>https://digital.wpi.edu/pdfviewer/5d86p4679</u>
- Anonymous. (2011, August 3). Timaru told to freshen its air; Winter fires cause pollution. *Timaru Herald*, 1.
- Armstrong, G. (2013, October). Air-source heat pump water heaters in Australia and New Zealand. *National Economic Review*, 68, 40–54.
- Barr, A., & Talwar, S. (2025). Understanding energy cultures of space heating in Aotearoa
 New Zealand: A desktop review of slow ground source heat pump uptake. *Kōtuitui: New Zealand Journal of Social Sciences Online*, 1–31.

https://doi.org/10.1080/1177083X.2024.2445828

Cassell, C. (Ed.). (2006). Essential guide to qualitative methods in organizational research(2. Reprint der Ausg. London [u.a.] 2004). SAGE Publications.

Clean Energy Wire. (n.d.). Germany's Energy Consumption and Power Mix – Charts.

Retrieved March 31, 2025, from

https://www.cleanenergywire.org/factsheets/germanys-energy-consumption-and-powermix-charts

- Climate Council. (n.d.). Momentum Tracker Energy. Retrieved March 31, 2025, from https://www.climatecouncil.org.au/resources/momentummonitor/#energy
- Edward, K.-L., & Welch, T. (2011). The extension of Colaizzi's method of phenomenological inquiry. *Contemporary Nurse*, 39(2), 163–171. https://doi.org/10.5172/conu.2011.163
- EECA. (n.d.). Electrifying Aotearoa: The Consumer Perspective. Energy Efficiency and Conservation Authority (EECA). Retrieved March 31, 2025, from

https://www.eeca.govt.nz/insights/eeca-insights/electrifying-aotearoa-the-consumer-per spective/

EECA. (n.d.). New Zealand's energy-related emissions. EECA. Retrieved March 31, 2025, from

https://www.eeca.govt.nz/insights/energy-in-new-zealand/new-zealands-energy-relatedemissions/

- Ellison, J., Thorn, D., Pawson, M., & Griffith, D. S. (2024). Electric Homes: The energy, economic, and emissions opportunity of electrifying New Zealand's homes and cars. Retrieved February 21, 2025, from <u>https://www.rewiring.nz/electric-homes-report</u>
- Ellison, J., Thorn, D., Pawson, M., & Griffith, S. (2024). Delivered Cost of Energy:
 Evaluating Grid vs. Distributed Generation in New Zealand. Ara Ake. Retrieved
 February 21, 2025, from
 https://cdn.prod.website-files.com/65e8e4d8dd233b8f20bfea98/673d2989fd8b9c0ea54b
 f573 RA Cost Of Energy Report V1-1.pdf
- French, L. J., Camilleri, M. J., Isaacs, N. P., & Pollard, A. R. (2007). Temperatures and heating energy in New Zealand houses from a nationally representative study—*HEEP*. *Energy and Buildings*, 39(7), 770–782. https://doi.org/10.1016/j.enbuild.2007.02.004
- Griffith, D. S., Ellison, J., Pawson, M., & Conway, P. (2024). Investing in Tomorrow: The Electrification Opportunity. Ara Ake. Retrieved February 21, 2025, from <u>https://www.rewiring.nz/tomorrow</u>
- Griffith, S. (2024, March 5). Electrifying everything: The fastest path to a clean energy future. YouTube. TEDx. https://www.youtube.com/watch?v=FQ8-uAhG-zs
- Herman, L., & Vervaeck, B. (2019). Handbook of Narrative Analysis (2nd ed.). *University* of Nebraska Press. <u>https://www.jstor.org/stable/j.ctvr43mhw</u>
- Hoare, K. (2022, November 29). The NZ Government's Involvement In The Solar Power Industry.

https://www.mysolarquotes.co.nz/blog/solar-power-news-in-new-zealand/the-nz-govern ment-s-involvement-in-the-solar-power-industry/

- ICED. (n.d.). India Climate and Energy Dashboard. NITI Aayog. Retrieved March 31, 2025, from <u>https://iced.niti.gov.in</u>
- IEA. (2024). World Energy Outlook 2024 Regional Dashboards. International Energy Agency. Retrieved March 31, 2025, from

https://www.iea.org/reports/world-energy-outlook-2024/regional-dashboards

IEA. (2024, June 5). EV Life Cycle Assessment Calculator – Data Tools. IEA. Retrieved March 31, 2025, from

https://www.iea.org/data-and-statistics/data-tools/ev-life-cycle-assessment-calculator

- Khan, I., Jack, M. W., & Stephenson, J. (2019). Identifying residential daily electricity-use profiles through time-segmented regression analysis. *Energy and Buildings*, 194, 232–246. https://doi.org/10.1016/j.enbuild.2019.04.026
- Khan, S., & Maoh, H. (2022). Investigating attitudes towards fleet electrification An exploratory analysis approach. Transportation Research Part A: Policy and Practice,

162, 188–205. https://doi.org/10.1016/j.tra.2022.05.009

New Zealand 2023 Energy Policy Review. (2023, April 26). OECD.

https://www.oecd.org/en/publications/new-zealand-2023-energy-policy-review_d99c30 85-en.html

New Zealand: Study on Health and Air Pollution in New Zealand Published. (2007, July 11). US Fed News Service, Including US State News.

https://www.proquest.com/docview/468893116/citation/6189842A595D447BPQ/1

Olivier, J. (2015, April 21). Culture and the Economy: Understanding the Dynamics of Globalization. *HEC Paris*.

https://www.hec.edu/en/culture-and-economy-understanding-dynamics-globalization

Rewiring Aotearoa. (n.d.). Electric farms. Rewiring Aotearoa.

https://www.rewiring.nz/electric-farms

Rewiring Aotearoa. (n.d.). Electric homes report. *Rewiring Aotearoa*. https://www.rewiring.nz/electric-homes-report

Rewiring Aotearoa. (n.d.). Investing in tomorrow. *Rewiring Aotearoa*. <u>https://www.rewiring.nz/tomorrow</u>

Schnack, A., & Gan, C. (Ivy). (2024). Facilitators and inhibitors of different forms of sustainable consumption: *Consumer surveys in Australia and New Zealand*. Cleaner and Responsible Consumption, 14, 100207. <u>https://doi.org/10.1016/j.clrc.2024.100207</u>

Soest, C. von. (2023). Why Do We Speak to Experts? Reviving the Strength of the Expert Interview Method. *Perspectives on Politics*, 21(1), 277–287.

https://doi.org/10.1017/S1537592722001116

Ventresca, M. J., & Mohr, J. W. (2017). Archival Research Methods. *In The Blackwell Companion to Organizations* (pp. 805–828). John Wiley & Sons, Ltd.

https://doi.org/10.1002/9781405164061.ch35

Appendixes

Appendix A: Expert Interview Consent Form

We are students from Worcester Polytechnic Institute (WPI), an engineering university in Worcester, Massachusetts, in the U.S.A. We are working with Ara Ake and Rewiring Aotearoa to research New Zealand's electrification progress. Our team plans to develop a product to inform and motivate individuals to explore the benefits and reasons for switching to electric appliances. Your taking part in this study is voluntary, and you may terminate this interview at any time. You may choose not to answer any question, and we will skip it. **This interview should take 45 to 60 minutes.** We will keep data confidential, store it securely, and use it solely for research purposes. If you wish to remain anonymous, we will remove or anonymize personal identifiers (if used) in any published materials. There are no anticipated risks beyond a normal conversation, and the benefits include a contribution to public awareness of electrification.

If you have any questions or concerns about this research, please contact the project advisor, Professor Robert Kinicki (rek@wpi.edu). If you have questions about your rights as a research participant, contact the WPI IRB Office at irb@wpi.edu.

- 1. May we record the interview via audio?
- 2. Do we have your consent to do this interview?
- 3. May we use your name, or do you wish to remain anonymous?

Appendix B: Expert Interview Questions

Interviewer:

Interviewee:

Recording Secretary:

Date:

Start Time:

End Time:

Location:

Demographics

- B.1. What is your highest level of education?
- B.2. What is your job title?
- B.3. Who is your employer?
- B.4. How would you rate your expertise in Electrification in NZ?
- B.5. How would you describe the importance of electrification in NZ?

Metrics & Motivation

- B.6. In your own words, how would you describe NZ's state of electrification adoption today? Are there any examples or observations that illustrate your view?
- B.7. When do you think NZ will reach net-zero emissions?
- B.8. What are the biggest challenges to displaying the benefits of electrification NZ households?
- B.9. Which quantitative metrics do you use to judge progress in electrification? Can you think of a time when one of these metrics influenced a decision?
- B.10. What metrics do you use to judge the benefits of electrification?
- B.11. What visuals do you believe would best convey the benefits of electrification in a motivational manner? Can you recall a visual presentation that particularly motivated you?

- B.12. Are there any existing visual solutions (pictures, graphs, etc.) or other online presences that fare well in communicating progress against electrification or climate targets? Why do you believe these are effective for communicating with the public? *Closer*
- B.13. Are there any other experts you believe would have expertise that would help with our project? What unique opinion do you think they could offer?

Thank you for taking the time to do this interview.

Appendix C: Non-Expert Interview Consent Form

We are students from Worcester Polytechnic Institute (WPI), an engineering university in Worcester, Massachusetts, U.S.A. We are working with Ara Ake and Rewiring Aotearoa to research New Zealand's electrification progress. Our goal is to develop a product that helps inform and motivate individuals to explore the benefits of switching to electric appliances.

Your participation in this interview is completely voluntary. You may choose not to answer any question, and you may end the interview at any time without any consequence. The interview is expected to take approximately 45 to 60 minutes.

If you have any questions or concerns about this research, please contact the project advisor, Professor Robert Kinicki (rek@wpi.edu). If you have questions about your rights as a research participant, contact the WPI IRB Office at irb@wpi.edu.

- 1. Do we have your consent to do this interview?
- 2. May we record the interview via audio?
- 3. May we use your name, or do you wish to remain anonymous?

Appendix D: Non-Expert Interview Questions

Interviewer:

Interviewee:

Recording Secretary:

Date:

Start Time:

End Time:

Location:

Demographics

- D.1. What is your highest level of education?
- D.2. What is your job title, and who do you work for?
- D.3. How familiar would you say you are with the topic of electrification in New Zealand?
- D.4. Can you describe how electrified your home is (e.g., heating, cooking, hot water)?

State of Household Electrification

- D.5. In your own words, how would you describe the current state of household electrification in New Zealand?
- D.6. Do you think most people around you (family, neighbors, friends) are open to switching to electric appliances? Why or why not?

Personal Goals and Motivations

- D.7. What matters most to you when it comes to your home or lifestyle? (e.g., saving money, comfort, sustainability, convenience)
- D.8. How do you view the importance of Electrification in NZ?
- D.9. Have you ever thought about switching to electric appliances or vehicles? If so, what made you consider it? If not, what's holding you back?
- D.10. And what benefits matter most when thinking about switching to electric appliances?

- D.11. What would make you feel more confident or excited about switching to electric machines in your home?
- D.12. Are there any specific goals you have for your household, like reducing bills, using cleaner energy, or becoming more energy-independent?

Key Metrics and Visualization

D.13. If you were thinking about switching things like heating/ cooling, water heater, cooking, or your car to electric, what kind of information would help you decide? (For example: cost savings, energy use, or environmental impact)

Visuals and Communication

- D.14. What types of visuals (charts, images, comparisons, etc.) do you think would best help everyday people understand and feel motivated about switching to electric appliances?
- D.15. Have you seen any pictures, graphs, websites, or social media posts that explain electrification or climate change in a way that worked for you? If so, why do you think it was effective?
- D.16. If you were trying to convince a friend to go electric, what would you say?
- D.17. If you could ask an expert in home electrification one question, what would it be?
- D.18. Do you know friends we could talk to who might be willing to have an interview?(They do not need to know about this topic; we want to hear about different views.)Thank you for taking the time to do this interview.

Appendix E: Non-expert Survey Questions

Introduction

Kia ora,

We are students from Worcester Polytechnic Institute (WPI) in the United States,

exploring how people in Aotearoa New Zealand view electrification. Your responses will help us design a tool to inform and encourage the public to transition to electric appliances.

Participation in this survey is voluntary and should take less than 5 minutes to complete. You are welcome to skip any question or stop at any time. We would greatly appreciate it if you could complete the survey by Sunday, April 27th.

If you have any questions, please contact our advisor, Professor Robert Kinicki (<u>rek@wpi.edu</u>), or WPI's Institutional Review Board Office (<u>irb@wpi.edu</u>).

- E.1. What is your age range?
 - Under 18 (End Survey)
 - 18–24
 - 25-34
 - 35-44
 - 45–54
 - 55-64
 - 65+
- E.2. What is your gender?
 - Female
 - Male
 - Non-binary
 - Prefer not to say
- E.3. Which of the following best describes you?
 - I was born in New Zealand and currently live here.

- I was born outside of New Zealand and have permanently moved here.
- I am temporarily living in New Zealand (e.g., student, visitor, work visa).
- I am visiting New Zealand as a tourist or short-term traveler (End Survey).
- Other (please specify):
- E.4. Please indicate your level of agreement with the following statements: (Likert Scale:

Strongly Disagree – Disagree – Neutral – Agree – Strongly Agree)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am familiar with the concept of electrification.	•	•	•	•	•
I actively look for ways to reduce fossil fuel use.	•	•	•	•	•
I believe electrification is important for New Zealand's future.	•	•	•	•	•
I would trust information about electrification if it came from a government or science-backed source.	•	•	•	•	•
I feel confident making decisions about home energy upgrades.	•	•	•	•	•
I would consider switching to electric appliances, tools, or vehicles.	•	•	•	•	•

E.5. Which of the following would most motivate or support you in taking the first step

toward electrification? Please rank the following options from 1 (most motivating) to 5

(least motivating)

	1	2	3	4	5
Saving money over time	•	•	•	•	•
Access to government incentives or rebates	•	•	•	•	•
Reducing environmental impact	•	•	•	•	•

Seeing examples from others who've done it	•	•	•	•	•
A simple guide or checklist	•	•	•	•	•
Feeling more in control over household energy use	•	•	•	•	•
Seeing others in my community make the switch	•	•	•	•	•
Other (please specify):					

E.6. What concerns or challenges do you associate with electrification? (Select all that

apply)

- High upfront cost
- Concerns about reliability or performance
- Lack of clear information
- Not feeling like it's necessary
- Energy grid limitations
- Other (please specify):
- E.7. How often do you look online for information about home upgrades, energy, or sustainability?
 - Never
 - Rarely (once a month or less)
 - Sometimes (a few times a month)
 - Often (once a week or more)
 - Very frequently (daily)
- E.8. If you were to visit a website about electrification in New Zealand, which of the following features would make you more likely to explore or take action? (Select all that apply.)
 - Clear visuals (charts, diagrams, icons)
 - Personal stories or case studies

- Short, readable explanations
- Side-by-side comparisons (e.g., electric vs. gas)
- Photos of common appliances or home systems
- Videos or animations explaining how things work
- A step-by-step guide to electrifying your home
- Other (please specify): _____

E.9. Would you be interested in helping us evaluate a future electrification website by completing short surveys before and after using the prototype?

- Yes (please enter your email):
- No

Thank you for taking our survey. Ngā mihi nui, we appreciate your time. Hope you have a great day! Kia pai tō rā!

The WPI Student Team

Appendix F: User Study Pre-Survey

Kia ora,

We are students from **Worcester Polytechnic Institute (WPI)** in the United States, exploring how people in Aotearoa New Zealand view electrification. Working with **Rewiring Aotearoa** and **Ara Ake**, we have developed a tool that aims to inform and motivate the public to switch to electric machines. Your responses will help us evaluate its effectiveness.

Participation in this survey is voluntary and should take <u>less than 10 minutes to complete</u>. You are welcome to skip any question or stop at any time. We would greatly appreciate it if you could complete the survey by **Sunday, May 3rd**.

If you have any questions, please contact our advisor, Professor Robert Kinicki (<u>rek@wpi.edu</u>), or WPI's Institutional Review Board Office (<u>irb@wpi.edu</u>).

Important Definitions:

Electrification:

<u>Switching</u> everyday machines (like cars, heaters, or stoves) from **petrol**, **diesel**, or **gas** <u>to</u> <u>electricity</u>.

Decarbonisation:

Cutting carbon pollution from our energy use to reduce the release of CO2 into the air.

F.1. What is your age range?

- Under 18
- 18 24
- 25 34
- 35 44
- 45 54
- 55 64
- 64+

F.2. Please indicate which type of device you are using to complete this survey.

- Mobile phone / tablet
- Desktop / laptop computer

F.3. What is your gender?

- Male
- Female
- Non-binary
- Other (Please specify): _____
- I prefer not to say

F.4. Which of the following best describes you?

- I was born in New Zealand and currently live here.
- I was born outside of New Zealand and have permanently moved here.
- I am temporarily living in New Zealand (e.g., student, visitor, work visa).
- I am visiting New Zealand as a tourist or short-term traveler.
- Other (Please specify): _____

F.5. Please indicate how much you **agree** or **disagree** with each statement.

Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I feel knowledgeable about residential electrification.	•	•	•	•	•
I understand the potential cost savings my household could achieve by electrifying.	•	•	•	•	•
I feel motivated to adopt electrification in my own home.	•	•	٠	•	•

I intend to replace fossil-fuel appliances with electric alternatives.	•	•	•	•	•
--	---	---	---	---	---

Before proceeding with the survey, please explore our website using the link below. Spend as much time as you need to familiarize yourself before continuing with the questions.

The link will open the website in a new tab. Your survey progress will be saved in this current

tab.

Click here to view our website

Appendix G: User Study Post Survey

G.1.	Please indicate ¹	how much vou a	agree or disagree w	ith each statement.	Website
····					

<u>link</u>)

Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I feel knowledgeable about residential electrification.	•	•	•	•	•
I understand the potential cost savings my household could achieve by electrifying.	•	•	•	•	•
I feel motivated to adopt electrification in my own home.	•	•	•	•	•
I intend to replace fossil-fuel appliances with electric alternatives.	•	•	•	•	•

G.2. After exploring the website, please indicate your level of agreement with each

statement. (Website link)

Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The website was easy to navigate.	•	•	•	•	•
The website's overall design was visually appealing.	•	•	•	٠	•
The graphs, charts, and diagrams were clear and easy to understand.	•	•	•	•	•

G.3. Do you have any additional feedback or suggestions?
<u>Appendix H: User Manual</u>

User Manual for the Aotearoa Electrification Hub

Overview

The goal of this user manual is to help first-time and returning users navigate the Aotearoa Electrification Hub. The website presents national progress on electrification efforts using charts, maps, and interactive data displays.

1. Accessing the Website

• Open a web browser and go to <u>https://households-hub.onrender.com/</u>

2. Navigating the Website

- Home Page A brief overview of New Zealand's electrification journey and three big buttons at the bottom. The three buttons will navigate you to the web pages:
 - Strengthen our Future
 - Cost Savings
 - Start your Journey
- Navigation Bar: Located at the side of the screen, this allows you to access the following sections:
 - Home
 - Strengthen our Future
 - Cost Savings
 - Start your Journey
 - Savings Calculator (https://calculate.rewiring.nz/)
 - Rewiring Aotearoa (https://www.rewiring.nz/)
 - Ara Ake (https://www.araake.co.nz/)

3. Interacting with Visualizations

• Hover on graphs/charts for more detailed data points.

• Hover or click on card buttons for more information.

Guidelines for Maintaining and Updating the Aotearoa Electrification Hub

Overview

This document outlines procedures for maintaining, updating, and extending the Aotearoa Electrification Hub after project handover.

1. Platform and Hosting

- The website is hosted on: Render
 - i. Automatic deployments from the main branch
- Front-end tools used:
 - i. React 18 (with TypeScript)
 - ii. React Router DOM for client-side routing App
 - iii. Framer Motion for animated page transitions App
 - iv. Chart.js (with chartjs-plugin-zoom) for all graphs BarGraph
 - v. CSS Modules (e.g. contentPages.module.css) combined with global CSS (variables.css, helpers.css, global.css) for styling contentPages.module
 - vi. Node.js and npm (via Create React App)

2. Data Updates

- To Refresh or Add Data:
 - i. Create a new branch.
 - ii. Drop new or edit existing exports in:
 - 1. /src/data/barGraphData.ts
 - 2. /src/data/lineGraphData.ts
 - iii. Update imports in pages (e.g. Home.tsx, CostSaving.tsx, HowTo.tsx, strengthenFuture.tsx) as needed.

- iv. Run npm start locally to verify that charts render correctly.
- v. Commit and push.
- Update frequency recommendation: Yearly (depending on availability of new data from sources such as EECA or MBIE).

3. Design Updates

- Wireframes and design mockups are in [Canva project link].
- Minor visual edits can be made directly in variables.css, but structural changes may require front-end edits.

4. User Feedback and Bugs

- Log bugs in the GitHub issue tracker, tagging by severity (e.g., data inaccuracy, loading errors, accessibility).
- Prioritize fixes based on impact and frequency of reports.

5. Backup and Version Control

• Git repository hosted on GitHub (main branch auto-deploys to Render).

Appendix K: Notes from Case Study

1. India Climate & Energy Dashboard (ICED) – NITI Aayog

Key Features: The ICED dashboard offered extensive access to national and state-level datasets covering emissions, energy generation, and consumption. Users could toggle between categories using a range of filters such as region, sector, and time. Charts were interactive and exportable, providing a strong foundation for exploratory data analysis.

Layout & Navigation: The interface featured dropdown menus and filter panels on the side, allowing users to easily narrow down data by variable. The structure was consistent across sections, helping users build familiarity as they navigated through different types of content.

Visual Design: The dashboard prioritized function over form, with clear chart layouts, standardized color schemes, and minimal visual distractions. While not highly stylized, the consistent visual language helped users interpret content easily.

Interactivity: High interactivity allows users to manipulate variables, switch between periods, and compare different energy sectors. Graphs responded in real time to user inputs, making the platform feel dynamic and responsive.

Content Clarity: While the data was well-organized and labeled, there was limited use of supporting text to explain what the graphs meant. For expert users, this was not an issue, but general users might struggle to interpret the charts without guidance.

Developers: Developed by NITI Aayog, an Indian government think tank focused on national policy.

2. Germany – Clean Energy Wire

Key Features: This site provided energy-related news, downloadable datasets, and static charts related to Germany's transition to renewable energy. There were no interactive components, but the platform served well as a reference resource.

88

Layout & Navigation: Content was organized by topic with consistent formatting. Sections included news updates, factsheets, and backgrounders. Navigation was simple, and users could easily switch between different data themes.

Visual Design: The aesthetic was clean and professional, with a focus on readability. Icons and layout grids helped maintain structure, though the visual appeal was relatively minimal.

Interactivity: This platform lacked interactive charts or filters. Users could only view static content, which limited engagement and personalized exploration.

Content Clarity: Text content was strong, factually detailed, and well-written. However, graphs lacked captions or contextual summaries, which may limit their usefulness for non-expert audiences.

Developers: Developed by Clean Energy Wire, a German non-profit media service focusing on the energy transition.

3. New Zealand – EECA Insights

Key Features: The EECA Insights website focused on household energy use, featuring consumer case studies, testimonials, and data summaries. It included minimal data tools but emphasized storytelling and public engagement.

Layout & Navigation: Information was grouped into themes like household energy decisions and appliance use. Navigation was straightforward, allowing users to explore based on personal interests.

Visual Design: The site used relatable imagery and warm, welcoming colors. It was designed for general public consumption rather than technical experts.

Interactivity: Limited interactivity, users mostly viewed static content, videos, or stories. There were no tools to manipulate or explore data independently.

Content Clarity: Strong in narrative clarity. Content was presented in an accessible tone

89

with minimal jargon. While not heavy on data, the stories helped frame the practical relevance of electrification.

Developers: Created and maintained by the Energy Efficiency and Conservation Authority (EECA), a New Zealand government agency.

4. IEA – Regional Dashboard (World Energy Outlook 2024)

Key Features: This platform allowed users to explore energy trends by region (e.g., Africa, Southeast Asia, EU). Key statistics included energy demand, CO₂ emissions, and investment forecasts, with region-specific visualizations.

Layout & Navigation: Navigation was intuitive and region-based. A dropdown menu or map allowed users to switch between regions, each featuring standardized charts for easy comparison.

Visual Design: The dashboard used muted colors and clean lines to keep the focus on the data. Visual consistency across all regional sections supported usability.

Interactivity: Graphs included hover features that revealed additional information and data values. While users could not filter or customize views deeply, the interface felt modern and moderately engaging.

Content Clarity: Data was well-presented, but lacked descriptive text or explanations. Users unfamiliar with energy metrics might struggle without additional context.

Developers: Developed by the International Energy Agency (IEA), a globally recognized organization in energy data and analysis.

5. Australia – Climate Momentum Monitor (Climate Council)

Key Features: This public-facing website highlighted Australia's progress toward renewable energy goals. It presented summary statistics across themes like transport, industry, and energy, with interactive sections that expanded to show more detail. **Layout & Navigation**: Organized into thematic categories, each section had a clear title and call-to-action button leading to additional content. The site avoided scrolling and used a button-based navigation model to control information flow.

Visual Design: The Momentum Monitor featured bold icons, consistent color palettes, and accessible fonts. The overall look was modern, polished, and appealing to both expert and non-expert users.

Interactivity: Although not complex, interactivity was effectively implemented. Users could click to expand sections, reveal data insights, and navigate without information overload.

Content Clarity: One of the strongest aspects of the site. Information was written in plain English, with a strong emphasis on accessibility and clarity. Data was always supported by context or short explanations.

Developers: Designed by the Climate Council of Australia, a nonprofit focused on public climate change education and policy engagement.

Appendix L: Expert Interview Transcript

I. Dave Karl & Bryony Lane Transcript

April 7, 2025, 14:04 - 14:56 PM

Ben Marsh

I just want to confirm: you have a Bachelor's of Science in Community and International Development with concentrations in Ecological Economics and Natural Resources?

Dave Karl

That sounds reasonable, yeah.

Ben Marsh

And you're a postgraduate in Economic and Public Policy?

Dave Karl

Yeah, sure, yeah.

Ben Marsh

Anything you want to add?

Bryony Lane

So, should we have your name on here, not mine?

Ben Marsh

We'll have both.

Bryony Lane

Oh, okay.

Ben Marsh

No, I just added both.

Bryony Lane

Oh, right. Right, right. Oh, I see. I see. Okay.

Ben Marsh

And then, do you want to tell me what your highest level of education is?

Bryony Lane

LLB, so Law. Yeah, and Bachelor of Arts.

Ben Marsh

Oh, I guess I don't need to write any of this down. Don't worry at all. I've already pressed the record. And for the job title: Director of Policy, Research and Data?

Dave Karl

Yep.

Ben Marsh

And then?

General Manager, Rewiring.

Ben Marsh

Okay. Who is your employer?

Bryony Lane

Rewiring.

Ben Marsh

And how would you rate your expertise in electrification in New Zealand? Is this a joint question? I've got two columns for each of you.

Bryony Lane

Oh, right. Mine's quite low. I've come from a climate action background, but not an energy background.

Dave Karl

Medium-high?

Bryony Lane

Medium-high.

Dave Karl

I would say high.

Ben Marsh

Compared to someone like Josh?

Dave Karl

Yeah. Steve too.

Bryony Lane

Depends what you mean by electrification.

Ben Marsh

Okay, now we're going to start talking about household electrification. So, how would you describe New Zealand's state of electrification adoption today?

Bryony Lane

Lacklustre.

Dave Karl

Lacklustre. Great word.

Bryony Lane

Low uptake, despite huge potential. Lack of knowledge. You know, like no sort of understanding of the...

Dave Karl

Not a lot of understanding of the products that are out there, what's available, or the why.

I should have said, there's no... You know what guys, we don't need to stick to the questions. Let's do it. I don't want to stick to the questions.

Bryony Lane

Well, but no. Feel free to explore your thoughts, you know. This isn't a survey.

Ben Marsh

It's supposed to be more of a conversation.

Dave Karl

Yeah.

Ben Marsh

But those are good answers. Say the question again?

Bryony Lane

What's New Zealand...

Ben Marsh

How would you describe the state of electrification in New Zealand?

Bryony Lane

Oh, the state of electrification in New Zealand.

Dave Karl

Oh, right. Oh, great. Yeah, sorry.

Bryony Lane

No, it's more lacklustre.

Dave Karl

Yeah, yeah, yeah. The state of electrification is not a good state.

Ben Marsh

Okay. I don't know. This is my first time doing this. Did you want more? What do you want?

Dave Karl

I guess I want to ask for some further follow-up.

Ben Marsh

I was going to say, it depends on what your other questions are. So, we know — and Jenny can provide you the machine count and stuff — we know that more than 85% of the fossil fuel machines in the country could be electrified yesterday. The technology is here, the economics stack up.

Bryony Lane

It's in the interest of the climate, in the interest of individual households and businesses, and in the interest of the country in terms of our balance of trade. Those machines could have been electrified yesterday.

Dave Karl

And they're not being electrified. People are still buying fossil fuel machines when they need to replace the machine.

Ben Marsh

That's a great quote.

Dave Karl

Yeah. Fossil fuels could have been replaced. These machines could have been replaced yesterday.

Ben Marsh

And then what do you guys see as the biggest challenges to tracking progress in electrification for New Zealand households?

Bryony Lane

Tracking progress?

Ben Marsh

Yeah. That's what this is all about.

Dave Karl

Well, yeah. So originally, it was all about progress. We were focused on visualising the progress of electrification. But we felt that was kind of railroading us a bit.

So what we wanted to do was, instead of necessarily sticking to progress, we wanted to investigate what would be the best methods of visualising the benefits of electrification. Specifically, in ways that could motivate uptake. That's the end goal.

Ben Marsh

To motivate uptake.

Bryony Lane

Yeah.

Ben Marsh

Or adoption.

Dave Karl

Say the question again?

Ben Marsh

What are the biggest challenges to tracking progress in electrification for New Zealand households?

Dave Karl

I mean, there's a data point: we don't actually know what every household has in terms of machines. We don't actually have a definition of what electrification progress looks like. If we were tracking it at the national, regional, or community level, there's no agreed metric.

Dave Karl

What metrics? What are the different things you would be tracking?

Bryony Lane

Industry-level metrics.

Dave Karl

Not agreed, right?

Ben Marsh

Household level though. Can you read the question one more time?

Bryony Lane

Yeah.

Ben Marsh

What are the biggest challenges to tracking progress in electrification for New Zealand households? I guess another way I could word this is: for the machine count database, what are your biggest challenges in ensuring that's accurate? Because I know you guys have a column all about count accuracy.

Dave Karl

Yeah. That's a great question for Jenny.

Ben Marsh

Okay, fair enough.

Bryony Lane

There's probably like a dozen, even a hundred threads to that. Like we're using proxies to count things.

Dave Karl

Lack of resources, being able to do this on their own, like in terms of a small team.

Bryony Lane

The machine count got some way, for example, with a produce company in New Zealand.

Dave Karl

But then they ran out of... the organisation didn't run out of money, but the programme to continue doing this ran out. So will they continue to feed into it or try to get more information on all the machines and what they're doing in the electrification space? Probably not, because it's not considered a priority in terms of what they have to do.

Bryony Lane

One of the biggest challenges though is: I'm a household, right? We have some petrol machines, we have some solar and stuff. But I don't have anything to input that into to see how I'm tracking or where I want to be. Or see how I stack up against my neighbours, or another city that I really don't like. You know, like the average person in Auckland, just to pick a city.

And having that education around how to use one of those machines. Even our CE's got... What's his machine? Have you got that tracking thing as well? He can look at it and go, "Right, I made \$45 today with money going back into..."

Bryony Lane

Have you got that?

Dave Karl

I can look at my solar right now. But in terms of tracking, you have to be pretty high-level to do that and even get the app and know how to read the app.

Bryony Lane

I made like \$16 today off the sun.

Dave Karl

See?

Bryony Lane

Yeah, yeah. I have \$15.04.

Dave Karl

But how are you getting the Joe Average person to track that sort of stuff?

Bryony Lane

You know, like: here's the app doing all the... and this is one piece of it, right? This isn't about my car or what I could be saving with my car. If I swapped to an EV.

Ben Marsh

What app is that?

Bryony Lane

It's for... it's SIG Energy. So it's for the solar battery system.

Ben Marsh

That's pretty cool though.

Dave Karl

That is cool, yeah.

• • •

Bryony Lane

Like, I am... Jenny will have a better data answer but... For me, starting at the household level: my household, how much of my energy is from electricity versus from fossil fuels. So that's a quantitative thing. Obviously, the number of machines, but how do you compare a car with a lawnmower with a... So that's where a single count is kind of misleading, I think.

Ben Marsh

Do you think it should be a household?

Bryony Lane

Well, definitely household, but like... Like, so what? So you've got... Meaning I can have like a dozen small gas machines and a big electric machine, and that's way better because I use the big electric machine more and it uses more energy, right? But not... Like, those are almost (not meaningless) but...

Dave Karl

So are you asking if you're going to electrify or if you have electrified, trying to work out which of those electric machines is worthwhile?

Ben Marsh

Well, so you guys mentioned earlier that you think the uptake or the state of [electrification]... is it just lacklustre or...? That was generally the...

Bryony Lane

I almost think this question is easier at the macro scale. Like the number of EVs coming in vs ICE vehicles, proportion of the fleet that is electric vs ICE, and then being able to interrogate that down to a regional level. The finest level that that information is available, which is normally regional or city-based.

Dave Karl

And then I even think (like it's not the household) but things that impact household decisions matter as well.

Bryony Lane

Like the number of EV chargers relative to the number of petrol pumps. That, for me, is not a household thing, but the more chargers we have, the more likely households are to adopt EVs and stuff. Dave Karl

Getting into some of that barrier stuff. Which is where I think your barrier work is really relevant to this, because understanding those barriers, and which of those you could shine a light on or deal with through infrastructure changes, is important.

Bryony Lane

Yeah, but highlighting that stuff makes it more likely to be actioned.

Ben Marsh

Okay, I see what you're saying.

Bryony Lane

This is potentially a tool to shine a light on those things that are holding people back, either at the household scale or at the community or national scale.

Ben Marsh

Does that make sense?

Dave Karl

Absolutely.

Ben Marsh

So one of the big... I told you I wrote a whole section on this. One of the big things is the lack of education on these topics.

I mean, it's very easy to look at a gas (I don't know, a lawnmower) and an electric one and say, "oh, the electric one is more expensive."

Dave Karl

Yeah.

Bryony Lane

But what you're missing is the long-term costs, because they're just not educated on that.

Dave Karl

It's just so obvious in front of you—the two numbers—and it's hard to really understand that it's a lot bigger than that.

Bryony Lane

And also how consumers think. Like I thought it was quite interesting talking to Abby from Z the other day. In terms of how we don't... consumers don't think rationally, you know? They don't.

Dave Karl

Even if you had the evidence in front to say, "Hey, this over the long term, over 15 years, will be more cost effective," consumers can be very in-the-moment. Or say, "what's the price right now?"

Bryony Lane

Yeah. Upfront cost, yeah. Totally.

Ben Marsh

Can you read that question one more time?

Bryony Lane

Yes. "Which quantitative metrics...?"

Ben Marsh

Oh yeah, I get it.

Bryony Lane

What was the one before that? Sorry.

Ben Marsh

You're totally fine. This is totally fine. It was: "What are the biggest challenges to tracking progress in electrification for New Zealand households?"

Bryony Lane

Okay.

Dave Karl

I also think it's a very valid answer to this question to say, I think boiling it down to simple quantitative metrics is a bit...

Bryony Lane

I think at the house... yeah.

Dave Karl

Yeah.

Bryony Lane

I think at the household level, the most useful metric is something like: "How much of my energy am I getting from electricity vs fossil fuels?" And what's the emissions impact of that? And how much of that am I producing myself?

Dave Karl

But if you're currently not producing... like the current bill does that, like your electricity bill.

Bryony Lane

No, my gas bill. Like all of my different gas bills. I don't see those next to each other, and that would be hugely useful.

Dave Karl

Oh, right.

Bryony Lane

My petrol bill, the thing for filling up the gas for my lawnmower, for the boats, and the gas that comes into the house—all of that next to my electricity bill.

Dave Karl

Yeah, yeah, yeah. So that's what I'm talking about.

Yeah, because when I'm talking about the building, I mean just the gas that comes into the house, but not the other fuels.

Dave Karl

Yeah, yeah, yeah.

Bryony Lane

And this is about expanding that well beyond just the house, right? Into all of the energy.

Ben Marsh

Yes. Yeah, I think those are great answers and something we're going to have to explore further. We're back to metrics. What metrics would you use to judge the impact, in terms of cost savings, power consumption, power type, and/or emission reductions, of electrification? And then we have some specific machines: space heaters and cooling, water heaters, cooking stoves, and light vehicles. So what metrics would you use to judge the impact of electrifying each of these machines?

Dave Karl

No, I'm not... I think about cost and emissions. Like that.

Bryony Lane

Cost and emissions.

Dave Karl

Overall costs. Lifetime costs.

Slash monthly running costs.

Dave Karl

Yeah, I was going to say reductions.

Bryony Lane

All of them.

Dave Karl

Reductions. Probably the most relevant to consumers.

Bryony Lane

Yeah, most convincing.

Ben Marsh

Definitely.

Bryony Lane

And in that order.

Ben Marsh

What did you say first: emissions or cost?

Cost.

Dave Karl

Yeah, I was going to say cost and then emissions.

Ben Marsh

And now we get... What were the other ones?

Bryony Lane

So it was about space heating and cooling, water heaters, cooking stoves, and light vehicles. And the reason I asked this question is because we were talking to Jenny about this. And so you guys had... I mean, this answer is just the most straightforward...

Ben Marsh

But for example, we were looking at space heating.

Dave Karl

Yeah.

Ben Marsh

And we were talking to Jenny about it. One of the most popular forms of space heating in the country is wood, which is what the machine count is finding.

Bryony Lane

Which is blowing your mind.

Ben Marsh

It was.

Bryony Lane

Were you there for that?

Dave Karl

Yeah, I was there for that. It blew our professors away too.

Ben Marsh

Like, "This is wrong." And I was like, "Nah, mate."

Dave Karl

Well, I was the professor. No, I know. I know.

Bryony Lane

That was really satisfying seeing you.

Ben Marsh

Yeah.

Bryony Lane

There's no way that's true.

This is my daughter Tilly. She's home sick today.

Dave Karl

How's it going?

Bryony Lane

Yeah, yeah. Groove as much as you want, darling. And there's chickpeas and quinoa and everything.

Dave Karl

And cheese.

Bryony Lane

Yeah.

Ben Marsh

But we were talking about how it's primarily wood.

Dave Karl

But when we... because that's clearly, I mean, we assumed that was clearly an issue.

Bryony Lane

But she made it clear that it's not as bad as some of the other coal-producing systems.

Dave Karl

We're in gas heating as well.

Bryony Lane

It's better than gas heating.

Dave Karl

It's better than gas heating. Exactly.

Ben Marsh

And one of the sections I did was a lot about how one of the big things that will help decarbonisation is not just electrifying machines but making them more efficient.

Bryony Lane

Because the way the country works is, when you hit these peaks, it just burns fossil fuels to make up for it. Even if it's an electric machine, the grid's using fossil fuels either way.

Dave Karl

Unless you bring down the peaks using other things like home batteries and stuff.

Bryony Lane

Interesting.

Dave Karl

Yeah.

Totally.

Dave Karl

And the more solar we have... you should look at our recent campaign. It's called "Like a Watt Now." Like, solar makes sense.

Bryony Lane

The more solar we have... so currently when our hydro lakes get low (which we're at right now), we start burning lots of coal and gas to keep water in the hydro lakes.

Dave Karl

But the more solar power we have in dry years (which is what we have now, which is why we're having another power crisis)...

Bryony Lane

It's obviously raining less, right? And so the sun's shining more.

Dave Karl

So there's 11% more production from the average solar system.

Bryony Lane

So it means instead of burning coal and gas when our hydro lakes get low, the more solar we have, the higher we can keep the lakes and avoid the need to burn coal and gas.

Ben Marsh

So there is a future where that's not going to be feasible?

Bryony Lane

And that's what we're fighting for.

Ben Marsh

You mean like diversifying renewable energy?

Dave Karl

Growing renewable energy and getting rid of the need to use coal and gas to back it up.

Ben Marsh

Is the cost of maintaining a solar panel and everything a lot too?

Bryony Lane

No, really minimal.

Ben Marsh

It's the upfront cost that's the challenge?

Bryony Lane

Yeah.

Ben Marsh

Do you have to clean it sometimes to get more sun?

Dave Karl

If you're living on the sea and it's getting covered in salt — probably. But the average system, no. You install it and can largely leave it. You might get a 5% bump in production by cleaning it, but it's not a very big deal.

Bryony Lane

Yeah, because I know in Massachusetts, if it's a snowy day or something, people have to clean their solar panels.

Dave Karl

Well, it's snowy — we don't have snow.

Bryony Lane

Yeah, that's why we're like Australia: prime for solar panels.

• • •

Bryony Lane

We can move on from the metrics questions.

Dave Karl

What was that last metric question? I like our metrics. This is just how it's used.

Ben Marsh

So now these are probably the more relevant questions. This is the meat of the interview. What visuals do you think best convey the benefits of electrification, and more specifically, in a motivational way?

Like what I'm doing now: here's what I'm paying now, here's what I could be paying. Here's what I'm emitting now, here's what I could be emitting. That's it.

Ben Marsh

How would you visualise that?

Dave Karl

We show it, don't we?

Bryony Lane

Just a graph.

Dave Karl

Like a graph? Or dollar signs?

Bryony Lane

Well, we put them in the case studies on the website. Sorry, I came in halfway through the question.

Ben Marsh

I mean, don't we do that? That's another problem I've been running up against. You guys have such an amazing website, it's hard for us to find something new. We're like, you've already done that.

Dave Karl

First we were thinking, alright, we're going to have the old electric machine, and then we're going to have a new electric machine. Or, sorry, a coal-burning machine, and then an electric machine, and we're going to show the benefits of switching. And the calculator and everything. But we've still got challenges.

Bryony Lane

Sorry, I'm going off-piste. The biggest challenge that we've got is that we've got the data, we've won so many of the arguments, we know that this is what should be happening. But how do we then get people to actually do it? You know what I mean? Like, we can show you statistics until the cows come home, we can tell people that there are these savings that can be made.

Dave Karl

What is stopping that uptake? For example, again, talking to a petrol company the other day, their sustainability manager said they've spent a huge amount of money on infrastructure to get charging stations in for EVs. But the number of EVs that are coming into the country and being bought is not going up.

Bryony Lane

So they've now made the company invest in all these chargers which just aren't being used. They're like, how are we communicating it? The biggest problem we talk about looking at is the busy parent syndrome. Someone like Dave or me—what's stopping us from doing it? Is it a one-stop shop? Do we understand the figures that are going on? Is it easy? Would it be easy for me as a busy parent to turn around tomorrow and say, "Actually, I'm going to do all of this"?

119
Does the industry know enough? Do the tradies who are having to put this stuff in know enough? That's not on the data. Sorry, I'm going on a rant.

Ben Marsh

No, no. We talked a lot to Daniel about this too, because it's like, I mean, we're here. This is our whole thing. These seven weeks, all we're thinking about is electric

Bryony Lane

But if it's your life, you're living your life. You've got to bring your kids to school, you've got to go to work, you've got to buy groceries. How do you get someone in that situation to think about these things? And how do you show it'll benefit them? Because it's—you know—they have a million other things going on. They're living their life.

Dave Karl

And it's just hard to get people motivated.

Bryony Lane

Yeah, all the comms. I don't... yeah. How do you, with all that amazing information that we've got, start the snowball effect to have people do it?

Ben Marsh

Sorry, I've gone... yeah.

No, no. It was perfect.

Dave Karl

Yeah, but we were speaking with Daniel about the subsidies for electric cars and how small a subsidy—I think it was five grand, right?

Bryony Lane

Five and six.

Ben Marsh

Yeah, five and six. That's what people would get for electric cars. Which I understand is no longer a thing anymore?

Dave Karl

I think so. Correct.

Bryony Lane

And it's not that big of a difference, he said. And it would still make people want to think about it for an extra second.

Dave Karl

Think about it, exactly. "Oh, I could..." or even get it.

Bryony Lane

The thing that we were talking about with the petrol lady last week was the price of an

EV now. Now that that's gone, and for various factors, the price of EVs is now significantly less than it was, even with that discount.

Dave Karl

So it's now around 50 grand. You can get a lot of the cars that were 70 grand or 80 grand, now for 50K. So it's a \$73,000 car, now \$50,000. And yet people aren't buying it because they don't think they're getting a good deal, since they're not getting the discount.

Bryony Lane

Even though it's more than \$20,000. You still hear people saying, "I've missed the clean car discount. I can't get it." That is awful.

Ben Marsh

Is it? Yeah.

Bryony Lane

It's interesting how that works, right? Our minds don't work right.

Dave Karl

Yeah, exactly. Consumers' minds do not work rationally.

Bryony Lane

And that's why I do think a regional thing matters. People love a competition between cities and stuff. That's where it's like, "Oh yeah, I should do this because I want to get ahead of that suburb." They talk about the neighbour effect too. Like, the most effective way to get people to electrify is to pack solar panels on your house.

The whole keeping-up-with-the-Joneses thing.

Bryony Lane

And not even keeping up with the Joneses, but just being that direct: go next door and ask, "Hey, what did this cost? Who did you use? How long did it take? Do you have to clean them?" It makes it feel so much more accessible.

Dave Karl

Yes.

Bryony Lane

It's about converting that into accessibility.

Ben Marsh

That is so true. Even when you invite a friend over—or they invite you to their house—and they have solar panels and they show you how it works...

Dave Karl

Like you just did with us. We were fascinated to see it. It makes you more comfortable with the change, right?

Ben Marsh

Do you know if New Zealand has a government programme to give out or rent solar panels?

There's not any anymore.

Dave Karl

There are some private companies that do it. But the biggest one of those went bankrupt earlier this year. Basically, they had a bad business model. They were bought out by BlackRock, the big American firm.

Bryony Lane

And so BlackRock decided it wasn't worth their time, so they folded the company, maybe about six months ago.

Dave Karl

Oh, it was last year. Yeah, that's the short answer to that.

Bryony Lane

I was going to say, correct, that the closest they'd get to anything was probably through this RAS scheme.

Dave Karl

Yes, that's what I was going to say. So we think a good finance scheme is way better for the consumer, because then the consumer gets all the benefits. Whereas in this case, BlackRock was obviously clipping the ticket quite a bit.

Bryony Lane

But it's kind of a poison idea right now, just because of how much money was lost. They

got the government to invest hundreds of millions of dollars into it, sucked it overseas, and then folded the company. Thanks, BlackRock.

Dave Karl

Never heard a good word about BlackRock.

Bryony Lane

They own 15% of Tesla, so they're having a bad week. ...

Dave Karl

That's the short answer to that. I was going to say, correct, that the closest that they'd get to anything is probably through this RAS scheme.

Bryony Lane

Yes, that's what I was going to say. So we think a good finance scheme is way better for the consumer because then the consumer is getting all the benefits. Whereas in this case, BlackRock was obviously clipping the ticket quite a bit. It's kind of a bit of a poison idea right now just because of how much money was lost. They got the government to invest hundreds of millions of dollars into that, and they kind of sucked it overseas and then folded the company.

Dave Karl

So yeah, thanks BlackRock. I've never heard a good word about BlackRock. They own 15% of Tesla, so they're having a bad week.

Bryony Lane

Yeah, I'm just kidding. I'm having a horrible week. That's my friend, she works in Fiji for Fiji Water. She's a lawyer for Fiji Water, and just all these massive tariffs have gone on.

Oh true.

Bryony Lane

Yeah, I was like, "How are you going, Farragut?" It hasn't been a good week.

Ben Marsh

Sorry, I'll go first. What's the next question? Are there any existing visual solutions or other online presences that fare well in communicating the benefits of electrification or progress toward electrification or climate targets? And why do you believe these are effective for communicating with the public?

Bryony Lane

You'd know more about this than I would.

Dave Karl

What's EECA got?

Bryony Lane

EECA comes to mind. The Energy Efficiency and Conservation Authority?

Ben Marsh

Yeah, have you talked to them?

Authority, not association. Sorry, they're a government entity. Nothing really jumps into my mind that is effective. Oh, like there are geeky-ass things that I look at.

Bryony Lane

So there's one—the Electricity Authority has the EMI thing that charts how many electricity connections have solar or batteries and solar. There's the EV equivalent of that that shows how many cars came in each month and how many of those were EVs and stuff. But nobody turns those into effective communication tools.

Dave Karl

Especially with the public.

Bryony Lane

Especially with the public. Probably very effective for communicating with educated individuals.

Dave Karl

Yeah, totally.

Bryony Lane

But then some of those—paired with global overlays—like, here's New Zealand's solar, and oh look, here's Australia up here with 40%. I think that would be effective for some people.

Definitely. And EVs as well. Like picking a few of those things that are updated monthly. But only a few geeks look at them. There's no comparison on those, other than over time.

Bryony Lane

Some of the banks would, wouldn't they? I know there's a... who we partnered with, you know, but then they revert to our calculator.

Dave Karl

Was there anything on...?

Bryony Lane

There are some calculators, but nothing tracking progress, right? So EECA's got a calculator as well.

Ben Marsh

But I don't know any. Also, it doesn't necessarily need to be about communicating progress. It can also be about communicating the benefits.

Bryony Lane

Yeah. That's what I was trying to look for here somewhere. I think there was, wasn't there like... there is a...

Dave Karl

So EECA's got one.

Powering Z or something like that. What is this? What is this? EECA? EECA.gov.nz.

Dave Karl

Yeah, they are great. They've got a calculator.

Bryony Lane

COGO is going to be releasing one to the New Zealand market soon.

Ben Marsh

COGO?

Bryony Lane

COGO. Wow. This is my brother, who's not in the sector, and he got in touch with me just last week. "I have no idea how many units I could produce in a month, but it says 1000. That will give me 130." So that's actually on energy websites.

Dave Karl

So that's Mercury.

Bryony Lane

And then he says, "But I'm finding that the information that's out there is very hidden. I reckon places could be a bit more upfront on costs and savings."

Ben Marsh

He would have done his... but I thought he said, "Oh, my solar quotes."

Yep. But that's just for solar.

Bryony Lane

Yeah, yeah.

Ben Marsh

The benefits... What's the question?

Bryony Lane

It's kind of a... "Are there any existing..." So, when you buy a car and it has a sticker, it talks about the running costs. But you'd have to compare it.

Dave Karl

But again, isn't it interesting that we can't immediately go, "Yeah, there is something out there that comes straight to mind."

Bryony Lane

Well, in my mind, Rewiring Aotearoa would come straight to mind.

Dave Karl

Yeah. Other than Rewiring Aotearoa—where is it out there?

Ben Marsh

That's the last question: are there any other experts that you believe would have expertise that could help us out?

Have you talked to Josh?

Bryony Lane

I think Josh.

Ben Marsh

Have we sent him anywhere?

Dave Karl

Yeah, we did. We definitely sent him something, but I can't remember if we scheduled it.

Bryony Lane

I think we've been waiting for his response.

Ben Marsh

He hasn't responded.

Dave Karl

Who else are you running to on the expert front?

Bryony Lane

You can probably talk to him. I tell him all the time, but he never replied.

Dave Karl

Okay. It looks like Chris Litton...

Miranda Struthers.

Dave Karl

These are probably Daniel.

Bryony Lane

From the... I was going to... yeah. These are from... oh my God, I feel really bad about mispronouncing. Hinerangi Peer, Head of Community Energy Services for Orion.

Dave Karl

I was wondering whether it would be worth—if she's open to it—talking to Nikki from the EEA. She knows her stuff.

Bryony Lane

Don't do that to these kids.

Dave Karl

Yeah, but she knows her stuff.

Bryony Lane

I'm just sort of wondering if anybody... oh, what about those people that were at the meeting last week, or the week before? The ones on the consumer side of things?

Dave Karl

Oh yeah, the Consumer... sorry, Utilities Disputes Limited.

Ben Marsh

I mean, we could design different questions for them, relevant for their expertise. If you guys have some people in the industry—like we were talking to our professor about construction.

Bryony Lane

Construction and farming.

Dave Karl

Yeah. Google in the farming industry as well. I know that Casey—I think that's his name.

Bryony Lane

Mike Casey?

Dave Karl

Yeah. I think he has a cherry farm.

Bryony Lane

Yeah. But I see on the website you guys already have a whole TED Talk about that.

Dave Karl

He's our boss.

So I like something similar to that. Like someone talking about their journey of transition to electrification.

Dave Karl

Yeah.

Bryony Lane

Again, on our website, there's the... even Ben.

Dave Karl

What about Ben Alcomsky?

Bryony Lane

Yeah, and I was going to say Russ Duncan at EECA.

Dave Karl

Yeah, it would be good. Russ Duncan.

Ben Marsh

What was the third name?

Dave Karl

Utilities Disputes Limited. Russ Duncan and Ben.

Bryony Lane

Yeah, so Ben's from our team.

No one just... Thank you. I just don't know who was at the one...

Bryony Lane

And we may email you guys later.

Dave Karl

Yeah, yeah.

Bryony Lane

Who else? She just speaks...

Dave Karl

Yeah, so Bean—Bean is one of... I reckon Bean would be good.

Bryony Lane

Yeah, yeah, yeah.

Dave Karl

Ben at Rewiring.

Ben Marsh

Yeah.

Dave Karl

Okay, we've got Ben. What about Jay?

Are you guys talking to Jay?

Ben Marsh

Did Jenny send us an answer yet? Because he knows the communities, right?

Dave Karl

Yeah. He knows the actual communities better than us.

Bryony Lane

Yes. So Jenny put a shoutout on there.

Bryony Lane

Just put in brackets that he's a community. He does engage.

Dave Karl

So Ben is our comms guy, but he has a lot of knowledge on the energy sector and he has solar panels. He's sort of done electrifying his house in Christchurch.

Bryony Lane

And Jay, as we said—he's not an energy guy. It depends whether you're wanting energy experts or you're wanting community perspectives.

Dave Karl

Diversity is the spice of life.

So it looks like Jenny mentioned Josh, Dave. And then she said you might have some people in mind.

Ben Marsh

Yeah, cool.

Bryony Lane

And there's no need to rush this. I'm sure it'll be fine if we get five or six interviews.

Dave Karl

That would be perfect already.

Ben Marsh

By the end of next week, maybe? Because we do have to start...

Bryony Lane

We're trying to set some up this week, but...

Dave Karl

If not, the week after is fine.

Ben Marsh

Exactly. And thank you for taking the time.

Oh no, thank you.

II. Chris Pye Transcript

April 9, 2025, 11:00 - 11:55 AM

Marsh, Benjamin

Well, let's start with how are you doing today?

Chris Pye

I'm good. I guess I'm interested in what you are going to be asking me and what I can, what value I can add. I'm not sure how much value I can add, but we'll see.

Marsh, Benjamin

So like I mentioned in that block of text, we're looking into how electrification is doing in New Zealand and just generally so one of the big things we're interested in is how industry is managing it. I think it'll become more clear when I start to ask you these questions. But let's just start with some basic demographic questions. So I looked at your LinkedIn and I pulled a good amount of information off that. But what is your highest level of education?

Chris Pye

It'll be a trade certificate.

Marsh, Benjamin

And then your job title is operations manager. And you work with Cleveland's construction.

Chris Pye

Correct.

Marsh, Benjamin

OK. How do you view the importance of electrification in New Zealand?

Chris Pye

It's important if it is actually sustainable. So what I mean by that is. We can go. We can electrify everything. But if they're pumping coal into support the network, then what are we really achieving?

Marsh, Benjamin

Yeah, that's a good point. And then how would you rate your expertise in electrification?

Chris Pye

Probably like most. Kiwi homeowners and business owners just know what we hear and that's about it. We're being told not to be. We got a lot, a lot of oil and gas. We're sort of the oil and gas hub in New Zealand, so. That is what we know and I used to. So you probably, if you're speaking to Tanaka businesses, there could be a little bit of. Hesitation. And to what the future's gonna be for our region, 'cause. We're quite remote. And so a lot of money comes into our region through oil and gas. So what does electrification mean for our region? But as far as my expertise, I don't know. I work in a construction company. We build stuff.

Marsh, Benjamin

Well, it's good to talk to someone who isn't. Necessarily 1000% electrification, because that's who we've been talking to a lot and it's getting a diversity of thought, you know.

Chris Pye

Yeah, cool.

Marsh, Benjamin

All right. So this could perhaps be different for your region like you mentioned because it's oil and gas focused. But how do you view the state of electrification adoption in construction?

Chris Pye

Let's say it's slow. A lot of if you go right down to a simple form like the industry is moving. To a lot of battery powered equipment. And moving away from the reliance on generators and gas powered bigger plants. But it's still pretty slow. There's a lack in the regions, there's a lack of access to the really modern gear. When it comes. To construction companies like ours, we hire all our big plants and equipment until the big stuff that is historically. Run on petrol or diesel. You can get electrified versions of it, or battery powered versions of it, but it generally stays in the bigger centres. It's not available in the region. So that obviously limits what we can achieve on a construction site. We're still very much reliant on power to get things built and fuel. To power the big plants, whether it's cranes or you know, all the best stuff.

Marsh, Benjamin

So you would say there's an issue of accessibility in more remote areas. That's one of the big barriers for you.

Chris Pye

Yeah, I think New Zealand in general though, like I think if you look at what you can get like if you took a brand like Hilti. You know, they provide really good gear. They've got a lot of really good solutions, but what's available in Europe or America is not available in New Zealand because we're such a small, small market. So we get the latest tech here. That's obviously a barrier.

Marsh, Benjamin

And then I looked at the website for Cleveland's construction and there were three. There were four categories and maybe we'll explore the last one, but. The main or the three I wanted to kind of mention right now were commercial, industrial and residential. And then I was wondering, which do you believe is the most electrified and which do you believe is the least advanced in that area?

Chris Pye

I don't think there's a difference. And I think there's a difference in how advanced any of them are. But I think the biggest consumer problem of other energy sources would be the commercial just due to the size and scale and what's required to fuel the equipment that's on those sorts of projects.

Marsh, Benjamin

OK. But, you wouldn't say it's because commercials are the least of the events. You would just say because they have the most. Sizable projects.

Chris Pye

Yeah. Yeah, correct, I don't think there's any area of our industry. Being construction that is doing it better than any other, you know, whether it's civil space, the commercial residential, I think it's all everyone's using the same stuff to get stuff built.

Marsh, Benjamin

OK. This kind of brings you to my next question. So how do you feel? And? What goes into your decision making? When? Considering. What appliances to use? So for example. You guys do residential and commercial? I don't know necessarily which one an apartment building would fall into. But for something like that for something like that. When you're deciding how to do heating and cooling, I understand that that's not a large amount. There's not a large portion of households that have heating and cooling, but if you were to employ that, what would go into your decisions for whether to use coal or electric?

Chris Pye

Yeah. So a lot of that is done at the design phase, which is before we are engaged. And I would assume that. So we don't, we don't really do any coal heating. It's mainly either gas, like a gas central heating system or electric central heating system. Those are sort of the most common now, and there's still some that will be put in like a wood burner fireplace, but. More and more and a new build that would be like a visual piece rather than a heating source one. That sort of ambience. But yeah, we don't. We don't really get a say at that stage unless we're involved in the design build process, but generally we just get it once it's consented and ready to be built.

Marsh, Benjamin

OK. So you also wouldn't necessarily be making a decision? Stakeholder for water heaters or you know cooking appliances, anything like that.

Chris Pye

No, but I guess. In New Zealand, they plan on phasing out gas supply to residential areas. I can't remember what date they put it on, but that would be. Influencing what people are putting in their homes as far as you know, it would make sense to go put in a gas. Whether it is water heating or the central heating system in your home now. If that supply is going to be turned off at some stage.

Marsh, Benjamin

OK, that is. That brings me to my next question. What kind of regulations exist around these centers' usage? You just told me they're gonna shut off gas, which is pretty severe. Are there any other regulations you find for? Energy consumption, quantities of energy consumption or fuel type.

Chris Pye

So that is my comment on the gas, I'm not sure whether that's and it's probably not a shut off, but they're going to stop allowing new connections and whether that means in a phased approach to a period where you know you might have a decade to transfer from. What you've currently got to something else, so obviously that regulation is there, but I don't know the exact detail. What else impacts our decisions? There was for a period of time. Rebates for electric vehicles, which was removed by the current government. So that was obviously an incentive for businesses to get involved. What is the specific regulation there is? I'm not. I'm not really sure.

Marsh, Benjamin

OK. Interesting. Does your company have any specific rules or regulations?

Chris Pye

No, but we are just. We are in the process of working through our environmental accreditation. And that's going to be looking at a carbon reduction program. So we sort of, yeah, we're going through the process of probably creating some, some more guidelines and structure around our procurement of vehicles and the likes. But we have. I have recently lasted well

actually last month. Reviewed what options we have for our management fleet. Looking at Ford have brought out a new Ute that is hybrid. So we're looking at whether that would be suitable for us. But unfortunately, due to infrastructure constraints and the cost to implement this vehicle compared to what we can just stay with the status quo. The business case didn't just didn't make sense. So I feel at some point our accreditation. And the goal. Whether we get a Net Carbon 0 or whether we just go to a carbon reduce program, I think those drivers will be pushing us to do more, but at the moment there's not really. There's a lot of talk about what you're doing as a business environmentally, but they're not hard and fast. You're gonna miss out on work, but once you start missing out on work that'll probably drive us a bit harder. But just to give you an idea. The jump to go from what? Our current supplied work utilizer for our management team to the hybrid was a jump from about \$55,000 up to \$90,000 and so. That's hard to justify. When there's no. And also we don't have the infrastructure of charging stations at work. So then the policy around charging vehicles at home and compensation, all that it all just becomes messy. And when you're almost doubling your vehicle cost, it's. Yeah, it just sort of goes out the window pretty quickly, even though that's where we want to head, we want to be doing the right thing, and it is still going to be a viable business as well.

Marsh, Benjamin

So I definitely want to jump back to the. Environmental accreditation you mentioned, but before we do that, when you talk about 55,000 to 90,000, you're talking about the upfront cost of the vehicle. But when you say 55,000 up to 90,000, you you, I mean I would assume do you already own these gas powered vehicles like?

Chris Pye

Yeah, correct.

Marsh, Benjamin

So you would, it would just be 90,000, you would just have to be buying new vehicles?

Chris Pye

Yeah. So we replace, we replace our management fleet vehicles every four years. So yeah, so it'd just be we can buy the brand new one Now 55 or and which is just you know it's a diesel. Diesel engine or the new hybrid one that's coming out later this year, which again is a hybrid with pretty limited range. So it's not the most environmentally friendly either. The one that made sense, the model that made the most sense was going to cost 90 grand.

Marsh, Benjamin

OK. And have you guys factored into that decision the cost of the long term cost of paying for like fueling it and everything?

Chris Pye

Yeah. I just over a four year period, just you're not even getting close to it. The difference is paying for itself, and it's also the unknown of what the retail value of that vehicle is going to be like. If you look at fully electric vehicles, the second hand market is pretty bad in New Zealand. As far as the vehicles aren't worth anything, so you. Also consider that in the process, because we I guess we want to follow a little bit in that space to see what the market does rather than lead it and. Bear the risk of it being a bad decision.

Marsh, Benjamin

Can I ask why do you guys replace your vehicles every four years?

Chris Pye

It's a couple of things. It's part of, I guess the perk of the role to maintain a new vehicle that's part of the packages that we offer our management team. It also, it also allows us to get good resale value and then once you're in that replacement cycle, you want your replacement cost to be not that high. Without van fleets, so we've got about. Must be about 4040 odd vans. We replaced him every 10 years. And the value they hold. So once they get to 10 years old that they're well and truly paid for themselves and they're a little bit beaten up, but they're still relatively good. And then the resale on that, they still hold really high value. So actually if you keep with the vans, if you're keeping that tenure cycle, you can almost book value. You're making money.

Marsh, Benjamin

Really. Interesting. Do these vehicles get damaged to a point where they are no longer effective?

Chris Pye

No, not really. You get like a bit of. It's just like, I mean, it'd be like a builder's van. You'd have and the states I'd imagine. Or maybe they will roll big Utes, because that's what I'm saying. But yeah, a little bit of panel damage, but that's still good work horses. And we use the Toyota fleet, which is super reliable. And they just hold the value like so. An example is through COVID. We couldn't get a new van, so we felt behind our replacement strategy and. So I was selling a van that was 20 years old. Hi K is pretty beat up and we were still getting about 10 grand for it and we would have pitched it. New probably 20 years ago for well, I guess got today's equivalent, a new one. Cost us 45,000, so we had time for 20 years and we still sold it for 10 grand. Yeah, that's just the value in those.

Marsh, Benjamin

Chris Pye

It probably got nothing to do with anything we're talking about, but anyway.

Marsh, Benjamin

Right. Well, so it's interesting because one of the big things about electrical appliances and all these things is it is just inherently true that the upfront cost is greater. That's why the rebates are so effective. And that's why it's very hard to get consumers to be interested because they see an upfront price tag and it's just not. It's hard for a consumer to think of the long term cost savings, but when you're talking about four years. Cycle the cost savings out there. I mean normally it works that way. The big thing that we look at is the lifetime cost. So I've been using it for 15 years or something. So it's it's valuable insight that doesn't really apply.

Chris Pye

Yeah, but I guess if we had confidence that. In four, you know, four to 10 years time that the desirable fuel source for a vehicle is going to be electric would probably have more confidence. But I mean, I don't know if anyone knows what's going to be fueling our vehicles in five to 10 years.

Marsh, Benjamin

Yeah, no, definitely true. So I wanted to jump back to you mentioning environmental credit accreditation. What? What makes you guys wanna get that?

Chris Pye

Well, we essentially like it. At one point in time, health and safety was found, you know, frowned upon. People just build stuff and you don't really worry about rules and regulations and then. Health and safety comes through and now you try and do that because that's a professional standard. We look after our staff through that and it gives us a really strong reputation and clients expect that. That's exactly where we are now in the environmental world. That's now the new best practice for your business to be, to be doing it. Our employees also expect us to be doing. To be doing it. Yeah. When we announced to the staff that we were, we had a lot of interest in people wanting to be part of the working groups to see what we can do better. So yeah, it's. I mean, you just have to like it, our clients expect that our staff expect that and it's the right thing to do.

Marsh, Benjamin

OK, interesting. So it's like an industry standard.

Chris Pye

Yeah, but it's like if you look at construction, construction's a long way behind most other industries when it comes to the environment and a lot of that is driven because the solutions aren't really readily available.So I mean in New Zealand, construction is the biggest polluting industry as far as waste into landfill and a lot of that's driven because there's not alternate ways to dispose of excess material or demolition products. It just sort of is what it is. And so as a whole, the construction industry probably has that mindset of it is what it is. People want stuff built. We'll build it. The environmental impact is what it is, because no one's doing anything about it to give us better options. That's slowly changing, but we're still, yeah, we're still a long way to go.

Marsh, Benjamin

Has your company ever? I mean, we talk about the four year recycling cycle of your fleet, but when you talk about the large construction equipment you have, I'm assuming you keep that, that's a lifetime cost like you don't.

Chris Pye

Yeah, yeah. But we don't own it. We don't own any big cats. Right. We used to when I came on board, but we're just not good at maintaining it. So we were just hired and as we need it by companies that are designed to maintain that sort of gear.

Marsh, Benjamin

OK. Interesting. So you mentioned hiring people on, I'm assuming you guys use subcontractors. When you were looking at these subcontractors, did you expect them to have that environmental credit accreditation that you guys are seeking?

Chris Pye

Not yet. We sort of got our kid our own house in order before we start demanding things of other people, but. In the regions with a smaller subcontractor pool, it's the same sort of when we look at our health and safety like our contractors don't have the same standards that we've got, but we have to use them because there's not many options available. It's going to be no different in the environmental space, so we'll focus on what we can control on our projects. And said what they have to do when they're on our projects, but whether we go to requiring them to have student environmental accreditations, I can't see it happening for quite a while. We're definitely. We definitely prefer subcontractors that can demonstrate and are there that definitely get priority over others. But yeah, we're just in a limited pool, you know, so we've got 70,000 people that live in new plumber 100 and maybe 150,000 live in the water. Tanakhi region. Yeah. It's not a big place.

Marsh, Benjamin

Yeah, definitely. Infrastructure is a big limiting factor. The charging stations and the grid. So the 4th category on your website was maintenance. What? What does that apply to?

Chris Pye

Pretty broad. So we have a crew that permanently operates in the oil and gas sector. So they'll jump from site to site, just doing general maintenance of their buildings and facilities. And quite often that will turn into construction projects. We also do have an insurance division. So we've got about 15 staff that operate. And just do insurance repairs and that's generally in the residential area? So you know someone floods their bathroom or burns their house down. That's all that sort of work.

Marsh, Benjamin

Interesting. So you mentioned that you are a little bit more motivated than you believe that? Electrification is important, albeit. Lacking in. Some areas. What motivates you about electrification?

Chris Pye

Yeah. Me personally or us as a business.

Marsh, Benjamin

Let's do both, you first.

Chris Pye

OK. Like I believe. I believe it's the right thing to do again. Goes back to my firing. Very first comment, as long as it is legitimately. A clean energy source, so as long as, as long as we

stop burning coal to create electricity, then I'm all for it. If it's cleaner. Going to be any cheaper long term. I'm pretty skeptical about that. But I think if it is, if we've got two options and one is better for the environment, then I'm personally all for the environmental option. That'd be fairly similar to us as a business. There's probably just a few more commercial decisions in the business space because you're still dealing with bigger decisions and probably bigger impact. But we're definitely, yeah, in business we say. We say how we approach health and safety, how we approach the environment as something we do better than our competitors. So we see it as a commercial strength and our clients we do a lot of work with. Ewi and Taranaki. And so they have really high expectations in the environmental space. So it gives us an advantage again.

Marsh, Benjamin

Interesting. All right, I think. So you don't. You wouldn't be the people that would decide these devices. You would also not ever speak to customers and recommend specific appliances. That wouldn't be your place.

Chris Pye

No, that would happen. That would happen through the designers, the architects. Depending if it's a lack of a residential building, it's really just the homeowner and the architect. If the builder is engaged early, you'd have an opinion. But if you look at a big commercial where you've got the most impacts, if you're looking at a big residential apartment complex then. The client and the designer are going to have all the same. The residential market when you're doing. When you're doing developments, cost is really important so you know they've gotta have a bill price. And then I gotta have the sale price and I gotta have enough margin in there to make the development stack so. Cost would be a big driving factor for most residential projects we are seeing though. In the commercial space, the clients are wanting to achieve better environmental ratings for their business. And so that if you've got a client that is of that mindset and willing to

pay for it. You know the good environmental decisions and design. And then that happens. But if the client's not into it, then it just comes down to money.

Marsh, Benjamin

What decisions do you think go into how they decide? So I was originally gonna ask. If a client was ever going for gas, would you ever try to sway them towards electricity? Like petrol. Would you ever try to convince them with the costs or anything like that?

Chris Pye

Really depends at what stage we were engaged 'cause. Sometimes we'll be engaged early enough where they're asking for us to have input. And cost saving opportunities, whether that's structural design or elements that are selected, then yes, if we can, if one if we know. If we've got, yeah, if we've got the knowledge and the product to be able to identify that. But to be fair appliance level, it's we're more focused on the buildability of the building. And don't really have the expertise and the energy space. You know there's. There's, I don't know what they call themselves, but. Professionals then operate in the space where they. Performance out of a building when it comes to its energy performance, and that's not a set of skills that we've got in house.

Marsh, Benjamin

OK. Do you have any other insights that you think are valuable in this sphere? Any information that might motivate people? For example, if you were asked, would you? You said if we have the infrastructure. And we have the product we would maybe recommend a nicer or an electric product. A nicer is a bad word, but. So, would you? Try to communicate the cost savings or do you even believe there would be cost savings in the long term?

Chris Pye

Yeah, I guess we would only go down that Avenue. if we had the data to sort of back us up all the guidance. Energy prices are really high in New Zealand, so it's really unstable. So, that's a challenge when you're trying to recommend. Implementing gas powered products over electrical. But it's not an area where I am personally knowledgeable or anything.

Marsh, Benjamin

But you would say. The electric product is much more volatile because that energy is required by the grid versus petrol.

Chris Pye

Yeah, yeah. I guess my personal take on it. This is through speaking to people that operate in the energy sector, on the electrical side. And to maintain what the grid needs, they've got massive diesel tanks, diesel generators that are putting electricity into the system. To manage peaks and troughs. And I'm gonna be skeptical of what the real impact is until we get away from that. Whether it's coal or whether it's a big diesel powered engine. But I know locally here in Tanakhi there's one one of the providers, it's got. Essentially 2 jet engines that run 24/7 fueling or yeah power in the grid. So yeah, it's hard. It's hard to look at it and believe everything you hear around the impact.

Marsh, Benjamin

Yeah, it's definitely better here than in other countries. The energy system here is much more clean, but it is subject to a lot of electrical grid insecurity, which is what I think you've talked about a bit. And then just, is there anything else you think? Would be convincing to people to hear or any other thoughts that you have on this topic.

Chris Pye

Now, I mean, I think consumers just want. Consistency of cost. It's probably not different from fuel. Everything fluctuates, but yeah, just having consistency of costs. Yeah, I think most people. Want to go the Greenway? It's just you've got to be. Sold. You've got to be sold. Most people don't really know. They just hear what they hear in the media. In it. Whether that's true or not, I guess most people are a little bit skeptical.

Marsh, Benjamin

Yeah, which, yeah, is reasonable. I think that. The communication of the downsides is kind of lacking and that kind of scares people away. If you only hear positives and never hear a negative. It's too good to be true.

Chris Pye

I guess probably selling with what? The future is of electricity, you know? So like what? What is the market doing to make it sustainable? What are the checks and balances on what's renewable energy to the grid versus what's not? I think it's been really clear and open with the data and actually not been afraid to show. Whereas a country where we're short. But detailing the plan to get to where we want to because what it's sort of like what you say, if you're just talking about all the good stuff. People are going to stop listening because you're not telling the full picture. You're just telling the nice to have. So you know what I mean.

Marsh, Benjamin

Yeah, absolutely. I think that's a very valid point and something that we're definitely gonna have to consider when we make this tool, because there's a million websites out there that talk up electrification like it's the best thing in the world and talk about green energy and it can
get. Repetitive and overwhelming. Just this kind of jump back really quickly. You mentioned environmental accreditation. What do you have to do for that?

Chris Pye

We've had a couple of stops working on it for the past year. The first stage is putting together. Putting together the system and the processes that. Make international standards. So that's what the first accreditation is to assist. Do you have the systems and processes that make the international standards? Once we've got that, then we look at the program called Carbon reduce. Which essentially will review. All are measurable. Essentially usages, whether it's fuel or electricity or other, we benchmark it, and then we put programs in place to reduce it. And so the goal is to reduce it year on year.

Marsh, Benjamin

OK. And there's no government subsidy for?

Chris Pye

No, it's pretty. It's pretty expensive. I guess it's expensive depending on how big your business is, but for us, just to have access to their system and process, it's about 5 grand a year. And then to be audited annually is going to cost you probably another three to four and. Depending how many accreditations you have. That's three or four to be audited each year against the different accreditations. So yeah, I can expense it pretty quickly, which will keep a lot of people away from doing it, but also the amount of time taken and allocating resources. To actually get it done. You probably go. You could probably say three times those costs just in resources to do it.

Marsh, Benjamin

It is very frustrating that not only do you get nothing back from it, but you have to pay for yourself.

Chris Pye

Yeah. And at the moment it's not. By us not having it, it's not stopping us from getting work. But at some point it might, and so we just want to get ahead of that.

Marsh, Benjamin

That makes sense. How long would a certification gonna last you like? Is it like yearly? You have to repeat it or is it like five years, 10 years?

Chris Pye

No, this one's this one's annually, which is annoying and a lot of work. What we're weighing up is whether we get the accreditation for the system, get that, get it ordered at once and then just maintain the system, but drop off the accreditation and then focus our dollars into the carbon reduce program because to really to have an effective car. Reduce program. You've got to have the system. So we're getting the carbon reduced accreditation. I'm sure we can spin it where they believe that our systems are up to speed and that would save us the additional, you know process of going through an audit just on our system.

Marsh, Benjamin

So paying for the green accreditation could lead you to doing less to reduce your carbon.

Chris Pye

No. I don't think it would stop you doing less. I think about what we're. What we're trying to do is be smart. What we feel we need to get independently audited. And if we get to a

point where we feel it's working well and we're not getting any demands from external parties or clients that require us to have different accreditations, then we'll just do what we feel is right. There might come a point, especially with government contracts, that they have some minimum standards that are above what we're doing, and if there's enough work in that pipeline. The frustrating thing sometimes, though, is there's a lot of stuff put in place that actually doesn't have any value. Just as compliance costs. So it's no different to safety work.

Marsh, Benjamin

Would you be? Would you be in favor of, like, subsidies or rebates for green energy?

Chris Pye

100% yeah. Again, as long as that green energy was actually legit. So none of that green washing.

Marsh, Benjamin

Alright. And then thank you so much for your time. Are there any other experts that you think we should speak to? Like maybe you mentioned you mentioned the architects decide which appliances to use and then you also mentioned the energy planning specialist that you guys do not do in house.

Chris Pye

Yeah, I don't have any context there, but I would suggest I don't know if you got on your list. If you look at a company called Boons, they're active. They're the biggest architectural firm in new plumber. And like they do some greenstar builds and stuff. So if it's a greenstar build, then they go through all that assessment and selection of what goes into it. Yeah. So if you look up, if you look up Green Star Building certification, it's a whole. A whole scheme on the design and the build and the objective is to get a 5 star green certification of your building which looks at its whole life from design, from your design build and. Operation and what it's. How environmentally friendly that building is. There's not. There's not many of those sorts of projects that happen here locally. I think that happened in the biggest centres a bit more, but there's quite a lot of costs to do. A Green star is built and that puts off a lot of clients.

Marsh, Benjamin

So what? Who's paying for these green star builds?

Chris Pye

So the client will have to so if the client decides that's important to them, then they will engage. Specialists in that field, you have like Green Star accreditations to be able to make the different processes to be able to say it's a green star build and then you're gonna have like some green experts and your delivery team. That's almost the same little environmental economy. But the objective is to get more. Efficient and environmentally friendly buildings at the end of the day.

Marsh, Benjamin

And do you, do you think these are getting more popular?

Chris Pye

They are until they see the additional costs involved in doing it and then actually turn people off because again, that would be a good way if there was. You know rebates for building owners to do it, to help offset some of those costs. They probably get more done.

Marsh, Benjamin

OK. Interesting. All right. Is there anything else that you have? Awesome. Well, this has been a great interview, yeah. You have given us input and.

•••

All right. Thank you so much for your time.

Chris Pye

No worries. Good luck with the research.

Marsh, Benjamin

Thank you. Have a good one.

III. Euan White Transcript

April 11, 2025, 11:05 - 11:48 AM

Marsh, Benjamin

All right. So first, we're gonna get through some demographics questions, and I searched and fought for your LinkedIn or anything, and I couldn't find it.

Euan White

I don't do LinkedIn.

Marsh, Benjamin

Fair enough. So the first question is, what is your highest level of education?

Euan White

A political Polytechnic is the answer? Is that on? Diploma. A diploma is my highest.

Marsh, Benjamin

And then just to confirm, this is the only information I could find. Your job title is Orchard Manager.

Euan White

I am now the operations manager. It is a recent change of title. I haven't changed my email signature yet. But I should do that, I wrote that down, so I should be doing that.

Marsh, Benjamin

Well, it's as long as we have it. And then your employer, would you say your employer is Forest Lodge Orchard?

Euan White

Yes, yeah. So me and my wife and Mike and Rebecca Casey, we friends with we own all of it ourselves. We own 10%. They own 90%.

Marsh, Benjamin

And then, how would you rate your expertise in electrification in New Zealand?

Euan White

I'm sure there are plenty more than no more than me. I'm probably putting on like a six probably.

Marsh, Benjamin

Based on what I've seen, it seems like you are one of the most educated people in this category.

Euan White

So, yeah, I've got a really interesting job, so I kind of interact with a lot of different areas. Our degeneration, like the New Zealand distribution network. Electric tractors and other electric implements are not only growing fruit. But I like marketing as well. And so social media, things like that. So I've got a varied job. I'm not an expert at any of it, but I've just gotten across lots of different little things. But you know one, no one in the world knows what I know about how to do this electric, electrical engine, or agriculture. We get asked lots and lots of questions. We do this kind of thing fairly often. But you spend a bit of time rewiring out there. And so Mike Casey is my business partner. He's the CEO of Rewiring Aotearoa. That's how it all comes together. And Rewiring Aotearoa was born out of our experience here. And it just needed to go to the next level. And yeah, his knowledge has grown immensely, has gone along as well for the last four or five years. Example with 28 individual members of Parliament in New Zealand sitting in our electric tractor. So in the last two years like that, that's how much of A political win-win. This is a backtrack in particular. Put it in perspective. You know and neighbors tracked it. No one's sitting in there knowing gives a **** about that, but we've had 28 individual Members of Parliament now sitting in our tractor over there, and I think that is a lot. That's quite poignant. There's a lot of political goodwill. And an important intention, it's a good start.

Marsh, Benjamin

So you're saying the farm came first?

Euan White

Yeah. So, this 2019, we started doing this. And Mike and Rebecca bought the property, which had their house, it had a big shed, and it had nothing else. It was weeds and it was sheep and it was just rubbish. So we started it from scratch. We inherited a diesel water pump that came with the property. For watering, watering the weeds for some reason. And we planted some cherry trees. Start of the orchard, planting some cherry trees and then our very first summer. The diesel water pump ******** itself. The radiator fan exploded, taking out the radiator. Disaster couldn't water our trees. Middle of summer, everything's going to die. So we needed a replacement quickly. We could get a replacement electric one quickly. That's what we did. And then we thought, why don't we run this off solar power? So, because of solar panels and the days that were not irrigating, we should be using this power in some other way, and some other vehicles, for example. So we got some electric vehicles. And then on the days that we're not doing much with the vehicles or irrigating, we should be storing this power somewhere. So we've got some batteries. And then it just expanded and expanded to everything running off our solar power and our batteries as well. But also, Mike's software program takes advantage of the

fluctuations. In the power price in New Zealand, which, as we've mentioned, is mostly down to sunshine. Rain and wind, both of which fluctuate. And so we export power. As and when the software program recognises a spike or a drop in the price of power on the National Grid, we can take advantage of that as well. So last month, we made \$5000 in income. Cash from selling power from just selling electricity. We're the only orchard that's making money throughout the entire year. Because cherries have a very short shelf life. So having an additional revenue source of electricity. It is an absolute no-brainer. So we've had our current solar system, which was in that video. That's been on the ground now for. Seven months, maybe eight months. So we're going into our first winter, or so there's less, at least some out of winter. Coincides nicely with less activity in the orchard, so there's less energy. There's no irrigation. We're not using the tractor much. For example, we're frostbite. And the spot and the price of power typically do this. And winter time, because all the rainfalls, all the rainfalls are snow which sits up on the mountains, the lakes keep dropping, everyone turns on their heat pumps and their air conditioning and things. So demand goes up, supply goes down, price goes through the roof. This system is designed to capture those spikes, and we anticipate making probably 1000 bucks a week just by selling electricity, just selling electricity like today, today we're probably going to make 250 bucks. We're doing absolutely nothing. I'm not doing anything. I don't have to touch it. I don't have to water it. I don't have to spray it. I don't need to harvest it. I don't need to manage it. It just happens. And the sun is doing the work. This is the best thing about this is the best thing about I can get on and on about this. This is such a no-brainer.

Marsh, Benjamin

Since you said you get started from the beginning, like what estimate cost do you think a Farmer has to put if they wanna convert their farm to like yeah that's.

Euan White

Yep, so we've spent about 1/4 of \$1,000,000 to have our setup as it is now. But as you reported, in the last three weeks, through Rewiring Aotearoa, the cost of solar panels and batteries is dropping. One of the only things in the world that's getting cheaper, especially with this tariff debacle. The cost that we paid won't be the same cost that the next person pays, but it's a ballpark. It's a ballpark at least. Lots of variables and around what? The distance from the panels to the main sheet or to the switchboard. How long is that? The longer it is, the more expensive it is. Does there need to be an upgrade to the transformer? So with a shed that connects to the grid. The box in between has to be capable of handling the amount of power you want to export. So we had to upgrade that as well. At our cost to enable us to do that. So yeah, rewiring could give you a ballpark number. But as we've learned, there's there's so many variables in it. You couldn't say to replicate our system tomorrow. It would cost 300,000. You just can't. It would be a ballpark at best.

Marsh, Benjamin

OK, let me jump back to some more basic questions. We're definitely gonna wanna get more into the process of electrifying your farm. But really quick, how would you describe New Zealand's state of electrification adoption today? I'm talking nationally. I'm talking about residential, industrial, and agricultural, obviously.

Euan White

It's pretty bad. Well, there's a lot of room for improvement. There's a lot and there are a lot of opportunities there. Yeah, it's not great. It's not great. The previous government was much more. Much more willing to invest in things like this, the current government. Not so much.

Marsh, Benjamin

Yeah, we keep coming to the idea that rebates were immensely useful in the past years, and now they've all been taken away.

Euan White

Yeah. So we received it. Maybe 1/4 of 1,000,000 bucks worth of grants. In our first couple of years. To purchase all research and development equipment and things that we use here. Things like our Frostbiting fans, so fans that we use at a frosty time of year. The frost happens at the wrong time of year. All of our fruit can die. All of it. So we had to import 2 electric frost-fighting fans from South Africa. But we received a grant from the government to assist with the cost of that, as well as the purchase of our tractor, as well as the research and development of our electric folio sprayer. So we got all these grants because we were the 1st. We're the first mover. We applied first. We got all these grants. If we apply today, there is not a chance in hell that it would go.

Marsh, Benjamin

Yeah. So it's interesting you say that same #1 quarter of \$1,000,000 worth of grants, because you also mentioned that was the cost of starting up. So was the startup cost almost entirely eclipsed by your grants or not?

Euan White

Not at all, no. So, the grants I give or take are about 40% of the purchase price. So lots of other things that we need to buy as well as setting up an orchard, so. Our knit cover as well all the structure that holds the trees up, all the other stuff. So we certainly had to get finance to get this place started. The last harvest. So, the harvest we just had in January? It was sufficient to get revenue above operating costs to start paying off some of those, some of the finance as well. We're on the right track. We're on the track towards profitability, which is nice, which is nice.

Marsh, Benjamin

And I'm sure farms probably have a good period where they're not profitable.

Euan White

Yep, that's it. We have had to spend more to be in the position we're in today. You know, our tractor probably costs double. A normal tractor would cost. Our fans. The Frost fighting fans did double duty as well. So, to not do this is far too good at the start. But because of all this, now we can call ourselves forest lawn orchids and we sell them. We sell electric cherries and we get 28 Members of Parliament sitting in that tractor and we get on TV and we get on radio and all that kind of jazz as well, so. That's to tell us that's what's happened.

Marsh, Benjamin

Awesome. Now I've talked about that. I wanna drill down into the agricultural industry. How would you describe the current level of electrification and its adoption in farming practices in New Zealand?

Euan White

Too limiting. So there's a lot of room for improvement. A lot of room for improvement.

Marsh, Benjamin

So we've talked about the upfront costs. Were there any other big barriers to making your farm electric?

Euan White

So the Frost fans, for example, existed. They were on the shelf in South Africa. Click a button. Buy. The tractor had to make it. They had to first design it and make it, and we got the

'66 one. Even though I'm out of California. Our folio spray goes behind our tractor, which is how we spray our trees. That didn't exist, so we had to make that. So there's lots of. Implements and vehicles, and things that you can buy today. There are also lots of vehicles on farms. That doesn't exist as an electric yet. To the barrier. The barrier is probably 50%. It doesn't exist yet, so they can't buy them even if they wanted to; they couldn't. The other half is the perception up here that they're not up to the job? Farms and orchards, and vineyards have to be done at certain times, and things have to get done. So that things need to be reliable, they have to be reliable, and I think there are a lot of misconceptions about perceptions out there. Electric vehicles aren't reliable yet.

Marsh, Benjamin

I'll jump to these questions, 'cause we're already on the topic. So one of the craziest things that I mean, you've only made it sound crazier when you say you have the 66th, but these electric tractors? Tell us more about those. What benefits do those give you? And what challenges, other than the procurement, do you see with them? So, one thing is, I don't know if I saw this right, but are these vehicles self-driving?

Euan White

So our tractor is by a company called Monarch, who operate just out of San Francisco. It took three individual trips from me and Mike to California to secure the tractor. Because it's so new and unproven, they were pretty reluctant to send it to us. But we are their perfect customer, just on the other side of the world. It's just how it is. So we had. We had to pay. The exchange rates and New Zealand dollar U.S. dollar are not great. Plus, we just ship it here. And then we are relying on emerging technology to do our job out here, which makes it challenging. You know, detractor does not work all the time. But it is needed. It needs to work most of the time to get the work done. Yeah. So it's been really, really, really challenging, but we've got to harvest those

two harvest periods, yet we harvest annually 2 harvests done now using our tractor, and it's getting more and more reliable as we go forward. But it is, I understand it is the only one. Before we got them on our tractor, we had to do spraying and things before that. So we had a home-built version of an electric tractor built for us in Christchurch in the South OLM, and that was upgraded for us. They put a bigger battery on it and a bigger inverter so we could charge it faster. So we use that for the first two years. Then the monarch was available. Then we had two tractors for a few weeks while we got our heads around the monarch, and then we and then we deployed the monarch. Does that answer your question?

Marsh, Benjamin

Yes, well, so the one other thing you mentioned slightly was the reliability. Do you feel it's as reliable as a diesel tractor?

Euan White

No, not at all. So this is the second tract I've ever driven. The first one was our previous electric tractor, so I'm only experiencing electric tractors; that's all I've ever driven. A neighbor, for example, has 2 diesel tractors. As there are fewer rivals than his? Probably yes. So I mean, because they're new. They're not tested. They don't have thousands and thousands of hours of testing under their belts, but every day that monarchs around the world are doing their thing, it's improving, and they're making software updates. And we just last week had a technician from Monarch here doing some upgrades. It's our TR tractor to make it more reliable. So they are committed to it, which is important. They are committed to it. We're on flights. We accommodated them here. Feed them. He brought all the parts and worked his *** off for two weeks. Making the attractor more and more reliable.

Marsh, Benjamin

That's good to hear that they're keeping up with upgrades, and it's also a super cool thing. I mean Tesla does the same thing. They can just update. You know what I mean? Like, there are software updates that improve efficiency, and they can be deployed. It's awesome.

Euan White

Yeah. So, having gone out as committed to it as we are. Is being important and I mean the next. If someone were to buy a tractor tomorrow from next door, they'd probably get the 700th one they've made, which is going to be quite different. You know, under the sink, there are quite different hoses in different places. Or, you know, breathers and things with different differences. The software's going to be different. So going forward, I think it's in a good spot. But it's been a pretty tough couple of years using it, but it's self-driving as well. So I mentioned before. So, self-driving does have the ability to drive autonomously, so that isn't something that we've had extensively. We've only probably only had one. 10 hours of autonomy so far. It's been quite unreliable, particularly when making autonomous vehicles turn. To come out of a row of trees. Making the turn and going back into a row of trees smoothly, without a jittery kind of turn, is quite challenging. So we've pretty much pulled back on autonomy. We don't go on about it anymore. Because it's kind of basically in the too hard basket. I would rather be an attractive person who was reliable. In autonomous.

Marsh, Benjamin

I think that autonomy is a difficult and tricky subject, because it's better for the farm owner. But it's also, you know, a way to phase out some of the old farmers.

Euan White

Oh Yep. Yep, I see this. Just removing the risk, so things like. Spraying. For example, if there's no person in the tractor, then there's no risk of a person getting hurt. Covered in

chemicals and things, and that has to be a win. No one's going to say, Oh no, I want to be in the tractor. That's a **** argument. Yeah, my experience with tractors is limited to the tractor before that. So that's how I see it going forward. You know, before this, before I was involved with this, I was a police officer and mechanic and a soldier. So no. It's whatever in horticulture. Same as Mike. Mike was in business and software and stuff, so we came into this completely new without any bias towards any brands or ways of doing things, which I think has been tremendously helpful, and that we just don't know. We just can't. We just made a lot as we went along and kept doing things, and our consultants told us what to do. You know, technically we need to apply this chemical or Plant. In a certain way, we just took his advice and molded it into a way we could do it without electricity. And we've proven that you can. And now it will prove that it's profitable. And it's just keeping. Doing it now. Keep doing it and doing this, and we get to do this sort of thing now and go on TV.

Marsh, Benjamin

And you know, I think it's very reasonable that you tone back your autonomy because it's not currently functioning. But I'm a CS major. I'm mastering AI and I'll tell you I am extremely hopeful and I would not be surprised if, in a year or two, you get a software update that makes it run right, you know.

Euan White

I completely agree there are. There are monarch tractors in California now that have autonomy that are this close to being good enough for deployment. You know, it's that close, you know, all the bones of autonomy are there. Yeah, just bring them all together. But making it reliable, you know, I don't want my autonomous tractor that's mowing for me, for example. Just to have a problem and drive forward 20 meters and not know that 20 meters. You're not going to go back and melt me. That's pointless. I don't want that. They don't want that, you know,

nobody wants that, so. Making it reliable, but I mean autonomy is such a win-win. When it works.

Marsh, Benjamin

So, a couple of days ago, we interviewed a member of the construction industry and we talked about electrification in that industry and he said that and you also mentioned this earlier, you're saying it was about oil at the time, but he said New Zealand is at the end of the supply chain, and one of the problems that he mentioned with upgrading to. You know, this new tech is, he said. New Zealand doesn't get the new tech. New Zealand and like you said, you had to go all the way to California. How do you feel about that? Do you feel like that's a real limitation?

Euan White

Does it exist elsewhere, and we don't get it? And horticulture? I don't think so. I don't think so. I mean, we had to make it. We had to make our sprayer ourselves. We had to go and find the tractor. Could I?

Marsh, Benjamin

You and your frostbiting fans were on the shelves in South Africa.

Euan White

Yeah, I just that no one else would. No one else would bring them. No one else had. Done. I just did the numbers like we had done the numbers. So we're on a wholesale electricity price, right? So any power we take from the grid, we get at the wholesale price, whether that's high, whether that's really, really low. So, a frost fight in particular. What happens at night during spring? During spring, all the water flows up the mountains. So the lakes are low. Generation is low. Suppliers' supply is low, demand is high. But at night, everyone's in bed. No one's using power, so the price is usually 0. It is usually under \$0.05 a kilowatt for frost fighting time, so we spent \$220 last year for our entire frost fighting energy. Bill, I guess. Nick Stork could spend that. Five hours in one night. And that can last for 50 nights.

Marsh, Benjamin

That's incredible. I mean, you spent 220 less.

Euan White

It's a mess. There's a mess of frost. Fighting is such a win-win. But again, these fans were unproven in New Zealand. No one knew how that would work. That we brought them and proved that they were.

Marsh, Benjamin

That's fascinating stuff. I mean, that is an incredible innovation. So in the video I saw that you guys have a dashboard that you guys have a dashboard that reflects your farms. How it's doing and everything and I was wondering what kind of metrics are on that, like what?

Euan White

Yep. You can look at this. Look at yourself. Punch in the punch in the computer. It's a public website. Anyone can see it. Yep. So nothing we do here is secret. Nothing we do here is private. Let me just turn on my iPad. If you search for something like blackcurrant **Forest Lodge** energy, it should come up with a dashboard Energy. So there's a tab on the top left. So my page is just being a bit stupid. There's a tab on the top left. You can change the period. Is it like the last two hours today, 24 hours, or 2 weeks? It's like the last month, for example, will tell you in the last month or the last 30 days. What has happened here? And it is. It is remarkable how much power we make, how much power we sell.

Marsh, Benjamin

Yeah. And it's also, it's cool to see. How it changes throughout time, and this is a great website, we'll be looking at that more.

Euan White

Yeah, cool. So that gets in the middle of those pages. This is the you know generation's usage battery level. So that gets its information from our Sun Volt dashboard, which is a separate one that I don't think is public. What I think it is, that's what monitors the state of the panels, the batteries, and they feed that into the blackcurrant. Platform. Better that works.

Marsh, Benjamin

Yeah, that is awesome. We will be looking.

Euan White

So I wanted to do that. I wanted to go to the Sunbolt page, but I also wanted to. There's a website that monitors the wholesale price of power in New Zealand. Which is a strange time. Be with me.

Marsh, Benjamin

Yeah. Do you know the name of the website?

Euan White

Sort the matrix. A few Google em. So the letters EM6.

Marsh, Benjamin

Yep, found it. This is amazing.

Euan White

So that's yeah. Yeah, you can see that kind of thing. So down the bottom left of that is Otago with a 256. So that means that the current price per MW is \$256. We talk in kilowatts, so we just divide that by 1000. So 25 cents 25.6 cents per kilowatt. So the black current gets its information. From that website, I think. So on the black current page at the top right, I think I see a spot price. Yeah. Get what gets that information from. So right now, \$0.25. \$256 per kilowatt. Sorry, per MW, which is where the spot price comes from. So, micro software is separate again. Tells Black what it wants. White software tells the Sunbelt system what it wants to do. Do we want to buy power if the price gets low? If they want to spill the canals and they want to turn all the turbines flat out, generation goes up, supply stays, demand stays the same, price drops, and it will tell. It will tell the inverters, take it from the batteries, dump it to the grid.

Marsh, Benjamin

So, do you guys have massive batteries for this?

Euan White

So we have 300 kilowatt hours of storage in our shed. In perspective, our tractor has 100. And cars sitting just over there, it's got 64. So that's how much storage we have. So this is probably one of the largest privately owned systems in New Zealand. I would have thought probably in the world, probably. But there are much bigger versions of this elsewhere. It is not usually owned by a mass of power companies and things like that. Let me let me bring. I don't know how to do my screen sharing thing. This is the Sunbolt dashboard. This is the state of play of our solar system right now. If we can see those numbers, so down at the bottom there it says buy. That means that the wholesale price of power has dipped. I think it's 10% below the average. For the last week, I think it is, I think I said it, which triggers a buy response. So if we needed it, if our batteries weren't full and the sun wasn't shining, we would be buying power

from the grid because it's cheap. \$0.25. This morning, when it was cold. This morning it was \$0.43. I think about \$0.47 would be about it would trigger the sell, and it would start dumping power to the grid, and if we can dump outa hundred hundred kilowatt hours at \$0.45 at \$45 just like that for doing nothing. If we can dump out 200 kilowatts, that's \$90.00. But that price over winter will go to 7080 ninety \$1.00 per kilowatt. And if you can dump out 200 kilowatts. At a dollar and you can buy it for 0.

Marsh, Benjamin

Yeah. It's a good business.

Euan White

Buy low, sell high. It's the keep it simple way, this. This one isn't. This one is in public. That's not a public one. That's just our system, but that feeds its information into the blackcurrant screen, which you can see is public. So, same thing.

Marsh, Benjamin

Yeah. OK. That's awesome, websites. Thank you for those. We will use those as resources. But now that we have some good background on how your farm and such work. I wanna ask, do you do any outreach to other farms to try to convince them to go through the process, or guide them through the process of electrification?

Euan White

So we've hosted about 12,000 visitors here in the last four years. So we advertise that we offer tours, and we say, Come and see our place for the first three years. We just did it as a pro bono for the greater good. Come and see our operation. We'll tell you all about it. In the last 12 months or so, we've started charging for these tours. Because. There were so many of them. And.

We didn't get anything out of it. There was no value in it for us anymore. So we've started charging. I think we made something like \$20,000 last year just in hosting and hosting visitors. So we've hosted visitors from all around the world, from the UK, from South America, all over New Zealand, Australia, who've come here to see this, to see everything. Coming together and working, which is easy for us to do a tour now, because this is just business as usual for us, so. But they pay us. I think it's about 1000 bucks for an hour and a half, and we wander around. They can ask any questions they want. But it occurred to me now in the last sort of six months or so that I can try and convince people this is the way to do it. You should be doing this. Look at. Look, look, look at these numbers. They're so good. But I don't care if they do or not. I don't care anymore if they want, if they want to go and buy a John Deere diesel tractor, I can go for it. I don't care if you want to buy a monarch, that's cool. I kind of care, but I don't really, I'm not. I'm not getting any value out of it. I've no financial interest in anybody else doing this. I mean, if they employed me, if they contracted me to come to their place for a month and get them up and running and doing it, then so be it. That hasn't happened yet. I think it will, but it hasn't happened yet. But do we? Do we don't go out and approach places and say, hey, if you want, if you want to be electrified, I can show you how. We don't do that. I don't see any value in it for me. If places like. I'm sure you've heard of EECA Energy Efficiency Conservation Authority, and if they wanted me to go out to places and talk to people about how they could do it. I'd do that. I'd expect to be getting paid for it. Because ultimately. I don't care. Yeah, I've got. I've spent. I've worked my *** off to get our place working up and running, and I'm happy to show people around, but they're going to pay me for my time. Yeah, this ain't cheap. Nothing else. It is cheap.

Marsh, Benjamin

You know, it's funny you say that because our job is to convince people, and you know, we're looking at all these different methods. But, you know, even with your, you know, you don't care anymore. But what you've done is more convincing than anything we could ever make. You know, you're leading that charge. That example is more motivational than any to prove it's possible.

Euan White

Yeah, I think it's the profit and loss at the end of the year. Spent more, you know, spent this. Earned this. That's the metric that people give a **** about, right? Particularly, fathers in New Zealand, but in particular, are doing it pretty tough and you can bang on about emissions. And optics, all you want. But money is the big factor here. Is it cheaper to run? Am I going to save myself money by doing this? Yes or no. And we, we're proving we've proven so far that you need to spend more. That you will, you will spend less day-to-day, for example. Today the sun is shining. I've got two workers out there. Our solar generation and export will cover their wages today. So it's not going to cost us anything to run today. Today is a neutral day. Next two weeks we've got school holidays. No one's going to be here. We're going to be making heaps of power. Because the sun is still shining. We're going to be in profit for the next two weeks. We're making a profit, and there is no other cherry orchard in New Zealand that's making a profit in May or June or July up until December, January. Everyone's just spending money and losing money. To keep their operations running until harvest time, when they get paid. So this is what we're proving at our scale. It is a lt is a revenue stream, but the potential right now we're making 116 kilowatts from our solar panels. We're using it. I'm using two kilowatts around the orchard. Now I'm not doing anything. If we had twice as many panels, we could be making 200 kW. And I could be making twice as much money per day, but that's because we're privately owned. We have to make it. Yeah, be careful with their money. So we have more room. We could make a bigger solar array, but we've chosen not to. Deliberately chosen not to because of the array that we have, we forecast that it would make about twice as much power as we would use over a year. But as I mentioned before, frost fighting happens at night. We need to take it from

the grid to supplement our batteries as well. So even though we make twice as much power as we need, we still need to use the grid as well. At the same time, where some people struggle to get around, we're making twice as much as we need, but we need to use the grid at the. Same time. To have a battery array. Capable of supplying enough energy to run a frost to fight, a frost would be needed. Six, we need 100 kilowatts per hour for 10 hours. So you need to. You need a KW or MW and a half to give you some redundancy with the batteries, and then you're probably talking 1,000,000 bucks just in batteries and a place to store it all. So. That ain't gonna happen. That ain't happening. Still grid tight. Still the grid. Still very important to us, but we use it. In a much clearer way. And Mike's program, the black current program that is available to anybody, is not something anyone can do. Anyone can do this, anyone can? You just have to want to. That's half the battle, and then you've got to be able to pay for it, which is the other half of the battle.

Marsh, Benjamin

So yeah. So you mentioned at the beginning that you had your diesel. A diesel water pump, I believe, and it exploded and all this crazy stuff happened. And you guys decided we're gonna make an electric car. What convinced you to take that first step?

Euan White

So it was more out of umm. It's more Convenient than anything. This is in 2020, probably the summer, so early 2020, we didn't know much about solar or batteries. Electrical things at the time, but we could get. We needed a pump quickly, and we got it. We can get an electric one quickly, which is just simply plug it into the wall. Go. Then it was the conversation. Let's run this off solar power. Let's store some of this power in some batteries. Let's use this power to run vehicles. It means AI. A snowball effect is usually a bad thing, but in this case, it was a good thing. It just kept adding on. If we did this, we could do this if we could, if we could make this much power, we could use this. If we could get rid of our petrol, our diesel, and YouTube that we had, we could get a plug. In version. So we did. I'm very happy about the snowball effect. But I guess now this is all very naive and very, very seed of the pants. But you know now, we know if we're doing this again, you can go on the shelf right now. All of the stuff, all the start, everything you needed from day one, and that would make life a hell of a lot easier than the way that we did it. Yeah. For the next farm or orchard or vineyard that wants to electrify, you know, these things exist near you, you can go on the Monarch website and check the tractor. Yes, deliver this date, and you can get a sprayer. Now you can get the phosphating fans. You can have the solar and the battery installed within probably two months. It took us five years to get to this point, so that's how much easier it would be for the next person. Plus, they've got more experience in not only doing it, but also doing it in the orchard. You know, making electrical machines work and achieving all the same outcomes, facing all the same challenges in regards to, you know, insects and diseases and frosts and fungicide applications and harvesting and all that kind of stuff. But now we know how to deal with electricity. And as you said before. The proof is that we are still here. You know, the tractor hasn't burned down the orchard. Like everyone said it would on day one. Everything is still here. Our profit and loss, our spending is coming down and our profits are going up and there are lots and lots of orchards around here that are spending, spending, and their profits are going down. Because of the costs of everything. Except solar and batteries are going up.

Marsh, Benjamin

Tell me, what do you think about because your situation is somewhat unique in the.

Euan White

Hope that you don't have time like a unit. I am unique. You take one of us.

Marsh, Benjamin

Yes. But at the start it was somewhat unique in the fact that you didn't have the infrastructure already. You were you because you said you got there. You had a shed, you had a water boiler, you had. You didn't have it. I mean, you had a diesel tractor that you later converted.

Euan White

We'd have anything. We had a **** or no water pump. That's it.

Marsh, Benjamin

So, how do you view it? How do you view the challenge for you versus the challenge for a farmer who has all this infrastructure? It's all diesel, and to make the switch would mean to trash all their current stuff.

Euan White

Yeah. Yeah, it's a good one. I think it comes down to when it comes time to replace that thing. That quad bike, or the car, or the Ute, or the tractor? There's an electric option available now. If you look at the costs, look at what you've spent on diesel in the last 20 years with your tractor versus what you can spend on electricity with your electric tractor. Durban in vain. Hey, make the power yourself. Make the power fuel your own orchard. With the sun. They can't take the sun, so let's use it.

Marsh, Benjamin

Yeah. Also, there's a lot of questions from people like what they're gonna do with, like the machines they're gonna throw out, like the diesel machines or like the even, like, the solar

panels. Like you have to renew it a couple of years after. So what are you gonna do with those that you throw out?

Euan White

Yeah. So the recycling program in New Zealand doesn't really exist yet. Because it isn't a problem yet. Like when it becomes a problem, people will start thinking of solutions for it. There's no point having a solar panel recycling factory in New Zealand because right now solar panels recycle, so there isn't one yet. I think when there is, when there are 100 tons of the solar panels. Sitting in a field somewhere that needs to be replaced and recycled, then the solution will. Appear. I think it doesn't exist now because it's not a problem yet. I think forecasting it being a problem, and I think it's 25 years as the life cycle of our panels, that's a really long time. I will be here in 25 years. This probably won't be here in 25 years. I've got no idea. Yeah, when it's a problem, I think there'll be a solution for it. I think in the States in particular. Yeah, you've got better recycling plants and things like that because there are so many more of them. We're just too small. We're just too small to do that. Yeah, I know it's rewiring that a whole bunch of work in regards to electric machines on farms and then the recovery, the recycling process, what it would look like, it basically comes down to there isn't one because it's not a problem yet. Yeah, that electric farms report is based pretty much on us. Is that there's a lot of pictures of our solar panels and our sheet, and our tractor in that report can and we contributed greatly to it. Which is. Which is great. Whether it's getting much buy-in from farmers. Dunno, dunno. And I just said before. I don't care. It's not in my interests. Yeah, I used to. I used to care. How about people doing this? But honestly, there's no interest in it. For me, it's just more of a... That's cool. You brought a monarch. That's wicked. I'll come and show you how to drive it. I'll come check it out. I don't go any further than that.

So I've got three more questions that I need to fire off quickly because we only have three more minutes. The first is. Just so we're looking for every opinion we can find. I understand if you don't think that this is necessarily your field, but when you're looking at a website, what makes you engaged?

Euan White

Regarding anything in particular.

Marsh, Benjamin

Well, in this case, it would be. Dashboard on electrification. But like, would you say? Pictures, graphs, hand-drawn like rewiring Aotearoa's website.

Euan White

Yeah, I think the graphics that rewiring use, you know, they clearly did make it simple and easy to understand. And I think that's important. Lots of people out there have no idea what a kWh is or what an amp or a Volt or what is. They don't know, and I think it's scary. So they don't engage. I think it might just make it really, really simple, really easy to understand. Yeah, we, we, we, I hold up. I've got a. I've got a TV in my shed that displays this. And that black tariff thing and we walk visitors through it. This is how much we're making on the solar panels. This is where it's going. We think of a battery like a fuel tank that goes up and down. Except ours. Ours goes up off the sun, and we can set it to the grid and get paid for it. Whereas if you're 10, you can't do that. To make it really easy to understand. Is absolutely essential.

Marsh, Benjamin

OK. Is there anybody that you feel we should speak to? It could be any industry. It could be anybody. Even people against electrification, yeah.

Euan White

So no one that I know is anti-electrification. I haven't come across anybody that this is stupid. No, no wrong. You're doing it wrong. No one. No one said that. I think people are just unconvinced. This will be around in 10 years. Or the tractor won't go and catch fire. Which it might. I don't know. It might. I doubt it very much. I yeah this dear. There's nobody else that doesn't like that like we do it like I do it. So I can't. I can't think of anybody relevant that you could ask and that would sort of have similar ways of thinking than me. And also people are completely against it. I can't really think of anybody either.

•••

Marsh, Benjamin

Awesome. Thank you so much. Well, thank you so much for your time.

Euan White

I'm happy to help. And we'll hear from you soon. It's nice to talk to you. Sweet. All right, we'll see you then. We'll see you in a few weeks.

IV. Josh Ellison Transcript

April 11, 2025, 13:04 - 13:53 PM

• • •

Marsh, Benjamin

Beautiful. That will certainly give our paper more credibility. All right, now for some quick demographics questions. What is your highest level of education? I scoured the Internet for your LinkedIn or for anything and I couldn't find it.

Josh Ellison

Yeah, I don't have LinkedIn. My highest self education is an advanced Diploma of Industrial Design in Australia.

Marsh, Benjamin

Awesome.

Josh Ellison

Which is unrelated to this and not a very high level of education.

• • •

No. Yes, continue.

Marsh, Benjamin

And your job title is research and development lead?

Josh Ellison

Yeah.

Marsh, Benjamin

Your employer is both Rewiring Aotearoa and Rewiring Australia?

Josh Ellison

Yeah.

Marsh, Benjamin

Awesome. Just jumping back super quick. Your research and development lead, can you tell us a little bit about what that entails?

Josh Ellison

For the most part.

•••

Modeling and report writing for most of our research at rewiring. There's another angle to that in that there's work on the ground and kind of development of innovative projects and things like that.

• • •

Marsh, Benjamin

Did you work at all on the website?

Josh Ellison

Yeah, a little bit.

Marsh, Benjamin

Really? OK. Did you work on developing it or just the information that's on it?

Josh Ellison

Well, it's on webflow, it's like developing it is the answer, like developing it a little bit but not that much. But it's on Webflow, you don't actually need to code it, it's more visual development. Web flow is kind of like Photoshop for website development.

• • •

So you need to know CSS classes and things, but you don't need to actually use them very often.

Marsh, Benjamin

OK. We might ask you some questions about our specific website then, which is normally something we don't do. How would you rate your expertise in electrification? In your own words, out of 10

Josh Ellison

Wow, that's a good question. 7. Yeah.

Marsh, Benjamin

Cool. OK. Now we can move on to actual questions. In your own words, how would you describe New Zealand's state of electrification adoption today and are there any examples or observations that illustrate your view?

Josh Ellison

New Zealand is behind on a lot of things compared to other similar nations. While simultaneously having some of the most incentive to go fastest compared to other nations. So I would say that my first thought is that it's surprising how far behind New Zealand is. For example, on distributed solar and battery installs. Though it's not that far behind other nations on Ev's, it's still going relatively slowly. And some examples of that are, like Australian rooftop solar, which is 42% of occupied homes. New Zealand is maybe 3%. I can't remember the exact number, but it's well under five I think. And so there's, you know, both countries are next door to each other. And so the idea that, for example, New Zealand has less sun than Australia. That's unsurprising. But you can have a look at Victoria in Australia, where they have similar sunlight hours, I think, to New Zealand on average. And they still have at least 25%, maybe more, solar adoption, I think. But all those numbers are kind of publicly available online, from various places.

Marsh, Benjamin

So I understand you work with both rewiring Aotearoa and Australia. I wanted you to go into a little bit more comparing New Zealand versus Australia. So you mentioned solar panel household adoption. How is it over there? Because I know New Zealand has 80% around Renewable energy generation. How would you compare those numbers and that progress to Australia?

Josh Ellison

Yeah. Well, in some ways that's really good. That New Zealand's got 8% renewables, I think is important. For context there is that they had 85% renewables in 1985 too. And so from 1985 to in the last 40 years or so they've kind of gone down and up and then down. I think they got to 65% from 85% and then now they're back up at 85%. So I would say an alternative view on New Zealand's renewable generation is that they got like handed one of the biggest opportunities in renewable generation and in the energy transition and they have not capitalized on that opportunity even remotely. In the sense that if Australia, like Australia's, has built out heaps, of solar and is trying to build out the storage for that solar. New Zealand has the storage

that is the perfect thing to go with its solar but hasn't deployed the solar so I think if you're wanting to compare the two in that sense, I think New Zealand is further ahead technically speaking. But I would say really that it is out of luck and not out of planning.

Marsh, Benjamin

That's a very interesting context. I didn't realize that it was already 85% in 1985.

Josh Ellison

Yeah, there's an interesting one of my colleagues who actually made a documentary called Powering NZ. It should be on YouTube.That will be interesting from a historic perspective, but New Zealand early on built a lot of Hydro bills, one of the first transmission lines in the Southern Hemisphere, first hydropower Power station in the Southern Hemisphere really early on, and got a lot of electrical infrastructure. The first wet steam geothermal plant in the world. ... Like so, so that they set themselves up for this. ... Like pre climate change being a worry. They had all this hydro built out. So what? It's not like they've built out the renewables in order to solve the climate problem, you know, they were already there.

Marsh, Benjamin

Interesting. Now, what would you say are the biggest challenges in displaying the benefits of electrification for New Zealand households to the population?

Josh Ellison

Displaying the benefits? The biggest dilemma is. Switching people's mindsets away from how they currently pay for energy to how they could pay for energy in the future. This is true across all things, including households and renewable energy plans. But a good way to explain it is perhaps with renewable energy plans, which is if you build a coal power plant, you pay to build the plant some amount of money and then in the future you pay to burn coal in it, so if you burn more coal, you pay more for the coal. If you burn less coal, you pay less for the coal. But basically, the costs are a combination of the cost of building a thing and then the cost of putting coal into the thing. When you build a wind farm or a solar farm, you have the cost of building the thing and then energy is just free forever. Not forever, but you know free for, say, 30 years. There's still some maintenance and all that sort of stuff, but largely speaking the energy becomes free and it is to some degree out of your control. You can't put more sunlight into your solar panels. You can't put more wind into your farm and so. That means it's a different perspective. Looking at the same problem, finance is being swapped out for fuels, and if you think the same about an electric vehicle for a home. If, for example, you could buy a new car today and pay off the cost of that car at the petrol station at the same frequency you currently buy petrol in a petrol car. Most, if not all, new cars purchased today would probably be electrical ready. But the dilemma is the electric car might be 10 grand more expensive upfront. That you have to pay that upfront and then you don't have to fill it up with petrol and you know it's much, much cheaper to run. But right now the context people have is cheaper to buy upfront and they don't necessarily think about the ongoing costs and so. Another way of saying again maybe is like when you go to buy a water heater, you might look at a gas water heater. Hey, that's \$3000, but over its lifetime, you're gonna have to burn \$8000 of gas in that water heater, and you can't run electricity through it through a gas water heater. So the alternative might be an electric water heater that's run off solar, which might cost \$7000. But you might only spend \$1000 on electricity over its entire lifetime. So really the decision you are making at that one point in time is like do I decide to buy a thing that's gonna include 15 years worth of gas burning? Or 15 years worth of electricity and the actual total cost you're deciding on at that one point in time is very different to what it looks like at the shop. And so I think combining that perspective is possibly the one of the biggest things in terms of people understanding the financial benefits of electrification.

And then the emissions benefits of electrification is kind of like another, you know, another thing altogether.

Marsh, Benjamin

Yes, yes. You mentioned this very briefly at the beginning of your answer. Talking about switching out, people think about paying for energy and we've heard a little bit about this, but my understanding is that people use very, very little energy during the summers, but then they'll end up using a lot of energy during the winters. But the way that the gas bills have, you're paying year round.

Josh Ellison

No, not necessarily. So the first part is true, the second part is not true. So in New Zealand we use more energy. In winter, because it's a winter peaking energy system, but that's an A that's a definition of energy. That's only including appliances, right? And This is why I wanted to jump in and mention it at the very beginning in the sentence you gave about building a dashboard for switching to electric appliances should also include electric vehicles or or be electric machines. Because it's not just appliances, it's also cars. But it's also tractors and it's also, you know, every, every machine that burns fossil fuels which. They are very varied. And lawn mowers and so on. But that's to say that you're, if you look at a household. Households about 2/3 of their energy consumption comes from driving. And that is not that seasonal. You know, people still commute the same distances, whether it's winter or summer. So 2/3 of the energy is largely unaffected. The next two biggest portions of energy are space heating and water heating, and. The rest is kind of like the other bucket of cooking and refrigeration and lighting and stuff. So let's just say for a household, if you exclude the vehicles, those loads are roughly 1/3 each. And this change is based on individual households and all sorts of things, but roughly 1/3 each seasonally, the only one that is impacted is the heating. So about 1/3 of the
household load is without vehicles. Which is about like less than 1/6 of the total household load. You know, vehicles are impacted by that seasonality. You still have roughly the same amount of showers in summer, you know so on and so forth. There's slightly more. Might be slightly more water heating needs in winter, but largely it's only that really really small portion, which is probably 10 to 15% of your energy that is impacted by the seasonality. Yes, I don't know if that answers your question or not.

Marsh, Benjamin

It does. And actually we may ask you at the end, I might give you a little sneak peek of our website and maybe you could help us because. That's a very interesting opinion, and I actually think that it will affect our website design, the idea that. Electric vehicles are so influential.

Josh Ellison

Yeah. And then and this is, this is part of one of the big things that is necessary to communicate both at a government and planning level and at a generalized level is that the energy transition combines 2 sectors in that. Historically we think of. Transport as a sector, think of residential as a sector as different things, right. And that's been relatively easy to do because cars go and fill up at petrol stations. They have a different supply chain, and then households have electricity grade and gas and that's a different supply chain. But in the future, all of those supply chains become one in that 85% roughly of car charging happens at home, which means that the solar panels you might be installing on your household are. Actually, decarbonizing the transport fleet, because obviously an electric car does not produce its own energy, it needs electricity from somewhere. And that electricity is not going to come from petrol stations.

into one. We need a lot more electricity, which is gonna include replacing the gas in the home, but also now charging vehicles off, you know from home rather than a petrol station.

Marsh, Benjamin

Well said. Yeah, that's gonna be so. Originally our website had three big categories. It was residential, industrial and transportation. So I mean that sentence you just said there obviously is very informative and will change how we set that up.

Josh Ellison

Yeah, I think I would say shift away from sectors and towards machines. In that sectors are generally a relatively messy category for things. For example, if you look at the emissions inventory of a country, there will be a large portion of emissions that are like electricity generation and who is responsible for those emissions. Is it the electricity generation companies or is it the household to buy the electricity? Or alternatively, the entire S island of New Zealand? Most of the gas ethanol is LPG bottled gas. That bottled gas is delivered on a diesel truck to households. Whose emissions and energy does the diesel truck count as? Because if the household stops using bottled gas, the diesel truck no longer needs to deliver the bottled gas. And no longer needs to exist. The same is true of piped gas, and that piped gas leakage is a huge portion of our emissions. Fugitive emissions in our inventory. I mean, not a huge portion in terms of all the other things, but it's a large amount of emissions often in countries. The fugitive emissions of a gas pipeline. Wouldn't be there if the gas pipeline didn't need to be there. And so household decisions on whether or not they use gas can actually influence decisions, which would be, which would be categorized under like gas industry sector or gas, you know, energy sector, but the household is the one that actually has control over that decision.

Marsh, Benjamin

I also think on that topic. I think the tool that we're building is gonna be much harder to influence. Like you said, it's messy. It's gonna be much harder to influence, you know, a company than an individual.

Josh Ellison

Yes. And I think it's in. It's arguably much less important to influence a company for a few big, big reasons. One is that the majority of missions don't come from the companies they come from, like the aggregate of people. So if you look at the largest emissions in the New Zealand economy outside of cows, that's just a rarity of New Zealand's economy and the accounting system for emissions. But if you look at the largest portions of emissions generally, it's cars. Followed by like you know, it's residential and it then mostly residential cars like that's the largest sector section of missions in most economies that I've seen. Obviously it changes. You might be in a place that's like if you're in a country that has lots of things like, light transport and much more urban, so like Taiwan as an example. Like, that's quite different, because then you might be. The transport fleet might have less emissions than like the industrial, and so on.

But generally speaking, the transfer fleet is normally at the top or or near top of the missions categories. And so, then who's responsible for the transport fleet? It's really decisions that are made at the dinner table by households. They're deciding what car to drive. And so where is it? A corporation generally will already be thinking about it. When can we replace this thing economically? A household does not really care that much. There are a lot more important things in their lives than the type of car they drive or the type of water heater they have. And so those decisions are much harder to coordinate than households, and sorry than than businesses. So I actually think it's probably easier to convince a business to make the decision. But it's more important to convince a household to make the decision.

Interesting. It's also one barrier. We found one hard barrier is the initial upfront cost and it's hard for an individual to see the initial upfront cost and still reason out that in the long term it'll be more cost efficient. But a business only cares about that bottom line. So for the most part, they will be more willing once, once it's viable economically, they're more willing to make those decisions.

Josh Ellison

Exactly. Yeah. And for most machines, it's already viable economically. The other. The other reason is in a way there is that this is true in every country. Generally speaking, the small machines are more economical than the big machines. So like as you know, you know you can't get a 0 emissions plane no matter how much money you have today, but you can get a 0 emissions car for similar cost to a petrol car and you can't get a 0 emissions water heat of similar cost to. A gas water heater. And so technological progress is happening on the side. For individual people and households and small businesses and big businesses, it's a lot harder. It's a lot harder to replace a process heat boiler economically than it is to replace, you know, a gas water heater in a home.

Marsh, Benjamin

I just want a quick comment. You mentioned earlier about electrifying tractors. And actually an hour ago, we interviewed Yuan White. So he told us all about his monarch and the progress it took to get to that point, which was fascinating. So what metrics do you use to judge the benefits of electrification? And can you think of a time when one of these metrics influenced a decision like? Either in you or in someone else.

Josh Ellison

I think there's two things that's really important here from the executive, like how displaying this information is. One is the benefits of electrification and one is progressive electrification and I think they have very different ways of displaying them. So, like progressive electrification is a question of individual machines. Like how many fossil fuel cars are there in the country? How many electric cars are in the country? And the same is true of gas, water heaters, electric water heaters. There's an absolute number there, but then there's also a trajectory number there, which is like X percentage of new vehicle purchases are electric and the only way to hit any of our climate goals is to basically make sure 100% of vehicle purchases are electric 100. Percent of water heater purchases are electric by, let's say probably. Like 2035 or maybe earlier, right, 'cause all of these things have long lifetimes. So if you buy a petrol vehicle in 2040, it'll still be burning petrol in 2050 and then we would have failed our climate goals by a long way. That's the metric for measuring progress, which I think is really important because measuring the progress is one of the things which is like, yeah, really underappreciated. And that is at a per machine level, what are the adoption rates. And what are the adoption rates that need to be reached? I'll send you a paper that was done in the US, which is interesting, which is like there's a gap between right now. Let's say we're buying 5% EVs per year. Next year, we might be buying 8% Ev's per year. But there's a gap between that and what is needed to hit climate targets. So this year, maybe we actually need to be at 10%. Next year, we need to be at 20%. And the year after 30% and there's this gap between real adoption purchasing behavior. And what is needed to hit climate targets? I think that gap is like one of the most useful pieces of information for how well it is succeeding. Like electrification is exceeding decarbonization is exceeding because it basically tells us how much we need to speed up this process to be back on track to our climate goals. So then back to your original question on the metric of benefits I mean. Metric of benefit I think is pretty easy, it's just the cost. Like and, it's just what it is. The annual or weekly cost of running a thing. I think putting it into a weekly or monthly context is guite good and helps people understand it for example. If you're buying a car, the car is probably going to

cost more. I'm sorry, probably going to last 15 years or so. But most people don't think about the cost spread over 15 years. If you buy a water heater, it's \$3000 more. People just think of \$3000. I don't think it's actually like that. What is going to last them all these years into the future and so there's an interesting question of how do you break down the cost into be like? One example would be how do you make it seem the same as a Netflix subscription? Seems right like. If you're running and these are just random numbers on my head, but like if you're driving a petrol car, your cost of fuel and buying the car and everything all mushed into one subscription cost. If you were subscribing to have your choice of car. Right. Might be like. For you know, SUV, petrol SUV or something like that might be \$150.00 a week is how much you pay in total for things like the fuel, the maintenance, the upfront costs. Over his life and lots of stuff. And the alternative is an electric vehicle. You might pay \$130.00 a week for the exact same spec of vehicle and so on, except electric. And that includes the upfront cost of electric vehicles spread over his life and the fuel cost and the maintenance costs and so on. Which is to say that if you were paying for your vehicle like a Netflix subscription, most people would probably already be driving electric vehicles, at least to this, at least for a new vehicle purchase. And probably a lot of secondhand purchases. And so I think that's a good perspective to convey. The overarching better decision making opportunity in the electric options. There's lots of other benefits which are not conveyed that often by us, at least, which is like there are massive resilience benefits. Obviously there's massive missions benefits, obviously. To quickly jump onto visions for a second. Like there's there's. There's only one realistic pathway to solve climate, like on any sort of time frame, which is relevant to good temperature ranges. And that's electrification of all of these machines. Like there's not. We can't plan enough trees to go fast enough. You know, there's no other fuel option that makes sense. You know, in water heating, in driving things like hydrogen and renewable gas do not scale enough. They're still more expensive than electrification, so on and so forth. So there's no other realistic available technology as you would probably be aware of. Carbon capture doesn't really work and is failing all over the world. And

it's extremely expensive. So there's really only one realistic pathway to solving climate. I think New Zealand is very unaware of that which is important. To also convey, as you may know, the last election political debate that both leaders got asked, how are you solving climate change? And both of them said we recycle at home. As you're probably aware, the impact of recycling is probably 2% of the world's emissions. It's not even like a it's. Yeah, it's kind of like a tiny fraction of nothingness, and it's probably the least important thing you can do for climate change out of all the things you can do. There was a study done at some point with a list of all the things you can do for climate, and it was very low, but generally speaking I don't know where it ranks, but it ranks near the bottom. I think there's not that much clarity here on what is the, what is the right kind of thing. What do we need to be focusing on to accelerate climate? And then there's obviously huge resilience benefits to electrification, which are a different story in themselves. But in earthquake prone areas like I'm in an area which has, I think a 70% chance of a high magnitude earthquake in the next 50 years. Where we're going to have no power for weeks, maybe months. Like that's an example of. There's plenty of other benefits which you know your petrol car cannot run your house, but an electric car could run your house for, you know, indefinitely. Actually, if you have solar that can charge in the day in an event like that.

Marsh, Benjamin

So one thing you talk about which is a very interesting distinction that that people don't normally catch is that progress first benefits. So originally our whole thing was about. Marketing the progress or displaying the progress, but what we wanted to do is we wanted to switch it to displaying the benefits because we thought that would give us more. Freedom. But what I'm hearing now? And what I want to ask is do you think that showing progress as a motivational tool is something that people would see and it would influence them to look towards, elect, look towards electrification?

Josh Ellison

Yes, I do. I think the benefits are that it would be interesting to figure out how to convey the benefits in a way which everyone understands from a climate perspective. I think from a cost perspective, which is the main benefit that most people care about. There. Yeah, there's lots of interesting ways that that could be that could be attempted to be conveyed to people. I think we've tried lots of them at rewiring. And continue to try lots of them. So like we're always interested in how to improve conveying that. But I do think there's like this gap between people who don't care about climate. Therefore, if you can make the cost argument clear, they can just do the thing on cost and not care about climate, but I think. Perhaps one of the areas of most opportunity in New Zealand is that we do have a lot of people interested in solving climate but unaware of what the most impactful thing to do to solve it is, which is where I think progress is. Really strong motivator for them. In that one way to look at it is that there are roughly 10 million fossil fuel machines in New Zealand, and that means we are roughly 10 million machines to 0. Right. So we could guite literally have a counter of, you know, this is how many decisions it is between us and the 0 emissions economy. Well, a zero energy emissions economy, we should say. This is obviously still going to have the cows fighting and burping, but like that, that context. In that like these are the decisions that matter from climate it's not. It's not whether you recycle something. It is the truck that picks up your recycling running on diesel or running on electricity. Like, that's the decision which impacts climate by far the most. So I think there's a lot of opportunity in that space. Where a lot of progress could be driven because people who historically have thought climate is a, you know is a cow, cow and plastics problem could see that it's a fossil fuel problem.

Marsh, Benjamin

OK. That's a beautiful, beautiful sub. So I want to talk a bit about switching. EVs are like the number one tool we have to reduce our emissions. But what is the path forward? Because I

know the rebates have been decreased. So questions arise, like when people like to plan on getting a new car. They want to sell their old one. Right, But that's totally contrary to this goal. You know, if you buy an electric car. But then just sell your old electric car to someone who doesn't have a car. You've decreased the amount of electors. You've decreased the amount of carbon cars by zero. You know there's the same number on the road. So what do you see as that path forward?

Josh Ellison

I mean, I guess the question is, why are you worried about the amount of cars on the road?

Marsh, Benjamin

Cause it well, we talk about love. We need to get cars to 0%, like carbon cars to 0% and you wanna get yes.

Josh Ellison

Percent. Yeah, sorry. So I think there's a very important distinction there between. Like a lot of the time, people argue that we shouldn't have cars on the road in general, which is like, and that you know, for example, everyone catches a bus or rides a bike to work. That is good in theory, but in practice it's never gonna happen. You know, there's so many examples of this, but we just wrote something about it recently. For example you can go look at the Netherlands. They, you know, the buy capital of the world, they've still got 1.21.12 cars per home and they still drive the same distance as New Zealanders drive, right? Obviously they'd go to work on a bike more often and like that, that's great. I love riding an E bike and so on, but one of these things is an Urban Development question and one of them is a climate change question in which society would be better, happier, more fun. If we could ride more bikes to work and, you know, have less

traffic, but that's not a climate question. If all of our cars are electric and charged with renewable energy, and built in factories powered by renewable energy, then it doesn't matter how many cars. We can have more cars than today if we want. And so from a climate perspective, what matters is the cars don't run on fossil fuels. And obviously aren't built with fossil fuels, but that's just the factories don't run on fossil fuels. So I think that's a really important context. So generally if someone is buying an electric car and then they are selling that electric car and buying another electric car.

Marsh, Benjamin

Or or selling their current carbon car.

Josh Ellison

Yes. Oh, I see. OK. Sorry, now I see the context you have there. So that is the really important thing there is, is asset lifetime. In the sense that car ownership dynamics are very complicated and messy, and like you might buy a car and keep it for four years and then sell it and buy another new car, which that's like an often fleet cycling type thing that people will do or like. Especially wealth, people. Or you might buy a car and just drive it till it dies. But even if you know you are, let's say, like normally speaking, a car won't be owned for that long. So what will happen is it will trade hands. But from a, that's because we're looking at it from a human purchasing decision perspective. But we're not looking at it from a machine perspective. From a machine perspective, where you lock in the emissions, the emissions of cars are locked in when the first new one is purchased, not in the rest of the purchase. Decisions are largely irrelevant. From that perspective, because when a car is built and purchased, it locks in the entire asset lifetime of emissions. Doesn't matter who's driving it. It's probably going to be on the road for 15, maybe 20 years. And so what's important is that we stop that cycle so that if new cars are electric, it means they're locking. In 1520 years of, you know, transport that doesn't need to

burn. Fossil fuels. So if you're buying a new car that's electric, and then selling your petrol car, that's not electric. That's old. That's, you know, you're still getting whatever like that car will get scrapped X many years earlier than your electric car will. So you're still getting a net benefit. And the goal is to, you know, accelerate the amount of new electric cars that get purchased, so that then more secondhand electric cars can get purchased. Because obviously, if you're selling your second hand, you're selling your electric car five years later. Now you've just given you know that person who was buying your second hand petrol car. The opportunity to buy a second hand electric car.

Marsh, Benjamin

That's very, very insightful. That's very insightful. Now we're gonna move on to a bit more questions about visualizing information and displaying it in motivational ways. So what visuals do you believe best convey the benefits of electrification and can you ever think of? Can you ever? Can you recall a visual presentation that influenced you? Or particularly influenced anybody?

Josh Ellison

Umm. There are a lot of different cost benefits of electrification, so it's like. Overall the one. It's our own work. So it's not that that's, you know, always painful. But the one chart that's like 'cause we didn't know we were gonna, you know make this chart. It just came out of, you know, the work and then that surprised us. But that had the most impact on me was I'll just find a link to it. Just in a paper you probably have. It's investing in tomorrow's paper. And it's Figure 8. And So what that shows is the total.... It should be on the website as well. It shows the fossil fuel cost. You're paying in addition to the capital costs that you're paying for your fossil fuel vehicles, machines and so on. But it shows that not only is electrification cheaper and it'll save you money per year, but because solar and batteries you're buying the energy source upfront and

then getting it free in the long run more or less you know you're buying it all over in one. Purchase upfront. It starts to flatten bills because they're less inflationary than fossil fuel bills. And so that starts to convey the kind of tipping point that New Zealand is at that not that most countries in the world are not at. Like in New Zealand, we're at that because petrol is \$3 a liter, Australia. Petrol is \$2.00 a liter. In America, it's probably like don't \$1.00 a litre. So because of those high fuel costs, we've kind of crossed that tipping point in New Zealand where this is now a good economic idea. And I think that's a useful way to convey it to people. There other than that I think. Summarizing it all down and having the stacked layers of all of the costs that people are paying into kind of like a Netflix subscription type like this month, this this week helps convey it. It depends on what the thing is. So for example like. One thing we found in the past is that it's sometimes. Useful to convey it as an everyday experience. So the cost of a shower on natural gas might be like \$0.70. Cost of that same shower powered by a solar powered water heater might be \$0.20. And so that like he is the everyday experience of. Of choosing the more expensive option over the cheaper option. The dilemma with that is that that seems cheap because you're like, well, it's just \$0.60, you know, to have a gas powered shower. Like, what's the point? So there's that problem with that is that that adds up to a lot over time. And so it'll be interesting maybe to have a visualization that shows something along those lines, which is like, here's the small everyday decision you make and how much they cost you per day. Like he is driving to the shops in an electric car charged with solar, he is driving to the shops and petrol car and it's like in a petrol car. You use, you know, you drive to the shops and you use two litres of petrol. So it costs you \$5.50. In a metric car you used a few kilowatt hours of electricity and it only cost you a dollar. And that may not seem like much difference. And then you add that up over the course of a year and it's \$3000 versus \$1000. Or something like that.

Marsh, Benjamin

I think one thing. I think that we actually will do it on our website because you said it. I think that putting things in the context of a Netflix subscription could be very interesting, because it's definitely a different way of thinking. You know people, people consider these things differently when they think of it like a subscription service 'cause. You know, when I'm looking at a subscription service and I realize it went up \$2.00 a month, I get annoyed because even though it's only \$2.00, it's like well. I'm paying that every single month.

Josh Ellison

Well, and an interesting thing you could add to that is that. When you buy something like a fossil fuel subscription is more or less a subscription that you're locked into 15 years where the price rises and you have no control, so you can't, like you can cancel your Netflix subscription. If you've bought a petrol car, you can't cancel your petrol subscription. If you bought a gas water heater and you still want to be able to use the shower, you can't cancel your gas subscription. And when the market is volatile, which is like very often investing in tomorrow's paper that shows the volatility of a lot of these prices over time you get stuck with that volatility like you know if there's a there. A war like the war in Ukraine, like there's the price spikes, right? And you have no control of that over as a household. And so you're locked into this volatile subscription. That is based on one decision you make. To buy a type of water heater or a type of car.

Marsh, Benjamin

If you know, that's actually another really good way to think of it. Imagine if your Netflix subscription was going up. You know \$5 every month. You could never. I think this is a very cool context and a very good way to display this information. I want to help people understand. So other than the rewiring website which we absolutely love, we're trying to do a lot of stuff. We're copying the cool water style color you have because we think that that's I think that's a it makes

it feel more accessible I think. And we're also more friendly. There's a lot of stuff we love about it, but we're wondering and actually you could mention a specific thing. Visual solution on your site, but are there any specific visual solutions or other online presences that fare well in communicating progress or benefits for electrification?

Josh Ellison

Umm. I'm not.

Marsh, Benjamin

And also why? Why do you think those are effective?

Josh Ellison

Yeah, I think. Like you may know, like our world in data, which is a global website and I think they have a lot of good visualizations and articles. Like mostly on emissions. Someone's electricity costs and things like that. They're generally very much just like straight, you know, straight, kind of plain plain charts. But they're generally very well made and. Have a lot of detail. I'll send you there. Yeah, the thing in the US about the pace of progress is a really good one. I think that's a really good visualization. In that report, it's really good visualization. Who else has good visualizations around? This is a good question. There are so many good visualizations and. I should know the sources but I do not.

Marsh, Benjamin

Well, if you could send them later, we would appreciate that a lot. If you need time to find them, I think that's more than reasonable.

Josh Ellison

But yeah, in general I think yeah, a lot of the I think look to Australia for a lot of the electrification stuff and a lot of like community groups in Australia generally generally speaking, Australia has a lot more electrification, visualization has a lot more of that work. Because Australia's been in this position of understanding electrification for a fair amount longer than New Zealand has, and they've been installing mass rooftop solar for 20 years. There are a lot of good visualizations. There's that sort of stuff. One actually just off the top of my head. Oh, actually I just remembered another one. Is a really cool visualization of solar uptake based on postcodes in Australia, so I think this could be done based on machines, not just not just solar. So that one I put in the chat is a map of all of the postcodes in Australia and how much solar they have and you can kind of zoom in and see all of the details. All about those specific installations.

Marsh, Benjamin

Beautiful. Yes, OK. Yeah... How do you think we can make this more visually appealing?

Josh Ellison

Yeah, I think the first thing that comes to mind is like the, I mean, yeah, looks cool. I like the visualisations as well. I like the illustrations. I think the first thing that comes to mind for me is like up top there seeing a like what is? What are we on track for which is to say when will New Zealand at the current rate hit 0 fossil fuel machines? Right, like. And so it's like New Zealand is on track to hit full electrification by 2070. We need to increase by X percentage per year to get back on track for full electrification by 2040. For example I think that would be a really cool way of summarising that, like that next to a counter which says like you know there's there's 10. Million machines or something like that, like doesn't. It doesn't have to be an exact number, but can be like an order of magnitude. Type number umm, like hundreds of thousands. And so you know or measured in, say 50,000 chunks, which is like something like that that they

did? So you don't have to go in too far, too deep into the like counting every exact number of machines, but. I think that would be really interesting to have a pathway which shows where we were gonna land. You know, where's our current trajectory going to land and next to that like what's the count, how many electrics? You know how many false fuel machines there are left to do? How many electric machines have replaced phosphor machines to date? Which kind of also shows the rest of New Zealand, like how many people are already doing this. We've got 60,000 solar installs. We've got X mini 1000 electric vehicles. And and and we have. You know, we may have. I can't remember how many electric vehicles we have, but we may have 100,000 electric vehicles, but we've got 4.4 million to go. And showing all of that context really quickly and then. I like the idea of the sections below as well like why it would be really interesting to then visualize the kind of. Things we were discussing about, like, you know, recycling doesn't matter. From this perspective, from a climate perspective and kind of showing this is the only pathway to get to a much lower emissions energy economy. And yeah, no otherwise looks cool. Exciting.

Marsh, Benjamin

Thank you. Are there any other experts that you think that we should speak to and yeah.

Josh Ellison

I think there's probably mass overlap with any that the rewiring Aotearoa team has already given you, so I would probably just be just providing you with the same ones. But I'll have a think if there are others that I could send across.

Marsh, Benjamin

Excellent. I actually wanted to mention something about what you just said, but it is still on my mind for a second. You talked about a counter and I thought about this. It's a very interesting concept and I would like to do it, but the one issue is that number exists in the

machine count. Right, that's. That's where that number would come from. But the machine count is on a Google sheet and I don't know how to do an API from that.

Josh Ellison

So I don't. I don't think you would want it to come from the machine count necessarily. So like there's a few, let's for say for example, it doesn't need to track every machine. But there are a few machines that you could track, like you could have an API that speaks to the Ministry of Transports Database for example, which has all the cars and probably gets updated. I don't know quarterly, maybe even monthly. I think it's an issue of transport or it might be something similar to that, but we can give it, which is like the source of the machine. Count users, right? But they should be like a government website which is relatively Open Access that allows you, you know that you could just get the data from there. The same is true of solar installs. They come from the EMI database, which is a government regulated database on solar installs that updates like every month. And and what I was referring to there is in not being like machine count. Trying to be really accurate right down to like almost individual actual machines. But you could have a higher level aggregation there so you don't have to worry about being as accurate in the sense that if you're rounding to the nearest 50,000 or 10,000 or something. You can say, well, there are this many cars you know from that database we have direct access to, etc. And like create some high level assumptions that that can drive that can obviously be refined in the future, but can then drive the type of counter type thing without needing to source it from the, you know necessarily. From the machine count. Because you wanted to update like, that's the one of the most important things, is updates over time, right?

Marsh, Benjamin

Mm hmm. Well, we've talked about this a good amount. Our professor doesn't want us to update it. He wants us to make it static because he believes we don't have the time. We only have

four more weeks on this project. But, you know, I'm definitely gonna. I'll probably play around with it today and see if I can get any functionality. And if it's possible, I would be more than happy to put the work in to do it, as long as it seems feasible. You know, as long as it seems like we will have a finished product at the end instead of just handing you guys a, you know, a half baked.

Josh Ellison

Sure. Yeah. Well, even just keeping it in mind that like, you know, it's not. Ideally you want the figures to be able to be, you know, just naturally updating. And just getting you know, the direct sources from various places like the Ministry of Transport and so on.

Marsh, Benjamin

Yeah. We just don't wanna. Were promised and under delivered.

Josh Ellison

Yeah, no worries, no result. There's also a EV database evdb dot NZ which is like I think they track a lot of the EB data as well, which might be interesting. Because if you tracked a number of Ev's, you can then track the total vehicle fleet size. And then that, that's your proportion. But yeah, there's probably a bunch of options there.

Marsh, Benjamin

You know what the logistics are for? Using their websites and using their API. Do we have to pay? Do we have to?

Josh Ellison

I don't think you'd have to pay, but I haven't looked into it recently so I'm not sure.

Marsh, Benjamin

Well, we will. And we'll, we'll let you know how it goes. All right. Thank you very much. Really appreciate your time.

Josh Ellison

Feel free to reach out if you have any. Yeah, do you have any questions or anything along the way?

Marsh, Benjamin

Absolutely. Thank you so much.

V. James Scott Transcript

April 15, 2025, 15:03 - 15:49 PM

Marsh, Benjamin

Do we have your consent to do this interview? And may we use your name or do you wish to remain anonymous?

James Scott

You can use my name.

Marsh, Benjamin

Awesome. Perfect. So I did a little bit of research on you before this interview and I just wanted to confirm some demographic information. Your highest level of education is an MSC in astronomy.

James Scott

Yes, I have two master's degrees, one physics, one astronomy.

Marsh, Benjamin

OK. Your job title, you have 3.

James Scott

I have a variety but it depends. I spent most of my career in information technology ranging from software development, consulting and business, and analyst. I am currently doing software development on contract for a firm for a day, day and half week. I'm running a couple of other companies and doing volunteer work cheering for a couple of them.

Marsh, Benjamin

Probably more than I have. I am the owner and director of mainspring.

James Scott

That's the company I do consulting with. I'm sort of the only person that's been going for 35 years or something like that. But I'm also an owner, director and running a company now called local energy in New Zealand. And that's something we're working on. And I am involved in a volunteer capacity in two or three of the local community initiatives. Mostly electrification is through either. Local energy or my volunteer work for electrification.

Marsh, Benjamin

OK. Do you? Are you still the senior Drupal developer of X equals?

James Scott

I still do that for about a day. A week lends me a bit of pocket money.

Marsh, Benjamin

Beautiful. And then how would you rate your expertise on electrification in New Zealand?

James Scott

Moderately good improvement.

Marsh, Benjamin

Always driving right? Awesome. So get those demographic questions out of the way. In your own words, how would you describe New Zealand's state of electrification adoption today? Are there any examples or observations that illustrate your view?

James Scott

I think we tend to be a bit smug about our state of electrification because we've been told for a long time we've got a great electricity system, mostly all green renewables. The reality is our electrification system, I think, is under huge pressure. There isn't enough electricity in settings such that it's difficult to add more to it. The market environment was created 30 years ago and was set up to facilitate and benefit the generators and the retailers, not so much the consumers. There was no incentive for them to invest in new electricity generation. So consequently, we're now faced with running out of electricity. Frequently, particularly in winter. It's a bit dry and we haven't got the rainfall into our hydros systems. Most modern houses are fully electric. In general, new houses don't have gas fitted to them because they're trying to wind back the gas network. But there's still a lot of gas appliances. Electric vehicles, we have a reasonable number on the road and they were growing rapidly two or three years back when there was a discount or a government incentive for purchase. That was removed 18 months back when the change of government and electric vehicle sales dropped through the or dropped through the floor, I should say.

Marsh, Benjamin

OK. That's very extensive. Thank you. When do you think New Zealand will reach net zero emissions?

James Scott

2040-2045 or something net 0 is. An artificial concept. And it's not one I support. We need to be focusing on reducing gross emissions, not letting there's a lot of focus on planting trees to offset carbon emissions. And that's a foolish goal in my mind. And I've been saying sorry for 30 years because of trees. While they are our only real. Tall at the moment for dealing with excess carbon emissions, they're not a long term thing. If you plant trees to offset fossil fuels, you really have to be able to guarantee that the forest that's planted is going to be there for 10,000 or 100,000 years, because that's the age of carbon underground. And so carbon in the biosphere doesn't matter whether. It's in trees with the atmosphere or something still there to do damage. We've just got to stop. Raising the carbon in the biosphere. So the answer to your question is net zero. Will reach it when various accountants decide we've reached it. And I don't think it's particularly. A hard goal it'll it's soft. It'll be whenever people have added or subtracted bits into the equation, depending on how they feel. It'll be a political decision as to when we do it, not a physical one.

Marsh, Benjamin

That's a very interesting opinion. I haven't heard that. But certainly I understand what you're saying. I mean, I remember reading the actual article where they promised net 0 carbon emissions by 2050, but there were a bunch of like qualifiers. So it just didn't seem very. I don't know. Honest, All right. What would you say are the biggest challenges to displaying the benefit of electrification for New Zealand households? Communicating it.

James Scott

Well, the biggest challenge is actually getting greater electrification, the high cost of electricity. Does that make it a challenge in communicating it? No, it makes it a challenge and convinces people. To shift into greater electrification. I think it's easy to communicate the benefits of electrification. It's much harder to get people to take action to follow that path.

Marsh, Benjamin

OK, that's it. A good point. That's a good point. How do you judge? Because you said you mentioned that you don't think the net zero goal is. It's more of a political thing than an environmental thing. So what metrics would you use to judge progress in electrification? Like, yeah, what would you say? The goal should be.

James Scott

Colin, the goal, I guess. Total energy budget, which has shifted towards electricity away from fossil fuel. And so that we're replacing energy. That comes from fossil sources, be that coal, gas, petroleum with energy, that's generated electricity. And the big one or the big 10? The thing to understand, and it's part of any energy discussion, is that if you've got renewables, they're easy to capture. There's a lot of them there. They're roughly easy to capture. We know how to do it, but you've either got to use them when you capture them, or you've got to store it. That energy stored is just the real problem. And that's why coal and petroleum and gas. So prevalent and favoured is because they stored energy. You can take it and keep it and use it when and where you want it, whereas electricity from a solar panel or from a wind farm. You've got to use it at the time or convert it. And our energy storage technologies are lagging behind our energy capture technologies.

Marsh, Benjamin

This definitely seems like an issue that we've heard frequently about storing energy and the energy fluctuation prices between the day and the night summer and the winter.

James Scott

And that's one reason why the company local energy on with prior to that we the business was E fuel Pacific. We were looking specifically at synthetic fuels as a mechanism for storing the captured energy. While I still think that's important, it's a technology somewhat in the future and it's probably out of reach of New Zealand because the size of plants that are going in there are way bigger than we would ever afford or need.

Marsh, Benjamin

Interesting. Synthetic field.

James Scott

Liquids, a great form of storing energy and you take captured electricity. You get carbon dioxide. You can make methanol or you can run it through chemical processes to make gasoline. And you know, that's an energy dense material, easy to store. We know how to transport it with 100 more years of handling it. Great stuff. And you can make it synthetically. And it's not a fossil fuel.

Marsh, Benjamin

Well, they're actually, they're also. Portion, I think it was Honda I think are developing a carbon neutral fuel. Well, they don't say much about it, but the fact that Honda joined in it was a year ago or maybe half a year ago, which kind of is kind of a good thing. So yeah, that is true what you say. This could be a step in. This could be like an alternative as well as valid.

James Scott

But there are a number of plants around now. We're getting a little bit off topic here, but Maersk for instance, the biggest shipping company in the world has an ambition to get all their ships running on synthetic metal, green metal giving away from phosphor D. And that's a multi year multi decade project for them. But in Europe there are a lot of synthetic fuel plants making methanol. I think they have one in southern Chile that actually makes gasoline. Renewable energy down there and in Germany, the Netherlands, France, they're all all into that. Anyway, that's a little bit off topic, but it's what you need. You need lots of electricity if you're doing it because. The energy you can get back after you've made methanol or gasoline is only a fraction of the energy you started with.So you have to have a lot of surface energy to make and store it like that.

Marsh, Benjamin

That's interesting. I mean, he's been. He's been mentioning the synthetic feel from Porsche for a bit now, but it's interesting to hear or it's good to hear that it actually is. A valid alternative. Yeah, your experts are validating which gives them more credibility.

James Scott

Do have a look up and do research. Methanol because that's the favoured one. It takes a lot less electricity. You make methanol. Then it takes to make petrol or kerosene.

Marsh, Benjamin

OK. So what metrics do you use to judge the benefits of electrification or why? What would you say? The benefits of electrification are, well, yeah.

James Scott

The key ones are cost savings. Lowering for a household or a family the costs are significantly lower. If you can electrify, particularly if you can generate your own electricity with rooftop solar small wind turbines. And that's the key one. There are a few. There are savings to be made just by converting a gas kitchen HOB to an electric one. You know, gas hot water to

electric hot water. The savings are not as great when you've got to buy the electricity from the grid.

Marsh, Benjamin

It seems like cost savings are gonna be one that we really have to focus on because emissions you kind of, I mean, as much as I can say climate change is one of the greatest issues of our generation. It's hard for a person to put aside their. You know their everyday life. And so I make those sacrifices for that reason. But if you can show them the cost savings, that is something.

James Scott

Well, that's the message that rewiring Aotearoa is pushing. It's the cost saving that will drive it. The climate benefits and the resilience it comes from. That is a bonus that it won't be a driver for most domestic or business users to switch to electricity.

Marsh, Benjamin

So what have you ever come across a visual that conveyed the benefits of electrification in a motivational manner? And can you think of why it affects you in that way?

James Scott

I've seen lots of visuals. They don't convey it to me because I'm not a visual person. I look for words, not pictures. And that gets me into trouble with people I'm trying to communicate with because I say too many words. But pictures don't do it for me.

Marsh, Benjamin

That's where we're doing a lot of expert interviews. We ask these questions. We're also doing a lot of surveys to see what people think and. That's one of the questions. If they prefer text or graphics visuals. Our final product should be highly reliant on what the people want. Obviously just a lot of text would be easiest but. That's not what we're going for. If it's not the most motivational. But maybe there's more people like you. Hopefully there's more people like you who like the text. Because God knows we've written a lot about this topic.

James Scott

No, I generally prefer to read an article than to watch a YouTube video about something. At least I don't like watching videos and things like that, whereas I will read papers and text.

Marsh, Benjamin

Yeah, that's very valid. Yeah, everybody has their ways, which is interesting. Geez, have you found any online presences that fare well in communicating benefits or progress for electrification? Yeah, that could be anything.

James Scott

Hello. You know about Rewiring website. Is useful, but it's. That's all the blog posts they put up. But I find it interesting. They have some quite funky graphics and things I think that attract a number of people. What other ones? Well, most of the energy companies. 10 to put up something that tries and shows the benefits of their electricity as opposed to somebody else's electricity. With varying degrees of success, I suppose. No, I can't really say I I can answer that question and point to an online presence that does that.

Marsh, Benjamin

Is totally reasonable. I think that, like you mentioned, Rewiring, or I'm not entirely sure I pronounce that word quite yet.

•••

But that website is definitely one of our biggest case studies and one of the biggest references we look at because we do believe they display information in a very approachable and clear way.

James Scott

They've got Mike Casey as a passionate leader and he's got a great team around him that is supporting him, yes.

Marsh, Benjamin

Yeah, it's also. I mean, I don't know how familiar. I don't know how familiar you are with his work, but he also did the electric Cherry farm. Which is just amazing because someone's gotta take that first leap. You know, someone's got to prove the technology works and he was willing to take the economic risk to do it.

James Scott

It's now. I've spoken with him and he's coming to talk to an Expo. We're putting him here later this year.

Marsh, Benjamin

I wish we were still around for it. Now I think that's actually everything we need. You answer the questions very concisely and very clearly. Honestly, I mean normally people like to go on their tangents and walk, walk around for a while, but you really got straight to the point and gave us some great quotes. Great quotes that we can use for our proposal. Are there any others? Opinions you wanna offer? Any other things you want to do?

James Scott

I'm I don't know if you know much about my background, but I'm involved with a small team we're putting on Expo, rewiring the Hut later this year because I live in the Hut Valley. It's close to Wellington. Was 110,000 people in lower hopes? Probably about 40,000 and up to about 150,000 people. And the two parts of the belly and this Expo is educational. To attract people to or help them on their electrification journey. So they can come and talk to exhibitors who may be selling solar panels or electric appliances for their homes and find out the issues involved and upgrading or embarking on things like that. And that's intended to help with this, this process here. I've just bought solar panels on my house here. Just a few months back, I've had an electric car for while I'm on my second one. Now I've had one for about 5 years, six years.

Marsh, Benjamin

What motivated you to install solar panels?

James Scott

Basically, the roof was there and running a business startup business where we're trying to build. Or get local communities to for energy independence or energy cooperatives. I needed to be involved with it. I do it myself. Find out how it works. I've got a Tesla 3 battery there. The supplier I'm with is one that. It takes me straight to spot prices on the network side. If the prices peak, I pay high prices. But the converse is the electricity I sell back to the grid goes back at spot prices. That's sort of nice. I'm doing that to see what the impact is for this. But a big thing that worries me and I haven't got an answer for yet. And it's something that you may like to think about and what? Doing that is what people like me do. I can put on solar panels. I can

electrify our home and lives and I can end up saving two \$3000 a year in costs from the homeless, and that's useful, but it's not a make or break for me, because half of our population don't have assets or don't have the resources I. Have and they can't do it. And for them, \$1000 saving in energy costs per year would be a huge difference in how well fed they were, how well clothed they were and what we've got to do with this transition is find ways of enabling those people that don't have. Their assets don't have access to a home or mortgage or loans. Finding ways they can get the savings that electrification brings. 'Cause we can't. We can't afford to leave him behind. Because the divide between the haves and have nots just keeps growing. And if we want a good community, we have to stop that.

Marsh, Benjamin

It's very frustrating when you see the rebates and the government subsidies being removed because it's like you say, the people who need it most are the people who can't afford the upfront cost of these electrified devices and they're the people that need the benefits, the long term.Costs are benefits the most.

James Scott

Yeah. And then that's a real challenge. That's one we've got to solve and sort of bending my mind too. And I don't know how yet, but we'll find a solution. We can't afford not to.

Marsh, Benjamin

Well, it's always a little bit sad to interview uh you experts and find that you guys are doing things that are going to be far more productive than our project though. Oh my case. He has his electric farm. What's being done now? I wouldn't say pioneer stuff, but trialling it to make it mainstream. I've got a neighbor down here who sort of built his own system. He imported some panels from China and he got 15 kilowatts on his roof. He got a Tesla Model 3 battery in his garage. That 60 kilowatt hours of storage and I think he's got software from Norway or somewhere that controls it all. So it's his, is something he's put together himself. For things, it's just an off the shelf system. So what he's doing will become mainstream in a few years because the suppliers will pick up some of those ideas. And that'll become easier and cheaper as people follow that lead.

Marsh, Benjamin

It seems like it's all getting cheaper and more accessible. The only concern is it's not happening quick enough.

James Scott

Part of one of the things that's driving me is I'm heavily involved in a business support group in Lower Hutt, the Central Low Hut City Centre and what I want to do is to have all the buildings in the centre of lower Hut fitted out with solar panels. And micro wind turbines so that the city can generate enough electricity just to support all the businesses there. And that'll give it a competitive edge to attract businesses from other parts of the region, perhaps, and get some what are currently empty buildings filled, like the city, vibrant and thriving again.

Marsh, Benjamin

That sounds like. An incredible idea, not just for that community but as an example for others. This rewiring the Hut you your Expo when is that? Is it in the next 4 weeks?

James Scott

It's on October 4th Saturday. You'll see things on the net or the website. It's an education Expo so that people who are interested in electrifying their lives or homes come along and talk to suppliers, talk to people who have done it, and find out about it. And, some of them will actually. Then go ahead and make changes in their lives or start doing. It's just. A way of providing an educational opportunity for people.

Marsh, Benjamin

Yeah, I mean that. That hands-on experience is, you know, when people can offer you or show you how these systems work right then and there. That's gotta be one of the best ways to. Motivate, motivate, or encourage people to do these things, yeah.

James Scott

And you know, if somebody sees their neighbor doing it, then they'll sort of say, oh, what's going on?I'll find out a bit and say, oh, it doesn't look too hard. Maybe I'll do it myself.

Marsh, Benjamin

That is true. You were talking a little bit about energy storage, so. We know that. Households if they wanna store energy for example like solar panels, they wanna use it at night. They have to store it like a house battery to store it. So a lot of comments we got from are like, oh, it's like the battery is too expensive and then you have to add solar panels on top. And then it just makes more sense of the use of the grid like on the grid. So what do you think?

James Scott

Well, I mean in, in my case I put solar panels and a battery on. The battery was about half the cost of the total system. It's a Tesla power Wall 3 battery and it stores 1313 1/2 kilowatt hours of electricity. Not a lot. My solar panels generate 10 kilowatts so they can fill the battery

up in about an hour and a half. And 13 kilowatts if you think about it. A normal little living room heater. That's 2K2 kilowatts, so A2 kilowatt heater would drain that battery in six hours just by itself. So it's not a lot of power storage and battery. And if you can get bigger batteries, but they're expensive, as I said, a neighbor of mine, he's got an ex Tesla Model 3 battery and that's 1660 Kilowatt hours. So that's about nearly five times the size of my battery. It probably didn't cost him anything anymore. Energy storage is the big issue. I get the value from solar panels by storing some electricity so that we can use that power after dark at what would otherwise be peak power, price time and cooking dinner and things. In most cases, the battery will last through the night. And still enough there for breakfast in the morning. But provided the hot water heating doesn't come on until the sun's shining again, and we're generating more power. So with careful management that 13 kWh battery will do the house. With reasonable sunny days, I won't be drawing any power off the grid.My solar panels will generate about 40 to 60 kilowatt hours per day. We use 2025 ourselves. So there's plenty of power there. It's just at the wrong time.

Marsh, Benjamin

Do you sell the excess power to the grid?

James Scott

I sell the excess power back to the grid. And I'm looking at other options for storing it and a key one here would probably be hydrogen. Because it's fairly easy to generate hydrogen, you can get a small electrolyzer. And hydrogen if you're storing small quantities and put in a tank and go up to a few atmospheres for easy, nothing to it. The real problem is that if you want to store significant hydrogen, you've got to go very to very high precious 800 atmospheres where you've got to cool it down to really cold temperatures and either way it makes it difficult to handle if a small quantities, you could store enough. Hydrogen probably to run the house for a week. If that was cheap enough, do that. I mean, I know here who's specialized in those off the

grid type systems and he's out for today in Ireland in the welling middle of Wellington harbour called Notre Dame's Island and that's called solar panels and wind generator. And they generate a small battery, but most of them. It goes to hydrogen and it powers the island. But just that energy storage. Is a key component. That's lagging behind our energy capture at the moment. And if we're to really take advantage of rooftop solar or local generation, we've got to have better solutions for storage of that captured energy.

Marsh, Benjamin

Yeah, that seems to be another recurring theme in these issues, the issue of storing it and then. The byproduct being the insecurity in the Peaks and lows. I'm trying to think of EVs, so I know there's like a battery on Amy's and there's different models that have different batteries. Like storage and stuff like that. Like this is just like a side conversation I have with my dad about how I'm explaining what I'm doing. So, like my dad, the question was like most people ask what they're gonna do with the battery when they have to renew the new one. And I also wonder if New Zealand has any plans for. Do you know about it?

James Scott

No, I mean the batteries in modern EVs are generally warranted for 10 years. So that they don't run out quickly and what happens is they will deteriorate in efficiency. So in like the car I have at the moment got a 78 kWh battery and after 10 years that might have gone down to 58 kilowatt hours of storage. 58 kilowatt hours. Is still 4 four to five times the Tesla Three Power War. I've just put on the House. So I could take it out of the car, put it in the House and be good for another 20 years. Provided we were not damaged. So there's a great use for those old EV batteries as static storage. In fact, you'll probably find all around the States and hear that. The public EV charge points. Will increasingly be equipped with batteries so that if a car pulls up, they can charge a car at 120 or 150 Watt kilowatts without having to draw that much from the

grid because they might have a stack of old EV batteries. Buried under the Chargepoint that can just unload and then those batteries slowly charge back up again. Well, there's no vehicles at that point. And so there's a great use for them. And in general at the end of their life, the chemicals can be recovered.

Marsh, Benjamin

Like batteries and 'cause. I know one of the alternatives is gravity batteries, but I don't know if. New Zealand has any its infrastructure, no.

James Scott

Not really, because we don't have a lot of old minds and things where such things would be useful. I've seen plans for them in Australia where there was a greater mining activity. Most of our batteries here are water stored up high in lakes.

Marsh, Benjamin

Yeah, the hydropower, yeah, makes sense. That's very cool. All right, perfect. I think I'm trying to think we have anything else for you because you seem so informed. But I think that we've got, I mean even after I said this the first time he gave us a bunch more good quotes. So I'm nervous to say it again, but. I think we're. I think you've given us a lot of phenomenal information. Yep. And just to confirm, you said we're OK to use your name in the final paper.

James Scott

I haven't seen it, haven't said anything. I think it'll incriminate me too badly.

Marsh, Benjamin
No. And we'll of course not, no. And if there was anything like that, we would. No, there's nothing like that.

•••

Thank you.

James Scott

Good luck to all of you then.

Marsh, Benjamin

Have a good day.

James Scott

OK. Thanks. Bye, bye.

Marsh, Benjamin

We appreciate your time.

VI. Christian Judge Transcript

April 15, 2025, 16:15 - 17:03 PM

• • •

Marsh, Benjamin

We could have met in person! And how would you rate your expertise in electrification in New Zealand?

Christian Judge

High. I've been around. I've written a policy. I've worked for a Minister of Energy. I've worked at the IEA. I've worked at ECA. You know who the eker is in the IEA?

Marsh, Benjamin

I looked at your LinkedIn and a lot of the places you worked. We've cited papers from them in our. So definitely pretty stacked this LinkedIn. All right. Now that we have those questions out of the way, we can jump into some of the more. Some of the more interesting questions. So in your own words, how would you describe New Zealand's state of electrification adoption today?

Christian Judge

You have to give me a bit more. Context. So in, in what residential? Business which sectors?

Marsh, Benjamin

So we narrow in a bit more later, but just like generally how do you feel the country's doing?

Christian Judge

All right, I don't know. I suppose latent is the right word because it's sort of ready to go, but not doing much at the moment.

Marsh, Benjamin

It seems like that question maybe isn't the best, but it seems like people are giving a lot of similar answers to that like we could be doing better.

Christian Judge

Yeah. I think it's at the beginning of its journey. I put it like that.

Marsh, Benjamin

That's a good way to set. So I read your LinkedIn and it seemed like you had a lot of expertise, a lot of experience with. So when do you think New Zealand will reach net zero emissions?

Christian Judge

After 2050. As the Lord knows when after 2050. Not anytime soon.

Marsh, Benjamin

It's interesting. The different people we ask. The answer seems to be one of two. It seems to be after 2050 or we absolutely have to do it by 2050 or we're all doomed.

Christian Judge

We've got such major challenges in getting to net zero, particularly if we don't do a whole lot of offshore buying, which. The current government will not do that. I'm very confident

they will not do that. And then when we have a change of government. Then I think they'll have such a big job on their hands. To do that, and the cost of doing it by buying offshore units. I can't see it being politically viable to do that.

Marsh, Benjamin

When you say offshore units, do you mean like renewable energy generation or do you mean oil?

Christian Judge

No. They need to buy properly fungible emissions units that the international community will accept as meeting New Zealand's commitments, and that that market doesn't properly exist yet. I mean, they might be able to do something like buy. Eu ETS units? I mean, who knows? Or something like that. That's a high quality unit and I am able to submit those. But. We can't do that today, and Lord knows if they'll ever be able to do that. I've got an idea how you'd go about it, but you'd get that over the line. No. Nice. Anyway, yeah, I just. I can't see how they would readily do it.

Marsh, Benjamin

OK. So now that we've talked a little bit about your views on the state of electrification. What would you say the biggest? The biggest challenges to communicating or displaying the benefits of electrification in New Zealand households. What are the biggest challenges to communicating the benefits?

Christian Judge

Just from the residential side of things.

Marsh, Benjamin

Or even like the individual you know, it's not necessarily right.

Christian Judge

Or to the individual. Are we going to talk about it? Sorry, just before I answer this question I just got my filtering one of my own towards my answer. Are you going to ask more systemic questions about government action that might help later or?

Marsh, Benjamin

Well, so I'm looking at my questions and I'm realizing that I wish I'd had more because you are. What's the word educated about these things, about the government side of these things? So if you want to go and talk about these things.

Christian Judge

Yeah. OK. All right, so let me set some. The policy context I would like to see is that. There's a lot more done on standards around energy efficiency in the building code and in terms of products that are for sale. So in the building code you can't. They should do a lot more to do with the energy balance of the House of a home. So therefore, the demand for electricity, where energy of any type, but it should. So all homes should be electrified. So you shouldn't be allowed to put gas in them anymore, and all homes should be very energy efficient because of the building materials and the designs used, so therefore they should be built along passive standards. So therefore the energy demand just plummets anyway, and then you should look at the course that would be full of electrification, full use of heat pumps. Mechanical heat recovery systems and ventilation systems. For indoor air quality induction, cook tops. And you should have solar. And you should have batteries in there for load shifting, but it's more a case flexing. When flexing energy demand, rather than being a net producer. Because of the electrons the

demand for a proper house should be really low anyway. But it isn't. All our houses are rubbish. Even the brand new ones. And then on from getting back to your original question. What was it to do with it? Was it an information question or was it a communications question?

Marsh, Benjamin

So I well I was moving over to the communication question, the communicating to the public, but the background that you have on on the political situation, we would love to hear about that stuff because we've been interviewing people all day about their opinions on on their opinions on how to display this information and I'm sure we'll get there. But I think that you can give some great insight on the political side.

Christian Judge

Yeah. OK. The current government has no interest in decarbonising or electrifying. The strength of the neoliberal strain in New Zealand is very high. And when I was years or years ago. When I worked for a Minister of Energy, we tried to do things about energy efficiency in homes, about with compact. It was moving from incandescent to compact fluorescent lighting at that stage and having low flow shower heads and it just got used as a stick to beat that. Government with the opposition. Right. They made it an election issue.

•••

Marsh, Benjamin

It's probably the biggest challenge that we have to face is just getting over that curve of why do I care? You know, there's a like, I mean, you perfectly said people have lives to live. You know, they don't have time to invest 20 hours into researching the benefits of solar panels. And and and sometimes that's what it takes to convince a person you know.

Christian Judge

Well. So should I talk about what I'm doing with, you know, the Rewiring? Is like the mother ship that does all the policy work. Right. And then underneath that, there's all these electrified groups. So I'm sure you've taken a whole bunch of electrified people and I am one of them.

• • •

So the people, my thing with rewiring and this is based on my own experience. So I used to work in local government as well and I used to work with a guy called Richard who was an eco design advisor. He goes around to people's houses and he'd go around and he'd talk to them for a couple of hours and he'd give them his stuff to do in the houses. All great stuff. The household loved it. Fantastic. Nothing was ever done. It sent up the list. Nothing happened. OK, because there's so many barriers beyond information. To action to overcome. And we face that in the electrification world, in the residential electrification world. Some people just get on with it. My brother-in-law did. We did, but we're very well educated on this. We designed our own system and modeled it all sort of stuff and a few other people I know have just got to just press. They've had the confidence to press on with it. The people I see 'cause when I say if you've got, if you're thinking about getting solar or an eBay and heat pumps and stuff. I'll come and give you free advice and I'll help you. I'm not selling anything. It's just my hobby. Let me come and help. It's just, you know, let me help you help you.

• • •

Marsh, Benjamin

This absolutely goes back to what you were saying earlier about people living their own lives and having their own issues. I mean, when a person's thinking about how to help their house is probably a bunch of things you could fix much quicker and much easier. And you can see much more. I don't know about physical changes other than solar.

Christian Judge

Yeah, but most of the places I go to. The houses in reasonable shape and going head to head with solar is a good idea. Unless there's a mature tree right over the roof. What does she get? You know, they're not gonna cut the tree down. Can't say that. And it's like people with, you know, we have. Wood burners in houses in New Zealand. They should be banned but. They would be pitchforks in the streets if you said that. All right. So when I'm in a house and we've got a log burner, we haven't. We don't use it. We haven't taken it out in case we have a big earthquake and it wrecks the system. It just smashes the roof, right? We want the log burner or the chimney to be down as well but. You know, we've got a gas BBQ that we never use and that's our cooking in an emergency. We have earthquakes and some of them. Do you know you can help for the first week? You have a big one in Wellington where I live. We're on our own. We know that you know.

Marsh, Benjamin

But you're also in a much better spot than most people who are demanding energy from the grid because you have some level of energy independence with your solar. I mean, assuming your solar panels aren't destroyed.

Christian Judge

Yeah, yeah. And we also view our solar it's clean. It's grid side, but because we got batteries, it's got the anti island in protection so it still works. But we also view our solar as a Community resource. So if my neighbor has medicines, they need to keep in the fridge, our fridge will still be running. We've I've rewired the we've got a little community hub at the school that's got an office, and I've rewired the office so it's got a generator switch in it now so you can turn up and run it remotely so you can plug that office into a car. The Vehicle is loaded.

And that's got a local radio station in it as well. So we'd be able to keep broadcasting because. Because of the way the broadcasting equipment works, we'd be able to keep that going. On FM and we've got a star link and stuff like that. You know, I can run the star link off my car. Sort of thing so.

Marsh, Benjamin

So quickly jumping back to earlier, you talked about talking to people about their systems and advising them about solar panels. What kind of things do you tell them? I mean, the way you make it sound, I mean, you're trying to convince them, I assume, but not necessarily. But you're being honest, of course.

Christian Judge

Yeah, I'm not trying to convince them because. They've invited me around their house because they want it. I'm not trying to talk them out of it. Even if it's a, even if they end up doing the installation first, you know it's back to the server another day. You really must sort this out first. They had health issues in the House as well that were made a lot worse by not having proper insulation. And they didn't know. They just didn't. They never connected the two 'cause they didn't know two anyway. So what? I talked to them about it. I'll give them a ballpark idea of what these things should cost, so they're not surprised when they get the quotes. I'll tell them that. I will look at that. There are Tier 1 manufacturers of equipment. And I know who they are. When you get your quote and it says who's made them, I can check that. But it's not. I've never heard of it. Solar panels are limited. People don't know who makes solar panels. And it's like the Longy ones. Fantastic panels. No one's ever heard of Longie.

Marsh, Benjamin

I've never heard of Wongi.

Christian Judge

Yeah, with an L. Yeah, along it. So yeah. And the interoperability of different systems, etc. They're just sorry to interoperate. What I mean is that if you have a battery system you want that ideally to be remotely controllable so you can do something funky with a retailer they know nothing about that you know. Typically know who their electricity provider is. They may or they may not know what sort of tariff they're on, and it will be either. Flat Rate day night rate or I get so many hours free in a week at some time. But they won't not have a clue what their rates are. And they've got no idea how many units of electricity they use in a month, but they could tell you how many dollars a month is. And nobody knows how much electricity they use in a year. They just don't know. They can probably find out and stuff. By looking at their bills and adding it all up. But when you go in there and speak to them, they don't know this stuff. They don't know what sort of and so therefore they've got no concept of. How much solar they would need, they've got no concept of how much electricity. One panel can produce. They've got no concept about what an inverter is or how to size it. They don't properly understand. Why would you have a battery and what it could do for you other than oh, it will keep the lights on when the lights go out. So when the power's off in this. When the grid's down keeps my lights on, that's all. You know that. But they wouldn't necessarily have thought about arbitrage. Or load shifting and if you say arbitcharge and load shifting those are terms. They do not. They will be completely alien to them. And this is because. They just don't know. It's not because they're stupid. They just don't know. How would they know?

Marsh, Benjamin

And it's like you said, you can be informed about a million things. Why would it be surprising that they don't happen to be informed about this thing?

Christian Judge

That's right. I mean if I went into someone's house and they were, say, a public health professional. And I didn't know my vaccine schedule or my. Are about 1001 things that they would just take for granted everyday. I just don't know. I am up to date on my vaccines. But do you know, you know what I mean?

Marsh, Benjamin

Yeah, yeah. So let's say you were talking to someone who was maybe interested in the potential benefits but didn't understand them. If you were talking to someone like that and trying to, I mean, maybe not even try to convince them, but what information would you give them about the benefits of electrification and how would you communicate that to them?

Christian Judge

Because the motivations vary, some people, and it's usually a mix of things that starts with. It's the right thing to do. It's good for the planet. It's good for climate change. And then I might save some money. And the right thing to do could be any of those things. Yeah. And that's it. So I'll get an understanding from that because I went to see one lady and she uses so little power it actually made no sense for it to get solar because she just didn't use it. So she was using that 3000 kilowatts a year. So she lived on her own. Has a log burner for heating, nothing else. Must use very little hot water. It's just and she's got an induction cook, so. I Like it cold. It's just like you know. And no battery, no battery. Yeah. So you know, it's like, how do you? How do you make that pay for itself? How do you make that make sense? And then she ended up getting a little system because she wanted to do it. And we found one. And it was great because she just wanted it. She's like it's the right thing to do. Most of the people I speak to are older. They own their own sound, right? And they've got the money to pay for it. In one hit the slide I'll write the check done. No one has asked me about finance. No one I've not seen renters. They're all old,

older, well off people that can just pay cash. But their house? But every house you do is one that is in the housing stock. I think it's like if you end up with. There is an X percent of houses that represents a tipping point in a community where people become really interested in solar or EVs or whatever it is or someone says got it. My neighbors got it. They've got it. There's another one. What's going on? So, that's good. And a lot of the people I see are not going to be in those houses for very long because of their age. And when they move out and the next people move in, that's great. And the people that move in might never have had where they put solar in or put that induction in or the hot water heat pump. And then they've got it, whereas they would never have had it. So it's like I hate the term triple down because it's just a lie. When you give. Incentives and rebates on EVs to people that can afford to buy new cars. It is to prime the second hand market. For people that cannot buy new cars to get into an EV in a few years time. That is the benefit.

Marsh, Benjamin

'Cause that's one of my big questions to ask after you buy a new car, like the car that you have before, what are you gonna do with it? And like, it's interesting that you mentioned that if you buy AV now and if you get a new car in. The future someone else can get a chance to get a second hand EV.

Christian Judge

We've always people. I mean, I'm never gonna buy a new car. So in the lottery. But we've always bought second hand EVs, so. Well, sorry, but the last three cars we've bought had a plug and they've all been secondhand.

Marsh, Benjamin

So what? What originally motivated you to go down this path? To go down all the electrification, to be some to be so active in the community in these ways.

Christian Judge

Uh. I started working in the energy sector when I was at university. In the mid 90s. And found it. I found sector 1. I enjoyed working at that point. I was working at a nuclear power station. In the press office. And I found that. My undergraduate degree is in public relations. And I was never interested in fast moving consumer goods or anything like that. I was always interested in real things. So it was always drawn to energy and then. Much more interested in the policy side of things and the technical side. So now I'm doing a master's in renewable energy. So I hopefully will have to do communications again. And then a lot, you know, along the way I've done lots of things and I'm active in my community in a number of areas and. I want to make my interest into my hobby and do some good. That's it, really. You know, I'm a DJ on the radio station as well. I enjoy it. It's just, you know, everyone should be a DJ.

Marsh, Benjamin

So we hear a lot about wind and a lot about solar. But what about nuclear power? How's the state?

Christian Judge

Oh, it'll never happen here. It'll never happen here. You need. So just put, altaria is famously nuclear free. Alright, big political thing. No nukes, right?

Do all that. Completely on its own, alright. And imagine that you're completely independent and physically vastly distant from the rest of the United States. Never going to

happen. Can you afford the liability and? We are the second most hazardous country in terms of natural hazards on the planet after Bangladesh. Very earthquake prone. You gonna do that? Build nuclear power plants.

Marsh, Benjamin

So what is it? What do you see as the path forward?

Christian Judge

So 2 things should happen. We should rewrite our building code to make the building envelope vastly more energy efficient and cost efficient. That's number one. So we reduce demand in the household drastically before we even do before we even get to putting solar on it. So would you mandate an energy performance of a building? You would ban gas and you would put in standards. Meaning that at the moment heat pump hot water is the only qualifying technology. There might be other technologies that come in another day that meet that standard. That's fine, so I'm not. Heat pumps at the exclusion of everything else. Some of the technology can come along and do it. That's fine. So, so are standards in the building code. Standards. In the general market where people can buy replacement appliances, you could say, OK, well, you can only buy a hot water system that meets this energy performance standard. And that's only that. That's only heat pump hot water systems, so you can't replace your tank with just the normal resistant 3 kilowatt thing. You just can't. I would also mandate that every new building be over 30 square meters or something. How solar on it? Every new house has batteries in it. That you know you can sell that as a resilience thing as a load shifting thing? And then. You need to build. The capacity in this sector. Of importers getting on top of having high standards for the equipment. And training installers and engineers and people that know how to advise on this stuff as well. So you cannot do that overnight. You can't wave a wand and then start a massive build process. Program here 'cause. There's no one here to do it. This is the capacity of the

market. Is such that it meets the demand today. This sort of self-evident really. And I I think some companies could grow bigger if the demand went up. But other than that, they just sort of sit there really. We've had. One of the most well known brands in this field that had a subscription model. Solaro has just fallen over. You know about. So they were bought by BlackRock and their model was. Essentially, we will give you discounted electricity for renting your roof to put our equipment on. And you can. But you pay us a monthly fee. So the household app pays a monthly fee, which is outrageous, and then is able to buy discounted electricity. Through their retail partner. And then the company itself put the panels on your roof and a battery in your house. And they were just aggregating and arbitraging that and using it for demand management. And an aggregated base that was their business model. And they collapsed. So if you say we're going to build these nationwide things with solar, a lot of people will turn around and say what? We're gonna have another solar 0. No thanks. So. Like having a nationwide solar company has been tried and spectacularly, very publicly failed. So that's a perception problem there with wanting to do, getting the government to do something. Another issue we've got is Grid Electricity mixes already and it always has been highly renewable. By getting solar and I don't tell punters this. I don't tell people. Let us meet this. You're actually not saving much carbon by doing it, because our electricity is pretty carbon free as it is. It could always be better and it helps to go solar, but. We're not really burning less coal because people are putting Salar in it, just it's just not. That's not the that's not a problem that's being solved by residential solar. On a, on a day today basis, I'm sure that all of the electricity that I get off the grid is. 100% renewable. Just because of where I am in the country as well. So I used to work for transparency as well.

Marsh, Benjamin

We were talking. We were doing some research and we learned that 80% of New Zealand energy is like clean energy. So like what is 20% of it made from?

Christian Judge

Yeah. It's normal. There's dashboards on the web on the Internet you can see in real time what the last 52 weeks are and stuff like that. But it's usually about 80 percent over a given 12 months. It does vary a bit. Not on a day-to-day basis. It could be as low as 80 and as high as about 9798. It is low and it's windy. That's great. Yeah. And we say sort of renewable sources because we can geothermalize that. We've got a lot of geothermal here. But you know, geothermal is not emissions free. So there are.

•••

And there's different types of geothermal and it. Double the confused thing. So the people I talk to never get near renters. Money isn't an issue. Having a fancy tariff structure. It's not gonna persuade anyone because no one ever looks at tar structures and they don't understand them. Changing. That I'm keen on. Enabling changes to regulation to let things happen. But because you do that, it doesn't mean it's going to happen. And if you really want something to happen, you, you, you make it compulsory. People don't spontaneously just want to do this stuff.

...

Is there anything else you wanted to ask?

Marsh, Benjamin

...

I was going to say I think we're running a little long. So I think that you would be open if we had any more policy questions to speak with us again. All right, well.

OK. Thank you so much for your time.

Christian

All right, go well with it all, enjoy ...

VII. Mark Unwin Transcript

April 16, 2025, 10:02 - 10:49 AM

• • •

Marsh, Benjamin

Beautiful. Thank you. All right. So I did a little digging on you to make sure I was prepared for this interview. So I just want to confirm some things. You have two drop titles as director of. Sorry, director at Cordal. And the solar guy at Marlboro alliance.

Mark Unwin

Yes. So the official title is business development manager at mobile lines. So if you wanted to be that's that. My official job development manager.

Marsh, Benjamin

Business development. I like solar guys more. Awesome. And then how would you rate your expertise in electrification in New Zealand?

Mark Unwin

OK. Well, I'll give you context. And you can tell me what the rating scale is. I used to have a solar business. So a company called I generate which I sold to light force seven years ago. That was my experience in the. Electrification or electricity market in New Zealand? Through that, I was a supplier too. That market, I've been at mobile alliance for five weeks. And so I'm new to the regulated EDB space or the distribution network business. So I would rate it whatever the scale is probably on the lower end of the scale. Piece. But I yeah, I know enough to be dangerous. I'd have to give you an example of it. When I started at marble lions, someone sent me some oven mitts and I think that was to stop me from electrifying myself by touching too many circuits.

Marsh, Benjamin

So very electrified. I'll give you a 10. Just making it doesn't really matter. I mean this is perfect.

Mark Unwin

Seven.

Marsh, Benjamin

Seven is very respectable.

Mark Unwin

You can tell me at the end if you think that matches up. Depends on how we go.

Marsh, Benjamin

Sure, the way people rate themselves, I don't know. I've had people rate themselves a 10 and then give me interviews that seemed like they had no idea what they were talking about, and I've had people give me a one and then have some of the most enlightening interviews of my life.

Mark Unwin

There you go. It'll be the full range. Let's see how we go.

Marsh, Benjamin

All right. So in your own words, how would you describe New Zealand's state of electrification adoption today?

Mark Unwin

Well, I think we are in a fortunate position in New Zealand, right we've got. Quite an established renewable energy. Sector. So we're lucky to have our generation based on hydro. There has been a lack of any major generational plants invested in in the last 10 years. That's been changing recently with the installation of larger solar farms. And wind farms New Zealand's always had a history of not subsidizing too much and around. Solar or these types of generation or distributed generation assets? So I think we have just rested on the laws of our hydro schemes to go along with that and then it's only been recently that we've had. A subsidy for EV. Cars, which is I guess. Started to accelerate the electrification journey. For our fleet. New Zealand has got the tyranny of distance. Where I am essentially the large landmass that's empty. We've got major populations and four centres that are joined by roads and so we still rely quite heavily on combustion engines, for instance, the area where we're in Marlborough has the highest diesel use per capita because we're primary industry and we still have a large amount of tract. That goes up and down. The vinevards that you can see behind me in my picture on a regular basis. So I think you know and again if you look at us on a macro level, we're our primary industry and we do a lot of exporting to the world. And part of now market access requires a big amount of decarbonization, and that decarbonization to give U.S. market access is starting to open the doors to electrification. So as people look to decarbonise to get themselves market access for their products, then I see we're starting on electrification. Journey. So does that answer that question? So I think we're early days.

Marsh, Benjamin

Yes. So you mentioned three things. I don't know, maybe we'll jump back to a couple of the other ones. This is a quick thing you mentioned EV subsidies. My understanding is that those have now gone away.

Mark Unwin

Correct. And then you could see that the drop if you looked at the car registration stats they dropped off a Cliff, right? 90% reduction in EVs purchased immediately, those subsidies stopped. Or the road use of tariffs came in.

Marsh, Benjamin

The road use of tariffs.

Mark Unwin

The road user tariffs. So now if you're an EV owner, you have to. If you have to buy Rd. user charge, they're called Ruc's Road. Ru C's Road user charges, and you buy those from NZTA.

And you, you have to purchase how many per kilometer you've you drive.

Marsh, Benjamin

That's right. That's the. Isn't that true? Because normally they tax the roads via the gas pump and so they don't. Yeah. So they don't have access to that.

Mark Unwin

Yep. And so for 10 years prior, you could have an EV. And you weren't paying for the use of the roads. So it's a big subsidy for those that owned it.

Marsh, Benjamin

Yeah, it's rough now.

Mark Unwin

Non sustainable.

Marsh, Benjamin

Yeah, but it's frustrating to see all the Subs that just go away. I mean, maybe it is what it is.

Mark Unwin

Everyone has to contribute to infrastructure here in New Zealand, right? You have to do it. We don't have a large enough tax base to properly do infrastructure.

Marsh, Benjamin

Yeah, it's a very fairpoint and it's, you know, realistic. So you also mentioned market access, so you said decarbonization is kind of the path to greater market access. So can you speak on that a bit? Are those certifications? Is that?

Mark Unwin

Yeah. So if you look at potentially what's happening with carbon tax coming into Europe. So depending on the carbon required to make your product, you could face taxes. And which makes. Your product pricing is too high, so you know you can't. You can't compete globally with that, but probably if you took it to the consumer, the consumer is starting to look at what is the carbon footprint of the products on purchasing. And so in order for us at the bottom end of the world to be able to compete with that and to make sure customers are happy buying our product, we need to decarbonise both the product, the supply chain and the product to go with it, right we can. Get away with shipping. So we've got to ship from New Zealand to wherever that market is. So that is a cost. So anything we can do prior to that to decarbonise is going to be useful for our product. For instance, if you want to get B Corp certification. To help with your

market access so that your product looks OK on the shelves so as more consumers become conscious. And their purchasing habits. Then you've got this issue of market access. So they're both from a consumer perspective. And then if people follow the EU and go there is going to be a text. If your carbon cost is too high, getting your product to the shelves, then that's going to mean like for instance the likes. Sainsbury's over in the UK might say right? Is she your product's gonna meet this carbon based or you can't be on our shelves. And so that is what I talk about in market access and it's really important for New Zealand, more important for the regions. I guess you know I'm from Marlborough and we're 80% of wine exports and 65% of muscle exports, so aquaculture. And all of that is exported. And anywhere you've got Fonterra or dairy, same kind of thing you need to be able to decarbonise the supply chain to make that work. And decarbonisation. The easiest way to decarbonise at the moment is a nitrification, right? Because as soon as things you can and can't do, electrification really helps with that.

Marsh, Benjamin

So you mentioned this carbon tax now in my mind. I'm wondering, does this disproportionately affect New Zealand because of the inherent shipping costs? Offsets or the inherent shipping?

Mark Unwin

Costs associated with shipping. Yeah, the distance, the further you travel on a, even if it's, you know, I mean aircraft are one thing, but it mainly it's you're going on a boat and which is pretty carbon efficient but it's still a long way to ship stuff. So the further you ship at the, the higher the cost associated with it until they move to hydrogen or? Sale or whatever they're going to do. Yeah. So we have to. So if you look at it from a wine industry perspective, currently we've got a couple of issues. We bring empty bottles from China here to New Zealand. Where you get into makes it elsewhere. You're shipping here and then you fill them up and then you ship them

to those markets. So things like in market bottling, we start to look at different ways of packaging. We start to look at it. But also then the supply chain and the decarbonisation of that is important. So it attracts hydrogen rather than diesel. Can you track? Can you? Can you use rail? Which again is a major port that we go out of. And again I don't want to localize it too much, but W we tend to ship a lot of our stuff from Nelson, which means trucks have to take it from here to Nelson. So if that was hydrogen rather than diesel every day. Started to remove some of our cub the decarbonisation piece which, you know, hydrogen is electrification. In my mind, I don't know how you consider it, but that's how I see it.

Marsh, Benjamin

I would say it's more decarbonization than electrification. But you know the same goal, the same spirit, you know.

Mark Unwin

You need to use a lot of energy to create hydrogen, right? And so I'm assuming that you know that's a big electric kind of stuff that goes on.

Marsh, Benjamin

OK. And for the record, you mentioned you don't wanna localize it too much? Our project is very specifically about New Zealand. This is what we care about, so feel.

Mark Unwin

Oh, I'm in Marlborough. I guess I don't want to be too Marlboro centric rather than for you.

...

Yeah, if you want to come and see a solar farm or you know.

Marsh, Benjamin

It's like all the experts are always giving us these great opportunities. It's just that it's hard to take advantage of them all.

Mark Unwin

Well, look, we'll we'll be well, I will definitely be here. Is that a Friday or Monday? I don't know. Whatever let's you can.

Marsh, Benjamin

Well, it'll be. We'll be there the whole weekend. We'll be there. Anzac is Friday and then Saturday Sunday. So I don't know if you're working on it. I'm sure you aren't.

Mark Unwin

No, but if I'm around, well, let's see. Well, I'll have a look after this and we can see what we can make work, right.

Marsh, Benjamin

OK, that would be awesome. Let me move on to my next question. How would you describe the importance of electrification in New Zealand?

Mark Unwin

Super important again, I think we've talked about the reasons why I think it's important. There's a resilience piece to this, but I think. For again, if you look at our exports or our GDP, it's governed a lot by trade. And I think that for market access and as I've talked about before, I think that's really important. And then I think if we look at it, there is an energy equity plan. A year and I think the gap opening up in any society is bad in terms of a poverty gap and we don't want that to be implemented from an energy perspective, I still think. Electrification helps lower people's operating costs. And have good renewable power. So I think those things really help. Warm, dry homes. Keep people healthy, good for society. How would you song ongoing costs with that? So I think it is a real upside and electrification movement.

Marsh, Benjamin

Yeah, I mean, I obviously agree.

Mark Unwin

Well, good, Dean. We're on the same page.

Marsh, Benjamin

Absolutely. This one might be a little bit out of your scope, but when do you think New Zealand will reach net zero emissions?

Mark Unwin

Yeah, out of my scope. For, I mean, we could if we really pushed. I still think 2050 will be. That would be my pick on it.

Marsh, Benjamin

OK. All right. I was wondering. So you talk about distributing your job, aren't you used to be a producer and now you are a distributor for solar, is that correct?

Mark Unwin

Well, I used to be a residential installer and commercial installer of solar. So we used to sell solar and now I work for a distribution lines company. So and then as you'll be aware, in the New Zealand market, they have split the generators, the lines network, the centralized trans power, centralized network and then the retailers. And so I work for a distribution network that's owned by the community. So there's 27 edbs. In New Zealand, 20 of them are owned by the community. 17 and 20. Yeah, electrical distribution business. And 20 of them are owned by the community.

Marsh, Benjamin

We don't really understand them.

Mark Unwin

Yeah, sure. So I'll speak specifically to Margaret and then we can talk in New Zealand. So when the lines when the networks were split up, the beneficial owners, the owners of this business, are the 27th, there's 27 ICPS. You're aware of ICPS, so the connection points. So we're either the electricity goes into a consumer or business. Nurses in ICP. And so we own that business or home is one of the owners of the trust the owner shares in this business. Does it make sense? So this is owned by. This business is owned by the community, and the profits of this business get returned to those owners in a dividend on an annual basis that gets applied to their power bill. Community pays a power bill to the retailer. We charge the retailer for all the power that goes to those homes and we maintain the poles and wires and in the network and we charge people for the use of that. And then if we make money, that's returned back. To the owners, which is the community, when I say so, I say the community. It's those people that have an ICP.

Marsh, Benjamin

OK. A little dance, a little complicated, but I think we. Understand the basics. I think we understand enough.

Mark Unwin

Yes, the ICP is an independent connection. And it's got a unique identifier and so that you can manage the flow of electricity in the billing etc.

Marsh, Benjamin

So the ICP is like the government maintaining the roads and the individual electricity producers are like the gas companies. Is that a?

Mark Unwin

Yeah. No. What would be a good comparison with it? So I guess you've spoken with someone at Transpower.

Marsh, Benjamin

Someone at trans power.

Mark Unwin

Transpower, which is the National Grid. So that's the people that maintain the big high voltage network across the length of New Zealand. That's trans power, right? So there's generators that feed into the National Grid Transpower when it comes into the region. We maintain, so there's a net grid accept point that comes in and we maintain the cabling that goes around Marlborough. Er, so that's an EDB. And so that's what we are. And then that goes. That power goes from the high voltage down to lower voltage, 220 volts to go into the homes and each one of those. And at each point where it goes from our network into the home wiring.

That's an ICP to the Independent Connect. So right there. And then that holds the meter. Essentially, so in terms of doing the billing and so we're responsible for getting power from the grid to all the homes and then we look at what the and what the usage is and charge them for that and regulate the Transformers, etc. For that and charge charge, the retailers who charge the customers for that and that money comes back and then. Depending on how profitable or not we are, that money then returns back. Those owners in the form of a dividend.

Marsh, Benjamin

So let me spin it back. What if? If, because we've talked to a lot of people that have this story, specifically if a person is producing energy and making money off, that is that is that you guys.

Mark Unwin

Yep. So that feed goes through our network back into the grid. And so we don't make money off it? I guess you know we're, we'll charge people for carrying that electricity into our network. And so part of whatever they get for exporting will cover some of our cost and the retailers paying the retailer pays them for that. And then the retailer pays us for carrying that. If that makes sense.

Marsh, Benjamin

That does make sense, OK. So you wouldn't. You would never work with the consumer, the individual.

Mark Unwin

Currently our customers are the retailers.

Marsh, Benjamin

Yeah, I. Business to business more than business to consumer.

Mark Unwin

Correct, there's exceptions to that because the customers will ask us to do electrical work, right, upgrade their Transformers. And so we do end up billing customers for that work. But that's kind of. On an ad hoc basis, not on a regular basis.

Marsh, Benjamin

Consumers came to you or a person looking for consultation advice. Would you advise them to electrify their own household or business or farm? You.

Mark Unwin

Yeah. So we have. We are starting to do more work in the Community on the benefits of electrification and particularly again for Marlborough. There's the ability to exchange. Your fireplace to heat pumps, which helps clean air and approves efficiency. We'll talk about moving gas, hot water to electrification. Ation. And then solar and EVs is our main area of that electrification piece. And so we will. We will provide those tips and conversations you know on our website and our conversations with people.

Marsh, Benjamin

OK. So when you're having those conversations, what do you see as the biggest challenge in communicating the progress or the sorry, the benefits?

Mark Unwin

I think there's still at this point there's a big educational piece component to that. So the challenges. And not to its ignorance of what the solutions are. And I don't mean that they should understand it by way of just everyone's used to the status quo and have a perception regarding solar or perception regarding EVs or perception around that. So you're dealing with apathy. And I think that's the big part of this is there isn't a lot of knowledge on it or there is just some preconceived ideas. And around those products, for instance, solar would be like, ah, you can't get a payback. It takes 15 years. It only works if you're at home, that type. Those exams, so I'd give all that.

Marsh, Benjamin

Absolutely, we've absolutely found it. Most people agree that the biggest challenge is people are living their lives. They're doing it. You know what they need to do. And this is just kind of something else they would have to worry about. And people just tend to not worry about it. I think apathy was the word you used, and I think that's, I think that's very apartment. It's very descriptive of the situation.

Mark Unwin

Yep. Yeah, if you looked at the electrical bill used to be the fifth most interesting bill that they get, right. So it was down the list of prominence, and therefore. I and it and it's shown by the fact I think in New Zealand we have a power switch where you can go and put in your electrical bill and it will tell you who's the cheapest electricity provider. Yep. And if all New Zealanders did that, they would save \$440 million per year.

Marsh, Benjamin

Wow, that's great info.

Mark Unwin

But they don't do it right. So people don't switch because they have a law to their existing provider, but mainly they just don't want to change. They can't be asked to do it. The apathy piece for it. But there's \$440 million that is left on the table just by switching which. Is free to do. And you know, there's interoperability and all that kind of stuff, but people don't do that. They'll do it. Maybe they'll do it every three years. Don't do it enough on a regular basis. So that to me shows the interest.

Marsh, Benjamin

I think that is an excellent point to highlight the apathy because you said they don't switch because they have loyalty. I don't think anybody has loyalty to their energy provider. I think it's like you said, I think it's 99% apathy and it's just like that. That's beautiful. I mean, it's a beautiful example of. Apathy.

Mark Unwin

Yeah. Hey, I'm just gonna. Sorry I can't multitask this. I'm focused. Here we go. Just in the chat, there's.

Marsh, Benjamin

OK. We will look at that after this, but let's jump into my next question. So we talk about or we just talk about the challenges to communicating the benefits. In what ways would you go about? Explaining the benefits, how would you communicate? The benefits of electrification. What would you say to someone who is interested but needs convincing?

Mark Unwin

It's a great question because it is one we are grappling with all the time. At the moment I think in order for this to work. And for people to be interested in the climate change chess piece, it starts with financial. So the thing for me to educate people is to say this is what it's costing you. This is what it could cost you. That's it. That's how I believe people are going to be interested in this is to say, what difference will it make in my pocket? And it's great that we've got sustainable funding. Now we can get 1% loans and that type of stuff. But the key thing for me is this is the financial benefit that you get from shifting and then there are these other benefits that come along with that. So we have cleaner air. If we move heat pumps, you'll have a better driving experience. If you drive an EV and you have this cool, cool thing while it used to be cool, now it's funnier. You start off being. Driving a tesla being an eco warrior and now you're a right wing fascist. So it's an interesting thing that goes on in this thing. But yeah, generally I think it has to be economic.

Marsh, Benjamin

Yeah, I mean, I'll tell you that's what we keep hearing. It's definitely what people care about. Since you said you have a solid business in solid. Panel before was like the question when customers come and ask you about solar panels.

Mark Unwin

Yes. How's the pay? When is the payback? The question is when am I and people looked at it in various different ways because I, you know that whole thing was to go well. You never got a payback for your fridge, but you purchased it. It's another channel for your business. It's the only one, and it's the only channel in your asset in your home that returns you money. Everything else costs you money, but the number one question is, what's the payback? The next. Now the questions that follow on from that was how do, how does it work, how to utilize it? Those kinds of questions. But that first thing is. And then you get down to aesthetics. Where you put them. How do they look?

Marsh, Benjamin

So if someone never had solar panels on their roof before and then just added it on top, do they have to redo the wiring or like adding wire to something they already like? I don't know how to explain my thoughts. It was like connecting to their house.Like how? How do they have to pay an extra wire fee to like? How complicated is that? Yeah, how? How much of the process is connecting up the solar panels? I don't know if that's right.

Mark Unwin

Yeah. OK. There's two things with that, Ron. One is actually, you know, there's standards. Now you run wires down and you've got to have space in your switchboard and and. But the electrician does that, and they're generally quoted and they normally fix quotes. So I think that bit of the business is pretty standard now in terms of you paying 10 1/2 grand for some solar panels and they're installed all the way through. There is a part that goes on. Now you have to apply. To the EDB to to get solar on and then and then. That allows the network to know OK that ICP could be exporting and so that potentially means an upgrade in the meter. And there's a cost associated with that and then you need to let the retailer know so that they can start giving you a credit for any, any power that you export if you do export with that. So, but generally your solar provider. Whoever that is, will take care of all that peace. And so those steps that because it needs to, the system needs to be inspected before it can be turned on, and you need confirmation across all that. And in terms of where that sits. Yeah. It's a little complicated, but the solar provider would generally take care of all that and. Every home part of the issue for the cost of solar is that, as you'd see in New Zealand, we don't. Every home is bespoke. We don't have the houses that are all the same, and so every house that you go into will be wired slightly differently and they'll have different space in the and the roofs are slightly different. So you have to quote for each home and that slows down the process of installation because of the different roofs. There's not many dwellings in the same format as you'd find in the states, and that's why the cost of housing is more. And. Yeah, it just makes it more complicated in terms of solar installs.

Marsh, Benjamin

I see. Interesting. OK. So you also, I'm sorry, what were you saying?

Mark Unwin

I was just going to talk about them. Solar people are unsure of the upfront costs and then they're unsure of what size system they should get. So there are some people that are selling A5 kilowatt systems or A10 kilowatt systems and then some people are doing, hey, this is what system you need for your home and your particular usage. And so there's a lot of information that people have. Together for it and you have to get three or four quotes, and that's a lot of time and effort putting it together. So there's a lot of investigative stuff that you need to learn about for that. And like anything you know. We used to be about scarcity, and now we're about abundance. So too many choices make it difficult. People don't really want a lot of choices. They want to be told what's the right choice, but who do you believe to tell you who made the right choices or who is that expert in the market that you can rely on to say I know what I'm getting is the right thing for me and at the. Moment. We don't have that. So you've got to make your own individual assessment on that. And that is a barrier because there's a lot of work associated with that. So you find like anything, you tend to go on your recommendation of whoever's done it. And that's the neighbor. That's you, whoever it was, your friend or family said I did this. And so therefore that's the right thing to do. And so people will follow that approach.

Marsh, Benjamin

That is, that is absolutely something we found too. One of the best. Motivators are when your neighbor gets it. When your neighbor gets it and and the and the person that you trust most to advise you on what to get is your neighbor.

Mark Unwin

Yeah.So you've got to convince someone on the street 1st and then you can get the rest of the street. So once you, once you see it, you believe that, right? And at that whole thing, you know, you can't be what you can't see. So if you don't see any solar panels, you don't believe they work and then you start seeing solar panels and then you believe they work.

Marsh, Benjamin

Have you ever worked with a construction company to put solar panels on top of apartments or business companies or something?

Mark Unwin

In terms of multi level apartments, we've done some small business stuff before. Yes, we've done those kinds of panels, but we haven't done any community one where you put solar panels in one place and it benefits all the apartments or the people in that one block. We haven't done that yet. Work in progress.

Marsh, Benjamin

So you mentioned earlier that you were beginning to do some community outreach. So tell me about that. Tell me about your process there. Tell me about what led you to that and tell me about what you guys are doing to do that.

Mark Unwin

OK. There's a couple of things with that. One is we are a community owned asset and 1% of our money goes back to sponsoring a lot of community groups. So we want to go out to the community and say, hey, actually, the more you electrify, the more it returns money to both you as a dividend and also these community groups supporting locals. So that's a key part of our messaging. We're investing in the future, so we're building 3 solar farms at the moment with a consent in for a four. And we'd like to tell the community more about that and the fact that there is. I think if we can up, you know, while we're at 80% renewable energy for New Zealand, if we can have more renewable energy here in Marlborough where the sun. Capital of New Zealand. Then there's benefits for us and for any businesses that want to open up here. So it's part of an attraction campaign to the region. And I think there is a part that we can play in that electrification piece. So we are going out to home and garden shows or wherever we have those events that we've sponsored and actually go here are three messages that we want you to take away. One is the safety aspect, so being careful around lines and the work that goes on the benefits of electrification both for you and then for our community. And then how reliable and what we're doing to build resilience. And that in those communities are the three things that we're looking to do. And this is just a new thing in terms of saving. OK, we've got some experts here that are impartial. We'll provide and I'd say impartial and inverted comments because obviously we've got a vested interest in electrification because we can get to carry more electrons, which ultimately just helps with what we're doing.

Marsh, Benjamin

So when you talk about that outreach, we talk about those specifically you're talking about. You just said that you have experts go and you just have them talk to the people.

Mark Unwin
Correct. Yep. So we'll have a couple of things to do. One is there's an update on our website, but the key thing for us is starting to have one-on-one conversations with people so that we can get feedback as to why people are and aren't looking at electrification and then that can help guide our messaging and we because. We are customers generally being the retailers that retail electricity. We don't have enough of those conversations to understand where people are in their electrification journey. And so we want to get that direct feedback. So then that can help guide. And our messaging.

Marsh, Benjamin

And that direct feedback you've gotten, that's what we talked about earlier with most people caring about cost that that seems to be, that seems to be the primary driver. That makes perfect sense. So now we're gonna move even further out of, like, the furthest we've gotten out of your scope. And we're gonna ask about it. Motivation and motivating people. So do you have any? Visual solutions? Or are there any specific methods that you found effective for communicating the benefits of electrification in a motivational way? Can you think of some time that you felt particularly motivated or you felt that you were able to particularly motivate someone?

Mark Unwin

I can talk about that from a personal perspective because I was, you know, we were selling solar solutions, right? So I can understand motivational pieces, I would say from an Ed perspective, where too early in that journey to understand what visual clues that will get if we provided that information. Did they go out the following week and buy something or the following month or the following six months and make those changes? We don't know exactly what seeded that. Piece and then tip them over the edge of actually going OK. This is the week that I'm going to do something. I would suggest to you and we've spoken about it a couple of

times from a solar perspective. It's easy as soon as they see their neighbor have or their friend have got solar that allows them to then go oh, it's OK for me to do because we have. Really, if they've done it, I can do it. Kind of scenario that's going on. So I think the motivational point is I can see. I've seen someone that I trust do it. Then I can do it. I think when we were selling solo records, this was a few years ago, we were looking for the innovators or those people that are in that saying, hey, I want to be a leader here. And I want to be. I want to show off my green chops and I'm happy to be first for that and take risks so they were more. I guess entrepreneurial. Their approach from that, but visually so that part of our sales packs were always like, OK, we have to have pictures of locals. Installations of local things that are happening so that people could get comfort and clarity on that piece.

Marsh, Benjamin

That is very interesting. Out of pure curiosity. What is the number of or what is the percentage of households that have solar installed?

Mark Unwin

In Marlboro or New Zealand?

Marsh, Benjamin

New Zealand, I mean this is a number we can look up, but I'd like to.

Mark Unwin

I think it's 4%.

Marsh, Benjamin

Is there? Like when you come to a house and you inspect it, inspect it like to put a solar panel on the roof. Like is there any? How do you have to tell them? Like no, we cannot put solar panels on your roof or anything.

Mark Unwin

They've got decor, mastic tiles or soft tiles or that kind of stuff then. You have to say no of that. I'm just trying to get you the there's a calculator that shows you how many installs there are on a monthly basis around New Zealand.

Marsh, Benjamin

It's nice when an expert says it to us because then we can just say, oh, this is the fact because the expert told it to us and then we don't have to because, you know, you can't just Google something and be like, ah, Google told me you have. To find some scholarly article, and we're speaking to a scholar. So why not?

Mark Unwin

Ah, there you go. You say all the right things. No, that you can actually get the stats in the network here, because the Ed B's register or the solar installs. And I just need to get you the link. For it, here we go. That will give you access to. The screen. So that's how many Icps with solar in New Zealand. And you can then play with it as you like. Yep, the various different regions. So if we go back, let's deselect. That and justice bring Through all the different networks in New Zealand. So you can see it's a pretty straight line in terms of it. We are now at 1067. Sorry, what is that 24 a month? Only four that month. 30 that month. Yeah, you can see the growth in solar. Can you see that growth? You can see that, right? Yeah. That'll give you your switching trends, retail all that stuff.

Marsh, Benjamin

OK, that is. Very effective, that seems very useful.

Mark Unwin

All right, hang on. What am I doing? Let's not get down a rabbit hole. Lose focus.

Marsh, Benjamin

No, that's very much on topic. I mean this is what we're doing. We're doing a dashboard to try and inform people so that the dashboard that informs people is very. Very useful.

Mark Unwin

Yeah, yeah. If you can show people that other people are doing it right, that's gonna. That is also part of their whole thing to say. If there's just a count of how many installs people know, they're part of a trend, then that's a good thing.

Marsh, Benjamin

Yeah, that's a good point too. People think they're and hopefully that graph is the start of a nice aggressive exponential graph. So.

Mark Unwin

I was in our PowerPoint presentation. Maybe not in real life, but that's, you know, that's what every business says. Hockey stick.

Marsh, Benjamin

Yeah. Awesome. Do you have any other advice or information that you think would be useful for our project?

Mark Unwin

Have you had a look at what Kogo is doing?

Marsh, Benjamin

Cogo tells us about that a little bit.

Mark Unwin

Kogo is doing a dashboard about electrification. They have been speaking with regional councils, so they're a start up in New Zealand that have taken their dashboard work over to Australia. But about to release in New Zealand. In three months. So if you have a look at examples of their dashboard, I think you could have a look at them. And then you would have had a look at ecare and what they've done with their calculator, right?

Aika warmer Kiwi homes. Their energy efficiency and conservation. Oh, hang on, what have I done here?

Marsh, Benjamin

. . .

We might have to reach out to these guys for an interview. This seems very relevant.

Mark Unwin

Yeah. So I have got a lot of cool people there. If you need an intro.

Marsh, Benjamin

We've interviewed some icape people. But I don't think we've interviewed anybody from

Cogo.

Mark Unwin

...

Cool. Yeah. Well, yeah, I'll have a look at my timing. And if I'm in town, I may be up in town. Let's just have mobile numbers and you'd be on WhatsApp or whatever messaging you've got. Have you got New Zealand Sims or are you? Yeah, just flick. We'll have your details and we'll see if we can make that work, yeah.

Marsh, Benjamin

OK. That's wonderful. Yeah, I yeah, awesome. Well, I will. We'll figure it out in the coming weeks. We got there a couple weeks before we went. So I'll probably email you my information if we find that we have time. And honestly, I think we'll probably make time, yeah.

•••

Yeah. Thank you so much. You've been a huge help.

Mark Unwin

Yeah, no problems at all. I can give myself an 8 next time then.

Marsh, Benjamin

Yeah, maybe even a nine.

Mark Unwin

Let's not get too ahead of ourselves. We're in New Zealand after all. OK. Cheers guys.

Marsh, Benjamin

Have a good one. Bye.

VIII. Karen Berger Transcript

April 16, 2025, 11:03 - 11:52 AM

• • •

Marsh, Benjamin

Awesome. So I did some research on you. To prepare for this. So I just wanted to confirm a couple details. Your highest level of education is a pH. D in civil and environmental engineering at MIT.

Berger, Karen

That's correct.

Marsh, Benjamin

Quite the title. And your current job title is associate professor.

•••

And you work at the roster. Sorry, Rochester university.

Berger, Karen

Yeah, it goes by University of Rochester, but yes.

Marsh, Benjamin

I will correct that. And. Now, what would you rate your or how would you rate your expertise in electrification in New Zealand out of, sorry, just in general out of town?

Berger, Karen

So not specifically to New Zealand.

Marsh, Benjamin

Now we're going to try and so a lot of the people we've been interviewing have been people who live in New Zealand. But because you're international and you have. Some serious credentials and some serious information. We'll make it more general because I'm sure you're going to be able to give a lot of great general information.

Berger, Karen

OK. I would like you to sit out on a scale of one to 10.

Marsh, Benjamin

Yeah, I think that's easiest.

Berger, Karen

I will say 8.

Marsh, Benjamin

Beautiful. And this doesn't have to be out of 10. This can just be however you see it, but how do you describe the importance of electrification?

Berger, Karen

I would say 10 out of 10.

Marsh, Benjamin

OK. You wanna expand that a little bit?

Berger, Karen

Yeah. I mean, I think the only way that we're gonna make meaningful change against climate change is by electrifying as many things as possible, given that we're able to decarbonize electricity sources much more easily than we can other other energy sources.

Marsh, Benjamin

Absolutely. I don't know if you're too familiar with it, but New Zealand is already 80% of their electricity generation or 85% is renewable. So that's why we're doing this.

Berger, Karen

Yeah, it's wonderful.

Marsh, Benjamin

Because we think you know electrification is somewhat meaningless if you're just burning fossil fuels to create electricity. But in a country like this?

Berger, Karen

Yep, and I'm in upstate New York. We actually have the lowest carbon electricity of anywhere in the country, so there's a lot of motivation here as well because we have a lot of hydropower and nuclear power. So we're upstate. New York is the cleanest grid, according to the EPA.

Marsh, Benjamin

Really. That I didn't know that.

Berger, Karen

I didn't either until I moved here.

Marsh, Benjamin

Have you electrified any of your own devices?

Berger, Karen

We have a plug in hybrid. We already had an electric stove and electric dryer. I got a new furnace and a new water heater. Sort of maybe within five years before I realized how important electrification was. And so I'm choosing to let them live out their life before I replace them.

Marsh, Benjamin

It's another important part of. Probably it's an important part of decarbonization. Maybe like the production of these. Elements are also a very taxing thing. It's like when they talk about it's worth buying a new electric car, but it's not worth throwing away a perfectly good one just to replace it, you know, 'cause.

Berger, Karen

Yeah, absolutely.

Marsh, Benjamin

OK. In your own words, how would you describe the state of electrification adoption today?

Berger, Karen

I think it is slow. It varies a lot from place to place, but I think that many people like the devices that they're used to using. You know, I'll give the example of a cook stove. You know, I talked to a lot of people who say, but I love my natural gas and I can't possibly give it up. And I

have an induction stove. So I talk about how there are technologies that people didn't necessarily know about 10 years ago. That are cost competitive and allow electrification, but I think we have a lot of work to do of letting people understand the switches that can be made without sacrificing quality and then also understanding the motivation to make some of the switches that. Might involve a change in quality or a change in habit from what people are used to.

Marsh, Benjamin

Yeah, it's us. We just talked about this. Well, let me keep going with these questions because we'll get there. So this next question was really built for New Zealanders, but I'd like to hear your input. So I'm just gonna ask it straight up how we would ask a regular person and I want you to speak about it in whatever way you think you are most informed in whatever way you would like to. So yeah, so I can ask. I can be more specific if you want, but let me just rip it. When do you think New Zealand will reach net zero emissions? Now I want it super quick just to say you can speak on what you think about reaching net zero emissions. You can think of speaking about when you think even upstate New York will reach this goal. If you think they will reach this goal. If you think it will become extinct as a species, first you know.

Berger, Karen

Yeah. Well, if I would say if New Zealand is already at 85% renewable. Then it would seem like in the space of a couple of decades it might be possible to really get there. I don't know what their use of electric vehicles is, an electric transportation, so that you know, I would assume would be the biggest barrier, but also it's a place that might have the land to do some offsets. That's not something I'm familiar with. I think in terms of upstate New York, I could imagine us decarbonizing. Our reaching net zero electricity generation within the next 20 years. But I am much less optimistic about electrifying everything. You know, I think our transportation sector is a huge barrier. The barriers are, you know, the charging infrastructure. The cost of vehicles, the

supply of vehicles. You know, despite the federal climate, New York State is still investing heavily in climate action. But we are seeing increasing headwinds against wind projects and solar projects. You know, geothermal installations. And so I think we're at a cultural moment where we can even stay the course with the rates we've been doing. Which I think has the goal of Decarbon being net 0 by 2040. We'd be lucky if we made that. I think if anything, it's probably gonna slow down a little bit with the loss of some of the federal support for these programs.

Marsh, Benjamin

So I want to clarify something you said a bit earlier, you said. Are reaching net zero electricity generation within the next 20 years what I think you might have net zero electricity generation. Do you mean by fossil fuels?

Berger, Karen

I mean having zero carbon electricity generation is what I meant.

Marsh, Benjamin

Yeah. OK. Perfect. You said some very interesting things there. Well, let me move on. I'm sure we'll pick it apart when we analyze the transcript. Yeah, it's definitely. New Zealand definitely has a lot of challenges with them. Transportation, it seems to be a little bit better than the states. They're doing a lot of it. They obviously have a lot better public transportation. Lots of trains. The trains are awesome. Trains are so fun. I wish we had trains in the states. It seems like they're doing a pretty good job of electrifying their fleet, although you do hear the diesel and smell it when off. Some of the buses. But yeah, I mean the other thing is, I'm sure you're familiar with the way this works, but there the way sustainable energy works is there's still peaks and during those peaks, they have to use them. I'm sure you're familiar with it. But that seems to be one of the biggest one of the biggest. Barriers here specifically.

Berger, Karen

I think of New Zealand as having a lot of topography. Is there any pump tider there as storage that's integrated into the grid?

Marsh, Benjamin

Hydro is huge. Hydro is huge here.

Berger, Karen

Hydro to get the I don't know if that can act as storage, so there's some of these facilities that they'll do when they're coupled with say solar that's going to be more intermittent. If you've got reservoirs at different heights. So when you've got peak demand, you send the water down and when you have peak production, you send the water back up and it's just kind of a closed system. So I was just wondering if they have any of that as part of the hydropower that they have.

Marsh, Benjamin

You know, no one's mentioned that, but like energy storage is one of the biggest limiting factors. They talk about batteries because in the states it's like what do they call EM, mega packs or something? They have massive batteries, but the infrastructure here, the economy, and IT just doesn't really work out the same way. My teammate is showing me that they do have. They seem to be. Experimenting with it at Lake Onslow, it's like one of the yeah, it's the like. They're kind of dabbling in it. The government. I just looked it up.

Berger, Karen

Oh great. OK.

Marsh, Benjamin

I don't know either. I've heard of gravity batteries, right? Like you said, right when it speaks production, you like to increase the weight and then when you like to lower the weight and that generates the electricity again. But I guess this kind of works in a similar way but with hydro.

Berger, Karen

Yeah. And actually from what I've seen in the, I can't remember I have a graph that I show in class and I don't remember if it's for the US or global that if you look at grid connected storage pumped hydro it is far and away the. Largest capacity. You know, I think batteries are trying to catch up because you can do them anywhere if you have the resources for them. But you know in the right place they make a lot of. It makes a lot of sense.

Marsh, Benjamin

That is. Really interesting. I can't believe no one's mentioned that because Hydro is a hydro is obviously a huge thing here, or I don't know if that's obvious, but there's a lot of it's very hilly, a lot of topog topographic opportunity there, topographical.

Berger, Karen

Good. Well, I'm glad they're looking into it. It's good to hear, yeah.

Marsh, Benjamin

Yeah. Perhaps not quick enough. Oh yeah, late 2023 is when they had us, yeah. All right, so now I wanna ask you a couple questions about. So I think we mentioned this earlier. Our goal is to convince people to switch to electric devices. So I think that obviously that requires a lot of background information about how electrification works, the barriers. But I wanna know what do you think the biggest challenges are in communicating the benefits? Or displaying the benefits of electrification.

Berger, Karen

Number one, I think, is probably the upfront cost of switching your devices. You know and I say device, but you know appliance, you know if we look at that. So that is the upfront cost. So thinking about payback periods, you know for what you're going to save, I don't. You know, I don't know how much electricity tends to cost in New Zealand. It's highly variable from place to place in the United States. So you know. In Seattle, it is always economical to electrify 'cause they have the cheapest electricity, and in Maine it's never. You're never gonna win on the economical argument. So like making sure you understand. Sort of what? The electricity prices and being able to do some payback calculations to say yes, it's gonna cost you more now, but you're gonna pay it off in fuel savings in three years and then it's just all savings from here on out. I think second, depending on what you're trying to electrify. Would be sort of the behavior and the if it. If it's something that requires a different way of using something like a stove or even an electric vehicle. Getting, you know, getting past this, this sort of behavioral barrier of, but I'm not going to know where to charge and what happens if I, you know, run out or something like that. And so I think those are probably the two biggest challenges. Were you asking me just about challenges on that question?

Marsh, Benjamin

I mean yes, but again it's an interview, not a survey. So feel free to expand or or go on tangents. Those are when we get our best quotes.

Berger, Karen

Yeah. I mean, I think one of the other things that's important, you know I look a lot at you know, electricity generation across the United States and the CO2 footprint of electricity is very different depending on where you are in the country. And so. Having locally specific information about the benefits is also valuable. You know there were 11 maps of the Union of Concerned. Scientists put out a few years ago, which I really liked. Which? Based on the electricity grid, if you had an electric vehicle, what is the equivalent miles per gallon of a vehicle? And so they took one area where it was almost entirely on coal and they said if you drive an electric vehicle, it has the CO2, em. Equivalent of driving a car at like 20 miles per gallon. So if you live in a place like that, what you really want to do is get a really efficient vehicle that can get 50 miles per gallon. On and, you know from a carbon standpoint, but really trying to emphasize the places where we do have clean grids. The values of electrification and I think you know one of the other big challenges when we talk. I mean, talk about electricity. There's so little people understand about impacts and you know, if you look at coal, right? So any Australia where they're increasing coal or or you know parts of other other places and highlighting? Not just the carbon, but the air pollution costs and. The solid waste costs and you know, sort of all of those externalities as well, I think are important to highlight. I don't know if you've seen, have you seen the solutions project website by chance?

Marsh, Benjamin

No.

Berger, Karen

It's put out. I think it was started by a professor at Stanford who works on air pollution and climate change. But he wrote a series of papers in 2011. Marc Jacobson is his name about how we could the world could. Could meet all of our energy demands with 100% wind, water and solar and talked about the challenges, but then also talked about, you know the opportunities

and they've now created this website where they show the potential renewable mix in almost every country in the world. Countries in the world and they look at cost savings, they look at job potential, they look at. Lives saved from avoided air pollution and things like that. So I think you know how to highlight. The benefits beyond climate change can be valuable for providing motivation for electrification.

Marsh, Benjamin

I think that's a good point. We talked to people and one of the things we found was that people are sick of hearing the same thing over and over again. You know, people are sick of hearing climate change and. People, it just feels like people don't really trust what they're hearing because they hear the same thing over and over again, and it's too positive. You know, people, people think it's too positive.Like nobody ever talks about the barriers. That's one thing that I think we're gonna do a little differently about our website is talk about the issues, talk about the reasons that are slowing it down and then talk about the solutions to those problems. But I think voicing those problems is an interesting thing that is different about how we're gonna design our site.

Berger, Karen

I think that's valuable. Acknowledging them rather than just ignoring them and pretending you don't exist.

Marsh, Benjamin

Yeah, exactly all right. So I've been losing my train of thought a bit. This is a very interesting article. We'll definitely look into this solution project, 100% wind power and solar, yeah.

Berger, Karen

Is there nuclear power in New Zealand?

Marsh, Benjamin

No, we just had a tirade about nuclear power. Because they say one is that the scale of a nuclear power plant is too much for the grid and for the economy to say, and they say like if for example, you need to go down for testing or you need to go down for repairs, it would destroy. They also talk about the public. Opinions of public views on nuclear. Which are nuclear. Radioactive, I should say. Like people are really, really not a fan of nuclear energy here. I think it has to do with how much they value their environment, and I don't know. I'm a big proponent of nuclear power. I think nuclear power is absolutely awesome. And I think Chernobyl ruined it for everybody.

Berger, Karen

It's complicated, but if you read Jacobson, he makes the argument that we don't need that. We can do it without nuclear weapons, you know. I'm. I'm. I'm not convinced. But I also. My concern about nuclear power is just the pace at which we're currently able to build them. They were not able to get 0 carbon electricity into the grid at the rate that we need to address climate change. So I think you know if. I'm not going to become an advocate until we can have more rapidly built smaller scale reactors, so.

Marsh, Benjamin

I think that's fair. Yeah, I think that's fair.

Berger, Karen

So sorry, that was maybe a diversion, but I was just. I was just curious 'cause you know there are people who say we can't, we can't decarbonize without nuclear energy. And there are people who say we have to do it without nuclear weapons. So I think it's an interesting issue among them.

Marsh, Benjamin

We try to be unbiased as possible and just hear what the experts have to say. Yeah. And I think that's a reasonable point. I don't know much about nuclear, to be honest, just because it doesn't seem like it's very possible here, so it hasn't been something I've done a lot of background research on.

Berger, Karen

Sure.

Marsh, Benjamin

It does feel disappointing though, because while it may not be the solution, it could be a tool. But yeah, again, it's just.

Berger, Karen

Not in a small island nation, though I can see that.

Marsh, Benjamin

Yeah, people don't like the apparent. It's also like denuclearization. So they talk about it very much, no nukes. Yeah, and for some reason that's spread to no uranium, no radioactive material. Yeah, the government kind of has like 0 nuke stance, which includes also on the power side.

Berger, Karen

OK.

Marsh, Benjamin

Somewhat frustrating, but you know again it is what it is. We got to work within the realm of reality. So what metrics and how do you judge the benefits of electrification?

Berger, Karen

I mean, I think first and foremost is greenhouse gas emissions. So looking at CO2 and methane.Per unit of youth, however, in and on, that's going to vary depending on what it is you're electrifying. I think the next thing I would want to look at would be other air pollutants. Looking, you know, primarily looking at particulate matter emissions 'cause that has the most health impacts globally. When we talk about air quality and again that's something that people don't think about is being connected to energy like being an issue with energy systems, but certainly with coal and natural gas that's that's a huge issue. Depending where you are, I think. Another metric and and again I'm sort of giving these metrics in terms of thinking. About your electricity, so you know, assuming that you're looking collectively at the life cycle system, I would say looking at water use. Is another important one. And then land use, I mean that's kind of the set of metrics that I look at when I'm comparing energy sources, you know and and obviously things like solar don't do as well on the power density front, on the wasp or square meter, but. Then you can also make the point that if they're. You know if it's multi use it's it's. You know there's asterisks on the land footprint, but I feel like sort of climate, air, water, land. There are the broad categories of impacts that I'm looking at in terms of trying to measure and then I would also say on the social front. You know cost would sort of be on top of their other one could also be jobs. You know, I think that it's interesting talking at least about energy use in

the US and everybody says well, we can't get off coal because we're all coal miners. But you know, if there are many fewer people who work in the coal industry than perception. And so I think that's an important thing to highlight that if you expand some of these renewable generation as an enabler of positive electrification, it can also create jobs.

Marsh, Benjamin

So do you think the world that we're currently in versus a world that was 100% electrified with renewable energy being the only source? Do you think that the world would have more jobs in the electricity industry or the energy energy industry?

Berger, Karen

I'm gonna say it's gonna have more jobs in the short term because the installation of a lot of these renewable facilities is gonna employ a lot of people. It might not have more jobs in the long term because you're not continually mining natural gas or oil or those other resources. But I also think there's enough time in the transition that it's not. It's not a disaster if we have fewer people working in the overall energy sector. If we can have people working in other areas, you know, we do a lot of this installation in electrification and then we see when we're getting towards the point where we've got all that. Renewable and we can train people for other other positions.

Marsh, Benjamin

Yeah, I agree. I think that. I don't know. It is gonna be disappearing faster than we can make them at some point, regardless of what we do with energy, regardless of what we do with any of this, I think that jobs are gonna start getting sucked up and everything's gonna become much more autom.

Berger, Karen

Yeah, I mean, I'd worry more about AI than I do about renewable energy.

Marsh, Benjamin

Yeah, exactly, exactly. OK, so you've told us how you judge the benefits of electrification. Now, how would you convey the benefits of electrification? What? What would you do? Answer that however you think it is.

Berger, Karen

Yeah. So I really like how the solutions project does it because they highlight cost savings to the society they highlight. Health benefits. So there's both like lives saved from having less air pollution and climate change and sort of the savings in health costs or lost productivity. And then they also. Now I've lost so they. Cost savings. Health benefits. Job benefits. I think those are things I would really want to highlight and I think one of the other. Things that's worth looking at are on the land use front, like letting people know that it doesn't mean you know. I've heard people oppose large scale solar because it's going to take up all the wonderful farmland you know and sort of show the difference. The different ways you can still have beneficial use of the land even if you are expanding the land footprint. So I think those are important metrics that it's not as much land as we think and we have these financial benefits. We have these health benefits. For you know, across societies.

Marsh, Benjamin

I think that the land footprint argument, I think that's much more valid in New Zealand than it is in the US, just because New Zealand is so much smaller, I mean the US has so much open space. I can't imagine us running out. That seems outrageous to me. Maybe I'm misinterpreting the size of the US, but.

Berger, Karen

Yeah, I mean, then the big challenge is though, how do you get, you know, how do you get the power from where it's generated to where the people are demanding it? And then you know, I was in a lecture where there were some physicists and electrical engineers who were hard at debating about how much the losses were going to be and that it, you know, the biggest like the Saudi Arabia of wind in this country. Is the central US. But that's not where people live. And so you know how much of that electricity are you going to lose? And I think that's going to be a huge barrier to electrification in this country. Even if we can expand renewable production, getting it to where the demand is will be a challenge.

Marsh, Benjamin

Oh, you found that? I'm sorry. I'm a computer science major, so I'm not very familiar with electrical engineering. So you're saying energy is lost when? Like, is this large? OK, I have an ECE Major sitting over here and they're nodding aggressively.

Berger, Karen

Yeah. I mean, I've heard numbers like 5 to 10% gets lost as it travels, you know through the grid. And so that adds up. If you're, if you're sending a lot.

Marsh, Benjamin

OK. So, have you ever yourself tried to? Convince people of the benefits or teach about the benefits of electrification, even friends or family.

Berger, Karen

Yes, I mean that's something I talk about in my classes and then I talk to people about it in the community. So I work with a local nonprofit that does a lot of education engagement around some of these issues. So you know, we had an event where we brought in someone who was able to say here's all the different money-saving things you can do. Like all of the different subsidies that New York State has and the federal government had at the time and like. These are the ways you can do this. And here's all the benefits. Of it, and getting people to talk to other people, like talk to somebody who put a geothermal. So making some of those connections. The main thing I talk up as personally would be. The plug in hybrid which for where we are like. I am not out and out advocating for electric vehicles because depending on where people are traveling, they might not have the range and we don't necessarily have. Of the charging infrastructure in some of the rural areas, but you know, I have a plug-in vehicle where most days of the week it runs entirely on electric and it's only when I go on a road trip that I use the gas. A lot to people about that and also about. An induction cooktop because that is, you know, I feel like for people who are cooking snobs and say, well, I can only cook on gas, it's nice to be able to say this has all the functionality and show it off to people. So I'm an advocate on that front.

Marsh, Benjamin

I think the induction cooktops are closed in the world. So can you think of? A specific so yeah, again we website. So we're trying to find what kind of visuals, what kind of. I just want to keep it a visual because I want that to be as vague as possible. Do you think is most effective? Communicating these ideas in a simple way, you know, like 'cause, one of the other big points we take away or we've taken away is that one of the big barriers is just apathy. You know, people just don't. They're living their everyday life, you know, they've got a million things to worry about. Why add one more? So can you think of any ways or any visual solutions that you've seen or have thought of that would be effective in motivating people?

Berger, Karen

Good question. I tend to be a graph person, but I know graphs on websites aren't don't work for a lot of people, especially if you don't have context. So, the things I'm thinking about. Do you know I've seen maps like this when we're talking about land footprint? And saying, you know, have a map of New Zealand and like if we cover up this little bit, this will be enough to close you know, three power plants or something like that, you know. Sort of having maps that show it's not as daunting a physical scale as people sometimes think it is. I think sometimes having. Having graphs that show the relative benefits of something like if you're looking at CO2 and and I've seen some of these graphs where it's, you know, the emissions from. I'll just say for now we're not talking about renewables, but like the emissions from natural gas. Plant versus a coal power plant and showing it as a bunch of spheres occupying Manhattan and like you know it's it's this view for this one and it's that you know having visuals that represent what you're trying just to show the sense of scale. Like, if we're looking at, you know, the emission, the life cycle emissions from hydropower, which are mostly in New Zealand's climate, probably almost entirely from just the construction and not from. Decomposition of lots of lush vegetation and warm temperatures so you know, so you've got like this much from hydropower and you've got this much from coal? I think those visuals can sometimes be impactful if you're trying to talk about health impacts like a little stick figure person who misses one day of work versus, you know, 50 people missing days of school because of asthma related to fossil fuel emissions or something like that. So trying to take numbers and convert them into images I think can be impactful sometimes.

Marsh, Benjamin

That. Yeah, that's definitely what we're trying to do. I don't know if you've noticed, but a lot of my questions about metrics, a lot of my questions about numbers. And then the last questions are about visuals and visualizing numbers. Yeah. That's all. Like stated questions I

have but I'm wondering is there any other advice or information that you could share with us that you think would benefit us? Our developing our product or completing this project.

Berger, Karen

Are you trying? Are you trying to have a broad audience for this website or is it targeting a particular subset of the population?

Marsh, Benjamin

It's meant to be broad. It's meant to be for, you know, we're doing a lot of expert interviews, but it's not meant for you. It's not meant for the experts that were interviewed. It's meant to have. The goal is to have the biggest impact possible, so reach the widest audience possible. Maybe 2 audio of a goal, but we try nonetheless.

Berger, Karen

Yeah. I mean, I guess I would think you know what are the issues that motivate New Zealanders, right? So you know I know there's been a lot of work on trying to eradicate invasive species, right. So you could even have, even though you're not talking about ecology, you're talking about climate. Maybe you visualize something with. One of the one of the you know native species like you know the impacts or the savings or the scales? Or, you know, if people really value it. A particular park or a particular mountain, or a particular waterway highlighted like having that be the setting for your visuals could be. Could it be an idea? You know how many you know what's a lake in New Zealand? Like how many lakes would we save? If we switched from coal to. Solar or wind, for example, or I don't know. I'm just thinking that that could be a way to speak to people, to think about what they care about. You know what they care about locally as the mechanism for visualizing the numbers you're trying to repres.

Marsh, Benjamin

One one thing that we have to come to terms with is when we have an idea, it's meaningless. But if an expert has an idea or expresses an opinion, it has a lot more value. So. I have considered that, but you saying it gives a lot more credibility and it is something that I think is a great idea and almost now that you say it, it almost feels like it was a no brainer that is. It's a great point. I can think of three or four naturally. What's the word like natural? And nature based formations. Yeah, that really has personhood. They've given them. So, definitely a path that we will explore and most likely.

Berger, Karen

Right, yeah. Good.

Marsh, Benjamin

Any other insights? Your first one was a big hit.

Berger, Karen

No, I mean, I think you know, finding what people care about, making it personal, having it be like acknowledging that there's financial benefits, but that that's not the only thing we care about. You know, I think if you just make it about CO2, you'll lose people. If you just make it about money, you'll lose people. But trying to spread the metrics you're looking at to cap like something will hit someone.

Marsh, Benjamin

Absolutely. I wish I had more questions to ask you because you are a phenomenal source of information. But I can't think of anything off the top of my head.

Berger, Karen

Well, if there's anything that you wanna follow up on, you have my email.

Marsh, Benjamin

That'd be perfect, absolutely.

Berger, Karen

OK. Good luck with the project. This is great.

Marsh, Benjamin

Thank you very much.

Berger, Karen

Have a good day. Bye.

•••

IX. Kristin Osterwold Transcript

This interview was hosted via email because the interviewee had an emergency and can't attend the scheduled time.

- 1. Could you please confirm the following details for our records?
 - Highest level of education: Master's in Civil and Environmental Engineering (currently working towards PhD in Systems Engineering) Confirmed
 - *Current job title: Lead Engineer* Confirmed
 - Current employer: Intertek Confirmed
- 2. How would you rate your expertise in Electrification out of 10?
 - 9
- 3. How would you describe the importance of electrification?
 - It is an essential part of almost all decarbonization pathways.
- 4. In your own words, how would you describe the world's/US's state of electrification adoption today? Are there any examples or observations that illustrate your view?
 - It depends what state you are in and the corresponding incentive programs, cost of electricity and fossil fuels.
- 5. When do you think the US or NZ will reach net-zero emissions?
 - It depends on how you calculate net-zero. You can't reach net-zero with some form of carbon offset, but many carbon offsets are questionable. If you are calculating net-zero with any kind of carbon offset allowed net-zero emissions (at least on paper) could be reached immediately. If you are talking about net-zero emissions only after reducing emissions as much as possible and then

only buying necessary offsets that are from actively pulling carbon from the atmosphere – maybe 30 years?

- 6. What are the biggest challenges to displaying the benefits of electrification in households?
 - I don't understand the question displaying benefits of electrification?
- 7. Which quantitative metrics do you use to judge progress in electrification? Can you think of a time when one of these metrics influenced a decision?
 - My focus has been on heating electrification, so I have been evaluating progress in relation to the installation of electric heating (specifically air source heat pumps). But I think overall progress in electrification can be evaluated by both the electrification of heating and transportation – using the metrics of number of electric vehicles sold, charging stations available, number of ASHP installed, number of gas & oil customers.
- 8. What metrics do you use to judge the benefits of electrification?
 - Carbon emissions.
- 9. What visuals do you believe would best convey the benefits of electrification in a motivational way? Can you recall a visual presentation (such as a website) that particularly motivated you?
 - Everyone's motivations are so different. I, personally, am motivated to reduce carbon emissions, but the biggest motivator for the majority of people seems to be cost. If it is cheaper to electrify, the uptake is swift.

10. Are there any existing visual solutions (pictures, graphs, etc.) or other online presences that you believe are effective at motivating people? Why do you believe these are effective for communicating with the public?

• I don't think most people are motivated by the desire to reduce emissions or prevent global warming. Most people live on a limited budget and the impact to their personal lives of reducing emissions is minimal – but the monetary impact can be large.

11. Do you have any more insights you want to share with us?

• Education and informing people is key – but working to support policies that impact the cost, either with a carbon tax or rebates for electrification, is more immediately impactful to carbon emissions. Also – straightforward honesty will get you farther than presenting a slightly skewed more-favorable-to-your-argument version. For example: electrification of heating in the U.S. does not current reduce emission in every state, and clearly showing the few states where emissions do increase due to electrification (and that by 2030 electrifying heating in all states reduces emissions) helps to earn the trust of skeptics by heading off their argument before they even start it – and demonstrates that you are not sugar-coating it with a perfect picture.

X. Anonymous A Transcript

April 16, 2025, 14:08 - 14:56 PM

• • •

Marsh, Benjamin

And you wish to remain anonymous.

Anonymous A

Correct.

...

Marsh, Benjamin

All right. How would you rate your expertise in electrification out of 10?

Anonymous A

Oh, that's an interesting one. Even though I work in space, I would still say 5 to 6.

Marsh, Benjamin

Very reasonable. And how would you describe the importance of electrification in New

Zealand?

Anonymous A

That's really a really good question.

Marsh, Benjamin

That's not out of 10. That's just you.

Anonymous A

Yeah. So if I was to think about electrification. For myself as a consumer, I probably have a little bit more information around electrification than your general customer. So for me it would be around the environmental impact. So where we are geographically, the importance of the environmental impact of renewable energy, even though we generate 80% renewable energy based on our hydro. But I would say. Yeah, it is really important. I think that it's important that we can we we can't keep drilling from papatuanuku. So even from an indigenous lens, we as a country. Cannot keep. Extracting minerals and resources the way that we have been. And based on our generation, I mean, we're fairly lucky, but it doesn't mean that we are bulletproof where we are. So yeah, electrification is important in terms of the environmental aspects. But it's also important that we do that transition. That we ensure that every part of our Community, including the most vulnerable parts of our Community, are looked after. So it's important, so long as it's done in an equitable way.

Marsh, Benjamin

Absolutely. I totally agree. That's why we want to make these tools. That's that people can understand the benefits and it's not just reserved for the educated people to reap the benefits, because I believe there are benefits, personal benefits you receive from it as well, economic benefits and such.

Anonymous A

Of course, yeah.

Marsh, Benjamin

So in your own words, how would you describe New Zealand's state of electrification adoption today?

Anonymous A

Well, so where I live in Christchurch, we're probably the one I heard in the City Council meeting that we are one of. So we had an earthquake here, so that took out a lot of fireplaces and coal and. And so people have had to adopt. To electrification, so heat pumps for heating. So I would say where I'm located in the country. Tree the uptake of electric appliances is very high. We've also had to rebuild a lot of housing stocks, so all of those housing stocks now have all of that stuff in it. So I think, yeah, I think the state of electrification in our country is generally pretty good in comparison to Australia or anywhere else. Yeah.

Marsh, Benjamin

OK. Umm. When do you think New Zealand will reach net zero emissions?

Anonymous A

Oh, shucks. How long is a ball of string? You know, like that aiming for 20. What is that 2050 that we're fully electrified, but the target year is 2030? I think it is. So how are we going? I think generally most of us are electrified. The complex parts of it are when we're talking about EV uptake, right? It's that kind of stuff. So EV integration of Dr. Battery storage systems. So is it really about electrification or is it really about? I think it's about a couple of different things. It's an overhaul of the whole South system. In terms of us looking at a different way of managing and utilising the infrastructure itself, so that's that's one piece. So you've got integration when residents want to electrify or generate electricity off their roofs. There's the other piece around battery storage systems. What does that look like? And then what does it look like? The integration of the into the network. So I think I think it's a. It's a whole lot of different pieces. And I don't think we've fully figured that out yet. Yeah. So we are electrified when you come down to a residential level in a sense that most homes have heat pumps. Most homes, you know,

like we there's a drop and people get it using gas. I assume that there's been a drop in the last few years because we're running out of supply. So if we were purely just to say for electrified appliances, we're pretty good as a nation, I think we're pretty good. If we're talking about participation in an electrified system, we haven't figured that piece out yet. We've got heaps of different moving parts and connectors, and there's also. Different participation points for different parts of our communities from. Vulnerable to those that can have the capital to be able to switch out all the appliances. I guess yeah. So. I guess that's what. What are you asking? Are you asking about efficiency? Versus just being electrified and just getting electric appliances. You know what I mean?

Marsh, Benjamin

Yes, I think that it's a good question.

Anonymous A

In others to the same thing, because if they're the same thing, then we're fine as a nation.

Marsh, Benjamin

Well, so the original question is about the net net 0 carbon emissions.

Anonymous A

Oh ****, sorry.

Marsh, Benjamin

No, that's fine, because a lot of the stuff you're talking about will get more into it later. Questions. Absolutely. That's all.

Anonymous A

OK, Nets are carbon emissions before a certain period. A you're saying what dates? Sorry. I don't know. Who knows when we'll get there? The government has time frames that they'd like to be there in. Now we've got a new government, so that's changed again. So it really depends on who the government is and it depends on the appetite of the industry to push that work forward. It tends to kind of change depending on the government of the day. Yeah.

Marsh, Benjamin

It seems difficult when you're trying to build infrastructure for the person building it to be changing. So you mentioned the integration of Doctor.

Anonymous A

Yep. Solar. So it could be solar. It could be windy. It's just the integration of other sources of generation. That generally. They're generally not coal. Or gas, yeah.

Marsh, Benjamin

Uh, so like renewable? Resources.

Anonymous A

Generally.

Marsh, Benjamin

OK. So. We talked. I kind of lied before. You mentioned a lot about. You know the efficiency and all the different details that go into converting the environment to. Sorry not the environment, the grid is fully electric. If you want to speak about efficiency. Of the current systems. Or the. Adaption or adoption of new resources. Adaptation of the previous system.
Anonymous A

We're still in an explorative state as an industry, so what we're talking about is the integration of a mass amount of, for example, generation from a residential level or a community level. So Community energy is very new in our country, but. You know, communities are different. Motivators for having. Energy coops or generation and then peer-to-peer sharing with the person with their localized community or virtual power plants. Things like that. So. Those community energies are still feeling you. But if we were to think about a whole lot of people integrating a whole lot of solar into the system all at once. Are we set up for that? And clearly, we're not a big part that's going to support all of that generation. Yeah, putting on storage, but it's also about understanding what are the aspirations that are localized level. How do we? What are the business models that support communities to be? Owners and generators in a market of some kind. So yeah, when we talk about integration, we're talking about the integration of a huge amount of generation similar to what we're seeing in Australia and they're having their own challenges over there. A whole lot of residential housing has a whole lot of generation all at once because it's got to come in and it's got to go out. There are a few different pieces there. Integration is an explorative state at the moment to better understand that. How do we? And how do we utilize efficiency at a localized level with infrastructure? Yeah.

Marsh, Benjamin

OK, so you mentioned community motivators. And so I wanted to quickly switch to something that you might. I think you'll probably be very, very informed about it. Which is what motivates people and how can we convince people? So the first question is, what do you think the biggest challenges are in conveying or displaying the benefits of electrification to households?

Anonymous A

Education is #1. So we have such a complex energy system. I'm sure it's the same case overseas as well. Wherever you live, it is a very complex system, so it's very hard for people whether you're a residential household, to see yourself in that system and how. What are your participation and entry points into that particular system? What is it that you want to do? Whether it's just generating solar or generating energy for your own home. To pull your daily needs. What a community of a bunch of houses down a street. Interested in? Sharing energy or sharing, like monetizing their worth. Anan or Koror, down the road, which is an older elderly down the road, or a single mum who isn't able to make her power bill that week. So I think the drivers are different for each community. Cannot say this is the umbrella, but I think the important pieces are education. Understanding what are the participation and entry points for each. You know, part of your community or personas, I guess. Of consumers. And yeah, where do they want to participate? Where can they participate too? Like if you don't have money to put solar in your house or you don't have money to go and buy a brand new fridge, that's more efficient, that might, you know, save you a little bit more money at the end of the year in terms of your energy. Or your utility bill. It always has to come down to education the most. The important piece. And. Yeah, I think that's the starting piece. You cannot do something. Yeah. When people I found when people understand how to simple things like understand what's on their power bill, understand how they can save money, understand how to make their homes energy efficient, whether it's small or large things. Generally after that they start asking questions. And those questions lead to what we can do in our community. Because we see a need. Can we group? A community that's able to get, you know, like a richer, wealthier area where everyone's going to get solar anyway. They may want to put it into a pool and monetise some of their energy. To support those more vulnerable parts of our community, and I hate that word. Vulnerable. So those communities that could really benefit from it at the time. So yeah, I think education is it's. Yeah, it's hard to say what the motivator is because communities and

houses are right down to households. Really different, but I genuinely believe that people just want to do good. So if there is an initiative or project where people can participate at different levels. To do good. I think that's where you gather and generate interest.

Marsh, Benjamin

That's a good point and it's a different perspective. You know, we've been hearing a lot about, like, hard numbers, hard quantitative values because we've been interviewing these experts. But I think there's definitely room. For what's the word? Optimism? You know, I think people do want to do good, and people here, I mean you, you know, I'm from the US. So it's really impressive when you come here and you see how much people here care about the environment. And even care about their communities. You know, America is a very independent place. It's kind of how we started, you know.

Anonymous A

Yeah. Also here. It's about the collective. Generally, people want to do good, right? So you can still be an individual, but you can still be a player in some way shape or form to do good and I think maybe that's just a cultural thing for us here. But I think that that's really important and we may not have the numbers that. Support that, but we've got a culture that tells us that everyday. You know, so for me, it's like, yeah, it's only because we as an industry have never done a good piece of research around that in terms of understanding the consumer and the customer and. People will say we have. We haven't really haven't. We're quite ill informed about our customers, which is the reason why when we talk about this stuff, people talk about it as just keeping. The lights are on. And there's a disconnect from the industry of engineers. Versus the person at the end of the line where their meter sits, you know, and the power comes into their homes. Two very different things. They're both important, but I think there's the piece where we look at hard data. And then you know, we always say soft qualitative, but I think that we actually

need to hear more about what's happening out in our communities, what's happening in residential households. So if we understand our consumers and our customers. We're best placed to be able to respond to those. Challenges ahead?

Marsh, Benjamin

Absolutely. And I'll tell you, we talked a little bit about what this whole thing is about and it's because our school recognizes that disconnect between the engineers and the and and consumer and they are not even the end consumer. The engineers and the A regular person, you know the. Why do we think it is very strange, right? Different and the whole idea is we, we come into these projects and it's to learn the value of. Qual qualitative? Information you know, like we're so obsessed with our numbers and our measurements, but this whole thing is about hearing stories and and and amplifying them and.

Anonymous A

Yeah. And bringing humanity back into energy, understanding that it's connected to economies, to families, to livelihoods, to health. You know, it's connected to all of those things. So there is a disconnect and I get it like I work in the industry myself. But we need to bring humans back into it to help inform how we move forward in the future. And I think that's it. That is really that's a really strong piece because when you understand your consumers and your customers, that's when you're able to create products or services. Align those opportunities. If anything else, they are opportunities for different parts of the sector. To be able to create new and innovative ways to address really complex challenges. The transition being one of them. Yeah. And electrifying our country, you know. And so even from like I'm really keen to understand what electrified means in America versus what it means here in New Zealand. You know, context is really different.

Marsh, Benjamin

I'll tell you, it means a lot more here, because here you have so much renewable energy generation that when you electrify a product, you're actually decreasing the amount of carbon used. But in the states it's so lacking that it doesn't matter if using an electric appliance or. A carbon one because at the end of the day the electricity providers are just being burned in fossil fuels, you know.

Anonymous A

Yeah.

Marsh, Benjamin

That's why we came here to do this project, because this is where we can have an impact. Or we hope to have an impact, I should say. And this country, I think, can be an example for the rest of the world about the potential of these technologies and the benefits of this process, this transition. All right, so I want to ask you more about it. How can we motivate people? Because you mentioned that one of the biggest barriers is the education barrier. The fact that people have, you know, a million things going on in their life and it's one of those things where it's hard to learn about it. It's very complicated and. So my question is. What topics do you think? Educating about. Are the best to motivate people and the next part is. Well, we'll get to the next part later. What? What topics do you think are most important to educate people about? To motivate them to electrify.

Anonymous A

What motivates people is we need to incentivize. You know, like it's kind of like what would motivate me as I want to see that I'm saving money on my monthly power bill. The things that motivate me is that. We have an industry that looks after the environment. What motivates me is that we have. You know, we create resiliency at a localised level, so. And then you know like that in terms of. Change behaviour so like even if we're looking at affordability. When we talk about education that is so broad, but it's what are the beginning and entry points for people to participate. It's always energy efficient. It's it's and this is what it equates to your power bill. Like if I got this appliance, this is how much you're going to save. This is your current appliance that you've got. This is how much it's going to save if you do a whole bunch of things in your home with some smart equipment. This is how much it's gonna save you if you get an EV vehicle. This is how much it's gonna save you and gas. So I think that that's what motivates people is they really want to know, like if it's gonna save their money, but also like, what are the other things that it could do like? Resiliency. So I think I. I think that's your entry level. Is it energy efficient home energy or like home energy audit stuff? Yeah, I think that that's kind of like your entry level. Like if you try and go straight to a person and say, do you want to get solar on your roof 9 times out of 10, they're just going to say yes because I think that's going to equ. A cheaper power bill, but doesn't always mean it's the best option. Right. So or it doesn't mean going with that P particular company is going to be the best option for them either? So there's all of these different pieces, I think, but the entry piece is really energy efficiency stuff. Understanding. One's power bill, and then understanding how that equates to your monthly bill. How much will you save at the end of the year? I think that's the kind of stuff that. People really kind of gravitate towards and probably just recently, people really want to have more control over kind of like their generation and they might see opportunities and putting back into the grid. But that's, you know, like participating that way. Once again, that's certain people and that have the capital to do so straight away. We don't necessarily have the banking loan structure set up either. That allows everybody to do that. Most people are renters. So then it's having to look outside the norm. Or different ways which are kind of like you know that buying into or having community projects? That benefits everybody. We can redistribute it to other parts of your community. Yeah, I don't know if I answered that, sorry.

Marsh, Benjamin

I mean, you know, you're speaking with passion and that's what matters. You know, you know.

Anonymous A

Well, it's if we're realistic, we're going to be very realistic about how do you motivate people? People are either. The motivation is incentivizing them. Otherwise they will just think their energy is just an endless flow sometimes, and the lights just are always going to be on unless you can't afford to pay a power bill. So I think education is really important. Like the beginning entry stuff.

Marsh, Benjamin

And that's what we're trying to create. You know we don't want to tell people or we're not trying to, you know, break down every statistic and this and that. We're trying to give to people. What they need to know. You know what I mean.

Anonymous A

Even things like EV, right? Like if a home can get an EV because that's they're going to get a new car anyway. But like that demonstrates that maybe not in the first how many years, but after that they'll be saving money on energy on like gas prices, things like that. I think it's kind of like just having a centralized place and we have it here. Umm Ika and ginless. Which is the current space, but it's not necessarily the easiest for consumers to navigate when it comes to trying to find their information. Yeah, yeah, yeah.

Marsh, Benjamin

I don't know how familiar you are. Please correct me if I'm pronouncing this wrong rewiring alterosa.

Anonymous A

Yep, I know quite a few of them. I know, Mike. I actually know most of them. And rewiring, yeah. Jayden.

Marsh, Benjamin

So, one big thing we're looking at is their website, because we believe their website is quite good at showing there's a lot of ideas we had that we were like, oh, well, if we do this, we're just copying their website really.

Anonymous A

Yeah, we've got rewiring in the US as well, right?

Marsh, Benjamin

Yes, yes. And they've also got it in Australia.

Anonymous A

Yeah, yeah, yeah, that's right. That's right. So. So it's international? Yeah. No, I know those guys really well. They rewiring guys and **** Hope up is cool and I think they're trying to solve the same things that we're trying to solve, you know.

Marsh, Benjamin

Absolutely. I think that that's why, yeah, we're. That's why we're working with them because we believe. We're furthering their goals. Or maybe they're able to advise us on our goals. It could go either way really.

Anonymous A

And they're really good with their data.

Marsh, Benjamin

They're great at expressing it in very clear ways, yes. And Speaking of clear ways to express information. Have you? What visuals? And I'm leaving that as vague as possible because I want to give you as much room as possible. What visuals do you believe best convey the benefits of electrification in a motivational way?

Anonymous A

I'm sure other people have said graphs. I'm gonna say the visuals are coming from a very ground roots way. Pictures of families that have done it, you know, like every picture of everyday people. Who do you know, who has done certain parts? I think the other visuals, if you were gonna ask me, I know everyone else was gonna say. Sit on a diagram and I'm just gonna. I'm this girl's just like, actually pictures of community people that resonate with everyday users and consumers. Yeah, 'cause, you know, like who's really gonna look at a graph.

Marsh, Benjamin

Hmm, how's it going?

Anonymous A

It doesn't relate to your everyday person. But then when you have a story and a picture of a family. Who looks like. Oh, that's cool. Yeah, that's cool. Or a picture of a community. Doing it. Picture of their project or initiative. Yeah.

Marsh, Benjamin

I love that. I think that like we said, or you're exactly correct. You're exactly correct. We get a lot of graphs, we get a lot of charts. But this is great to hear. I mean this is definitely something we've been thinking about for a long time, but we have yet to. We've been doing a lot of expert interviews. We've done a couple community interviews, but we have yet to send out. Our community surveys. Which are hopefully going to be much more down to Earth. You know, much more reasonable responses.

Anonymous A

Yeah.

Marsh, Benjamin

And quickly speaking on that, actually I'm wondering if there's any way or if there's any people that you know that we could send our survey to? Because, you know, we could ask our sponsor, but they're gonna send it to people who are already extremely informed, probably already electrified their whole household. So I'm just wondering if it's possible that we could. And you're also welcome to fill it out yourself if you'd like. We could also send it to you.

Anonymous A

Yeah. If you send that to me because I'm doing this interview not with my hat of an ADB on right. So it's just kind of trying to navigate me sending it out under the proviso of my current role. To community groups. Have you done an interview? Gareth Cartwright yet?

Marsh, Benjamin

No.

Anonymous A

From the Community energy network.

Marsh, Benjamin

No.

Anonymous A

OK. So maybe that would be a really good intro for you and Dan because. He'd be able to send out lights in that email out to all the cohorts from you, if that makes sense. Not necessarily from us as an EDB, yeah.

Marsh, Benjamin

Oh no. OK. We could probably email him asking him about that. Did you?

Anonymous A

Yeah, see if Dan is able to connect you in with. What's his name? Sorry. What Gareth? Gareth Cartwright.

Marsh, Benjamin

Cartwright, Gareth Cartwright. OK.

Anonymous A

Or even Community energy networks. If used. Email them. They'll be up. You. I'm sure someone will be able to respond to you. They might be a really good one for you to interview as well.

Marsh, Benjamin

The one thing is this interview. I don't even know if you know how helpful and useful this interview is gonna be in the long run. But we really are. I don't wanna say I'm sick of it, but we are really informed about what experts think. We know exactly what they think.

Anonymous A

Yeah.

Marsh, Benjamin

We know absolutely everything about their opinions, but that's not who we're making this for. You know what I mean? I just wanna ask you. Is this Gareth Cartwright? Is he able to send these to people that are?

Anonymous A

Ah yeah, I'm sure he would be. I'm sure he sits in a few different spaces like the people that are in the homes, like the organization does, like the healthy home insulation stuff. So like. The people that are going into those damp, cold homes. Like real ground roots stuff. So I'm sure like even if he sent it out to different service providers, if they're able to, here's another person. I think you should connect with 'cause. I just like throwing these out.

Marsh, Benjamin

Give it to me. We're interested. We're here for.

Anonymous A

No matter. I'm not sure if you've interviewed Israel. Ani, now I don't know. They're called nomita. Let me send that in the.

Marsh, Benjamin

Could you say that name one more time? Izra izra.

Anonymous A

Ezra Hirawani for no Mita and there a retailer. OK, but I think these guys are really good too. The reason why I say that is these are the ones that are doing the ground route stuff. So the stuff that I'm saying right now, they'll say the same or similar, and that's because they're seeing it live, right, they're not.

Marsh, Benjamin

OK. Beautiful.

Anonymous A

So this is a. Retailer that came about. To look after. Those parts of our community where people can't afford to pay their power bills and then they can't pass a credit check to even get power put on at their houses. So like that kind of ground route stuff. And I think those voices are probably the ones that you want to also have in your research to kind of just level that the playing field. So you've got to be really rich. You know, court it or to kind of leverage off for your research. But they are some really good ones. Dan will have the context as well. I don't have this context, sorry. And then Dan should have. Gareth's context Gareth Cartwright. I'll put

that in too, for the Community energy network. Just as in Ireland, just reach out. And see if they're keen to even just do the interview. Gareth. I think that's how you spell it. Yeah, sorry. So probably not. Worth Orion? Yeah, community energy. Yeah, apologies for that.

Marsh, Benjamin

No, that's really fine. That's totally fine. It is just I don't think you're I this is insanely useful. This is an opinion that we desperately, desperately have been starving for for a while. And so, because it's, you know, every expert is more than happy to be interviewed and those are the people that again like, because we're with the university, it's very easy to connect with those people. RK and rewiring a tarot or or Aote Tarawa are phenomenal at connecting us with those people. So that's, but you know it. Like I said before, it's not our goal audience, not our target audience. It's it's, you know.

Anonymous A

Yeah. Everyday people you want to do something for everyday people, right? How does that translate over into an everyday household?

Marsh, Benjamin

Absolutely.

Anonymous A

How do they feel like they contribute? The language that we just like uniquely for us in New Zealand, we talk about it as the tiell, which is the natural environment. So people resonate with that level of messaging here. And they resonate with the resiliency piece because recently we've had a number of different floods, large scale floods, different parts of the country, we've had earthquakes. So resiliency is a huge piece. For our communities and then affordability. I mean, you know, kind of understanding how we engage with people to have everyday conversations about energy that makes them enthusiastic and want to participate in some way, shape or form. And I think the way that we've set up the industry is that the industry has kept theirs. Cards very close to their chest and because of that. You know the general population don't even understand how the whole energy system is. Just let alone trying to see themselves in it. They just see themselves as I pay my bill every month.

Marsh, Benjamin

It's a frustrating thing when the path to saving money costs a lot of money. You know, so the only people who save money are the people who have money. It's like it just seems and then.

Anonymous A

I would love it all. I would love a tool that's able to kind of do like a business case study on how we can make. Kind of different generational projects. At various Community levels, financially viable and sustainable long term.

Marsh, Benjamin

Absolutely. I think that's the tool we want to create, but it's you know, it's just hard with.

Anonymous A

Difficult.

Marsh, Benjamin

It's hard with the like, like one of the big things we are seeking with these interviews is to find out, like I was asking you many questions about motivations. And I don't know. We're just gonna. We're gonna have to. It's, you know, we don't have a ton of time and it's we're gonna have to. Really rush to make sure that we can hear and invalidate the opinions of people who are not experts, you know.

Anonymous A

Can I ask you what would be the motivations in the US for an everyday household? What would happen?

Marsh, Benjamin

Cost. Instantly.

Anonymous A

Yeah, yeah, yeah. Same thing, right?

Marsh, Benjamin

Yes. So that seems to be the number one motivator. But the other big thing is like, how do we? Visualize how we convey those benefits you know?

Anonymous A

Oh shucks. Sorry, my brain just went. Just lost my reign there for a second. When do you say how do we visualize? What do you mean like materialize or what do you mean when you say visualize?

Marsh, Benjamin

Visualize isn't necessarily the right word. I think conveying is a little bit better.

Anonymous A

Right. Yeah, the messaging. How do we communicate that is of value? To the varying personas, varying consumer personas, the varying, and the varying entry points for each of those personas to participate. And there's always your baseline where everyone can participate, which is what they're doing at the moment, is passive consumers paying their power bills. And then there's the more active. Participants that probably know a little bit more or want to buy an EV, and because they're buying an EV, they have to learn a bit more. Or, you know, like your solar on a household, which means that they have to learn it a little bit more. They get to see generation as it's generating. Live. You know, like those are tools to educate as well, but those are also once again a different entry point for different parts.

Marsh, Benjamin

We're looking to turn those passive participants into activists, so we're not looking. Trying to find people who are not interested in electrification or maybe I shouldn't say that are interested, but not necessarily motivated. Because if you're not interested, you're not gonna seek out the tools.

Anonymous A

You know, just last year we did our first community energy activator here in New Zealand with Araki. And what we learned from that was people don't know that they want to participate until they learn more about what this whole system looks like. Like they often just have this visual of just getting a couple of panels on the roof. You know, and then realizing, oh, shucks, it's a little bit more than that. There's opportunities here to be able to do more. So yeah, one of the things that I learnt is we've got only passive consumers. I keep saying this, we only have passive consumers because. They don't know enough about energy. Once again, they can't see themselves in it and don't know what the entry points of participation are.

Marsh, Benjamin

I definitely agree. I think that is the hardest part. Is the step before they're interested in even being informed. We're getting near the end. So I wanna ask you. Do you have any insights or other information that you think will help us or develop this tool? Or if you have any other ways or if you have any ideas for how we can distribute our survey so we can get the opinions of more average people than that? Would be hugely helpful as well.

Anonymous A

I think you should find out all the different Facebook community group pages in New Zealand, even if you're just in Wellington. Look for a pony for our community in the Community Facebook page. Ask if people are keen to participate in a survey. You know, like I would do that. Like, that's a very New Zealand way of getting your stuff out like there are so many communities like get a map of Wellington quite literally. You'll find a Facebook page for most communities and everybody's on them. Like even if I'm on my community Facebook page here for crash city. Like most communities have a Facebook page. Go into the local libraries. And see, you know, like putting up a flyer. I don't know how long you're going to be here, but maybe like the Wellington City Library. Put up a flyer if you're interested. And learning about something ABC or D. Or participate in an interview. Those would be ways that I would really start doing a reach out or write down to maybe like just. Approaching people on the street with your likes quite literally, cause Kiwis are really good like that. That'll tell you know, but with every no, you're gonna get a yes after every 10. You know what I mean? Like that.

Marsh, Benjamin

Yes, yes.

Anonymous A

Just everyday people but. Keep the surveys, really.

Marsh, Benjamin

Sure, it's 5 minutes.

Anonymous A

Short and succinct. Yeah. Yeah, just a couple of questions. That you need to get from everyday consumers, but I think that those are really great ways. Yeah, Kiwis are pretty good like there honestly, like no one's too cold to do a survey. I'm telling you, you're actually in the wrong city because Christchurch is well known, apparently for surveys, and people love doing surveys, yeah. I don't know that I knew that though. Who was that? One of the ladies at a conference said so, yeah. Yeah.

Marsh, Benjamin

Oh yeah, that is us. We have come to the right country to speak to people on the street and then for service. That is true. People here are very open about what they really like. All right. Well, I think we are at the end of our time. But thank you so much for your insight.

Anonymous A

No worries. I hope that was all. I don't know if you can decipher all of it. There was a message in there somewhere, who knows?

Marsh, Benjamin

Well then. We will. Really quickly. Do you have any? I'm obviously anonymizing your interviews, absolutely. Going to be totally. It's gonna happen. The question is I'm thinking like how would you prefer to be? Like Community energy experts.

Anonymous A

Yeah, yeah, that's perfect.

Marsh, Benjamin

OK. OK, perfect.

Anonymous A

I don't count myself an expert in any way, shape or form, but yeah.

...

Marsh, Benjamin

Thank you so much for your time.

Anonymous A

No worries, no worries. Good luck with everything I'm sure. I'm sure you'll be able to get over the line a few, yeah? Might just have to do things a bit differently. Yeah. Awesome.

Marsh, Benjamin

Perfect. Well, thank you very much. Have a lovely day.

Anonymous A

Alright, khaki . Bye.

Marsh, Benjamin

Bye.

XI. Lyn Dawson Transcript

April 17, 2025, 12:30 - 13:21 PM

Andreas Keating

Do we have your consent to do this interview?

Lyn Dawson

I give my consent to the uh do the interview

Andreas Keating

May we use your name or do you wish to remain anonymous?

Lyn Dawson

I'm very happy for my name to be used. I know it's a very American thing, all the consent.

Andreas Keating

We understand it could be annoying, but we always prefer asking. Can I ask what your highest level of education is?

Lyn Dawson

Bachelor of Business Science degree.

Andreas Keating

Thank you. And your current job title?

Lyn Dawson

Last year I was a student, this year I'm nothing. I'm going to start casual work shortly as a laundry worker for the hell of it. I'm officially retired, but like so many others, I pick up part-time work.

Andreas Keating

... Now that's out of the way, the real questions: how would you rate your expertise in electrification in New Zealand?

Lyn Dawson

I'm not a technician; I'm a consumer. I'd probably say I'm better informed than most consumers, but obviously not on par with the people who are actually working in the field.

Andreas Keating

How would you describe the importance of electrification in New Zealand?

Lyn Dawson

It's vital. I think it's something we have to work on.

Andreas Keating

In your own words, how would you describe New Zealand's state of electrification adoption today?

Lyn Dawson

I would say it's not where it could be. We're still too reliant on imported fuels, fossil fuels mined locally or imported.

Andreas Keating

That's one of the things we have looked into. New Zealand imports so much fossil fuel, and it's a huge cost, right? So, we agree, it definitely is important to reduce that. Are there any examples or observations that illustrate your view?

Lyn Dawson

Certain guess articulation and new suburbs. They're still doing it. Which is complete nonsense. The current government focus on drilling for oil and gas fields, um certainly the gas fields seem to be exhausted if the recent experience of the Todd family company is anything to go by and Taranaki. They've drilled they've just opened a new gas field, they've drilled down three K then a right angle and HK I think out to C to pick up the gas. They're getting less than half of what they expected. And this is in a brand new field. Yeah, that was in an article in last week's newsroom. That's assuming I'm yeah yeah that is totally the fact that, yeah, new fields are being opened still it is yeah, definitely not hoping. and also the current current government insistence on giving a license to a company to mine sand off the coast of Tarenaki, which is where other companies had planned to invest in wind power and were prepared to get started straight away.

Andreas Keating

I have heard that. Because New Zealand, as you said, has a lot of potential, 80 to 85 percent of the grid is renewable energy-powered, very impressive, right?

Lyn Dawson

Yes, very high, but it could be higher. We must aim for 100 percent; there's no option now, not for the planet.

Andreas Keating

When do you think New Zealand will reach net zero emissions?

Lyn Dawson

Not as soon as I'd like. I'm not going to rashly put a date because that would just be idle speculation.

Andreas Keating

That's fair. We researched and saw there's a goal for 2050. Do you think New Zealand can reach that at the current rate?

Lyn Dawson

I can't see it at the current rate. I'd hate being pessimistic.

Andreas Keating

That's completely valid. What do you think are the biggest challenges to displaying electrification's benefits?

Lyn Dawson

I know they look good on an engineer CB but there's a hell of a lot we can be doing straight away um that at less cost a little more fiddly perhaps than I'm talking about uh as simple as uh putting solar on roofs. um You don't need resource consents for it. You don't have to do planning for it because the um the plan is it, although of course you've got to organise the reticulation and the battery storage and so on. But that there small beer besides putting panels on uh on roofs The panels on roof, I I feel like that's is more like um residential um view, because we have to convince people to put on their roof, like the we feel like um that's the heart thing to con to motivate people and to convince them to add it on the roof, because the, like the cost and they cannot see the far picture if the cost is overwhelming them, I feel like. I think it has been inappropriately sold on the dollar side. I had mine about 18 months ago and I was presented with it. I had three quotes and I was presented with each one with a route on-income what I'd have got on the bank sort of thing if I kept this money in the bank and it would have been \$20 to 30 years. And it was just an entirely inappropriate scale because what I was and in fact you have, you are shifting a resource. You're not spending it. You are moving it from the bank into something tangible and you are getting the benefit from the moment it is installed. You're seeing the benefit for goodness sake. uh and I think it needs to be turned around and I think my cashiering at her has done a bit of work on that but it's it's an area I think we need to push more because ultimately it's down to the money um you can talk all you like about high expectations for a saving the plan and so on. But it's your back pocket that starts talking about the money and how you're going to benefit immediately with the money.

Andreas Keating

We're making a website trying to motivate people about electrification. How do you think we could best convey its benefits?

Lyn Dawson

How it's going to save you money uh that it's a better investment for you than having it sit in the bank while you're still paying increasing power prices uh fuel prices if you've got a car uh that's that's an ice car, you and um how on day and showing the comparisons how you can

benefit from day one, have it in the um keep it simple show the graph, show the comparative graph. uh and so on and that to me is where the sales are. You know the lovely talk about sustainability and so on um particularly at the moment with people being um hard pressed for work and so on, um that's find this guy really. good for the clean good for the country. It's got to be good for the pocket.

Andreas Keating

One expert mentioned viewing electrification expenses like subscriptions could help adoption. What are your thoughts on this?

Lyn Dawson

We actually had a company I think it was called solar zero, a company that came in oh it was set up with very good ambitions along those lines. They would own the hardware you paid a subscription for each month. Do you know anything about them?

Andreas Keating

Yeah we've heard about them they um they were bought out by an American company right?

Lyn Dawson

Yeah, called black rock. Yeah black rock and a bunch of them honestly there are quite a few. I admit that is unfortunate yeah so um you know, I did I think that think like a stone. ... It's not the way we do things here. We own the stuff. We have to own the stuff. Yeah it's kind of made from what we've seen. It kind of made people weary about solar panels and electrification in a way.

Andreas Keating

Going back to visuals, can you recall any presentations that particularly motivated you?

Lyn Dawson

No. My father was an electrical contractor. I've always been pro-electrification; it's in my blood.

Andreas Keating

That's very admirable. It makes sense as we've actually recently found out that New Zealand started well historically but slowed down recently.

Lyn Dawson

Yes, previously we had the Ministry of Works running big projects effectively. Now projects are contracted cheaply, often resulting in poor outcomes.

Andreas Keating

We've also found out that subsidies for electric cars have stopped, affecting sales.

Lyn Dawson

Yes, however they only ever intended as a short term. option. It was never intended to be permanent. yeah, the introduction of subsidies for EVs that came in as scheduled. I didn't know that it was very valuable. We don't run on subsidies for a very long time.

Andreas Keating

Yeah, it's understandable. I have a couple of uh questions regarding your solar system, you mentioned installing it 18 months ago. What motivated you?

Lyn Dawson

It was probably protection which might sound odd but my now late husband was in t and it was costing an arm in a leg and so our savings were going down and one thing they won't do um and we weren't eligible for a subsidy to support us care So um in order to be eligible for a subsidy, you can only have so much money in the bank and assets and things, but your home is and your car is exempt. If you're a couple So, um I thought, right, this is where I'm getting the max value for the house. So it was panels and batteries. My car warranda fitness was due and the car was a crock anyway and it cost me over \$1 1000 a year before to get it up to a warrantable standard. So right in the car went and so went EV. um and I thought right, well let's do something protected so that I could have a decent standard of life. Things really continue on with a key situation. So that was the um that was the final trigger, basically, which I understand is unusual, but it has paid off big time because what I've realized is for anybody on a fixed income which I largely am um you are insulated from power price rises and petrol rises few rises and um it's a benefit I just really couldn't overstate. It's a worry. I two worries I do not have and it means that socially for my lifestyle, I am able to um get around more than perhaps I would particularly in bad weather um because I'm not worried about the cost of fuel., are being protected from the like vital prices of petrol diesel, even gas the improvement and lifestyle, I think has to be is something that hasn't been really looked at. and for somebody with with a fixed income, I think that that is a big, a very big benefit indeed

Andreas Keating

When you installed solar, did you immediately notice financial benefits?

Lyn Dawson

My first bill was I think about \$17 or something silly. It might be fourteen or 11 you

know, it was under \$20. um I've just checked at the moment the day outside is grey overcast. The temperature's 15. I'm running a heat pump. I've got their bread maker on and I'm generating the electricity.

Andreas Keating

Did the upfront costs concern you?

Lyn Dawson

No, I um had a budget and I I'd uh added a bit to it and what I think probably um what's the budget um was that Harrisons had been advertising heavily on TV so I sort of looked at their figures added a few grand and thought right well there's my budget and I can take that out of savings no trouble. um which I did I was in a position to do that as I say it was AC protection. um but I understand some of the banks draw one percent load, which more than covers the cost of um you own it with your power savings. So I don't know the details on that, obviously, because I haven't had to explore them.

Andreas Keating

And you mentioned that you have an Electric Vehicle. Is this correct?

Lyn Dawson

Yes.

Andreas Keating

Have you, um faced range anxiety or infrastructure issues?

Lyn Dawson

um you do have to change your thinking a bit if you're doing a trip. and last last February, I took it up north, did three and a half thousand k round the north island. um So uh I charge it home during daylight. I've got a charger so I don't have to muck around with timing and whatever can't be bothered. uh just plug it in in the system does the rest. um if I'm going on a trip I will check the charging apps to just to make sure I know where I may need to charge Certainly if I' travelling around to South Island I've noticed you know the weather can play a big factor instead of charging once perhaps on a trip to theedin. I might have to charge to maybe three times if the weather's poor because I'm using the heater, the windscreen wipers and all the rest of it. And the heated car seats. And the steering wheel but by cleaning ahead, but just by looking at it, um it was petrol just used to I got to a gas station somewhere with the charging point you need to know where they are. ... The apps are very good in that aspect. Good to have a public blue nearby, uh which quite a few of them do, and certainly the server station ones I like for that reason and you can sit inside. They drew a coffee or something. So uh a trip is definitely going to take longer and that respect, but you're getting the brakes, which is a good safety thing uh and um yeah, I have a good idea I'm having. I'd never actually thought about the brakes right. This is a good safety thing to rest your mind, kind of be ready for the next bit of road that I've never thought of, that is a very valid point. For so when you're looking for a charger that's not at your destination or at home, um are there is there is it an abundant thing or do you think the infrastructure is lacking a little bit? infrastructure is steadily improving. It's just rocketing on. And there's competition out there now. So it's um as far as I'm concerned it's not a not a concern because it's getting um companies are putting in charges the whole time. The big thing I I'm finding now is um some of the little places may have just one charging point and it's happened to me once uh vou've got the people who leave the car on the charger. Well, it was at least over two hours anyway before I was able to get to it. uh but and fortunately the person before me

explained very nicely to the people, little things about charging etiquette. And I'm so generally there's no no issues. uh and you meet the nicest people.

Andreas Keating

So, um. Do you produce enough energy to power everything you need at home?

Lyn Dawson

It's basically winter when I draw from the grid um it wouldn't surprise me if I drew from the grid today, but I'm in love with it. uh but most of the time, if I'm in Christchurch my car is charged by solar. Yeah that is good, that is sometimes the problem, right, when you electrify and you it doesn't really change much of the electricity coming from fossil fuels, but if it's coming straight from solar, that it's perfectly, completely common energy. No, it's um I've got the hooked up to the charger now, but there won't be enough uh enough light to do that. But that's all right. I'm not bothered but no, it's certainly you know, I'm not working during the day so that for people who are working, that's another story. But um for me, yeah, I can do most things solar. Yeah, that's a good thing. That's always a bonus... um well, did you have any more questions?

Andreas Keating

Yes, just a couple more. But, we are reaching the end so do not worry. So... If someone is skeptical about electrification, what would you say to them?

Lyn Dawson

Well, it depends a lot on their individual circumstances, of course, but um I I believe everybody stands to benefit. It's just a matter of how for each household. But I think there's a broad, broad measure that can be brought into play to do it. We've got one of the things that really is annoying at the moment. We've got far too many power agencies with their hands and the tools, so to speak, we've got the power generators, we've got the power of retailers and we've got all these subsidiary marketing companies. I mean most of which are owned by the power retailers. And everybody along the way is taking a click of the ticket. Personally, I'd like to see a lot of those get rid of uh because that is adding to the expense and, you know, we knew we had extra office space, extra people involved in marketing and what have you? You're not putting the focus where it needs to be, which is on the production and the efficient transmission to as many people as possible for a reasonable price that allows for putting money back into R&D and new generation and so on maintenance. This is my big big one because certainly finding a power company when I changed over was a potential nightmare. The company I was with, very happy to offer me a five-year contract and a nice price to buy my power, but as to say it was a five-year contract. I said no, let's negotiate. No, five years or nothing but okay. uh one of my brothers being an electrical engineer, it's right up his field. He had done a whole lot of the sun, done a whole lot of looking around and what have you? I said, "Who are you?" He said electricity. I said, right that'll do have he had taken all that otherwise I'd still be out there fluffing. It needs to be a very simple system and I know electricity has strong benefits for those who are generating power and using our batteries during peak times to get a benefit for that too. It has to be simple and so that we also need to see in simple figures just how much we're getting for the power we supplied to the grid. I've got to do calculations. And I never know if I'm right. Yeah, it's something that would provide those calculations in an easy way, right? They just without having to do anything extra, they would be that would be a good idea. It keeps it all simple. The current system administratively is from a consumer's point of view. It's just ridiculous. Certainly there was a or is a company set up for what they call it, so that you can check your power rates you're being charged against other companies. Let's assume they've got a particular plan on board which they didn't have with me. So was your time. Yeah, because everybody like most consumers have or if not all consumers, right, have their own life, right?

They're doing their things. Most of them don't have the time to do all of that. around with power prices.

Andreas Keating

Yeah. So if you had. If you could ask an expert in home electrification, one question, what would it be?

Lyn Dawson

I think probably the technology's changing pretty rapidly, which is great the big big changes in the 18 months that I've had my seat up and and was what would be recommended and um so that's that's that's that's that's all happening. uh what we've got to do now is just get it onto the roof. And not just homes, but also businesses. The school, the brand new school out the back of my place, which must have half an age of beautiful big rectangular roofs that get every bit of light that go. That could be a very good spot to put. Solar, like you said. I'm just out of curiosity. I mean do you mind explaining a little bit, like, by your um system at home, like, what happened to you involved in something like a sol? Right. My hand we' is um the technical stuff's all in phase. um which happened to be recommended by my installer and endorsed by my brothers as one of the best, probably about the best domestically in the world at the moment. And given that one of my brothers had worked in phase and R&D, although not domestic, uh is a good recommendation. The panels are sunpower performance six black, whatever that is, uh and my charger is an ethnics. My battery is a five kil hour battery. If I was doing it today, I'd put on a teen. They got teens the same size and that would probably sort me out for grid independence.

Andreas Keating

I do have just a couple more questions if we go back to the visuals and websites. So

what types of visuals such as charts, images or comparisons, do you think would best help everyday people understand? And feel motivated about switching to electric?

Lyn Dawson

Something simple that they can relate to. It has color. I'm not black and white, but not too complex and so not not um not complex. uh do you have a chance to look at a Rewiring Aotearoa website, so our main goal is to achieve something similar like that. Like the welcoming cartoon pictures, the simple graphs and the easy explanations ... to me now i'm the big objection I hear with people are it's so much money out front and at my age I'll never get the benefit. uh to which I count it with actually you get the benefit from day one, which is more than more than you get from the money sitting in the bank it's on your roof and it's generating and it's and it's generating um how do I put it the generating income and it's saving your income. Yeah. It's like a plastic income Yeah, yeah you can kind of use the power and everything. So it's nice it does give you a lot of perks that are very useful and don't it was a chart because you know, by the time you I've seen four, my are glazed, um and the other day at a meeting people slept out when they saw one pie chart. um and these would be the target audience. So, um, you know, I'm not I'm not being cliffant about this. uh I sort of looked at the guy who was going to do the presentation. I said you'll be lucky if there are four of us here you can you can understand them. um ... So uh it's um it can be near me vou know vou vou and then vou've got the nerds at the other end who are all into it. um and the guy who put in my panels I asked him about his customers and you know, uh he and uh I forget to tell it got round to his is the most difficult customers and she there very engineered because they look at the um of my panels are all each has its own in B boocher and that I can have a look at how each one is performing separately on my app, you know, if you want something to do on a cold afternoon, and and uh he said he's he uh sort of has to warn them. You know, they are all going to perform differently according to the way the sun hits them. And they do. um so you know, you've got the ner you've got the people

like me at one end and you've got the people at the other So you've you you've probably got to have a almost a range. Yeah, something that's for everybody, right?

Andreas Keating

So I do have one more question. So I asked you before whether anything inspired you and you said you were your pro-electric since you were born?

Lyn Dawson

I had no choice

Andreas Keating

That's awesome, honestly, that's awesome. So I was wondering if you, have you seen any websites, graphs, pictures of social media posts that you think explain well the benefits of electrification or that are motivating in a way?

Lyn Dawson

I haven't really looked for them. I am on the Rewiring Facebook page. uh some of them let me have a look. Some of the local contractors actually do put up examples of their work to show, you know here we are, we're local and I like that. um don't and don't identify the household um That's that's one thing. um Now I understand there's something there's a large number of New Zealand standards that have to be updated and I don't know what stage they are at. bring them in line with Australia and to make things simple, simpler there for the installers. um That would be helpful probably from a sales point of view and the installers point of view uh haven't heard anything about them blowing up or have been stupid as you get with the UVs. um I've did get the I've had the ones about the ones from was it solar City or the ones for the company that Black rock drove them broke? You closed them down just before Christmas and
how these people had been left on the lurch. But I have said as far as I'm aware they still have their panels on the roof, they might be in a very good position. Not a good way to get that way, but um I think they're going to be okay. Nobody's going to go, nobody's going to pick up a job going and picking up panels to dump them in , that's a positive way of seeing. It's definitely lemonade from lemons. um No, I haven't. I haven't actually seen much. It's out. I see the big solar farms on TV um but it's very hard to relate directly to those um you know and I have seen the odd one but uh yeah I think pushing the personal accessibility and that it's good for your pocket And it's very good for your pocket and particularly if you're tied them with an EV um which is what one of my daughters did she got well I did it too but she did it um she she got sold before I did, but she got her EV after me. She started a job up and she was living in Cambridge working at Hamilton Hamilton as a nurse the public transport was not really an option. First week cost about a hundred bucks. Week two, us hundred 30. She went on to trade me, got a used an old leaf for six and a half grand, and basically it paid for itself within six months. So um and it's a beautiful little car too. uh It's like what you oh yes um so yeah so it's got to be good for your pocket.

Andreas Keating

I do have another final question ... We plan to conduct our survey online. And you mentioned you're using Facebook for getting information about electrification. Do you think there's a good way if we post our survey on Facebook communities?

Lyn Dawson

Well, I'm on Rewiring Aotearoa's Facebook page, that's the main one I check, but I'm also in the New Zealand Nissan Leaf group and the Christchurch EV Drivers group. They all overlap. If you're into one form of electrification, you're usually interested in the others. I don't actively hunt for posts, so I can't give you a firm answer. Anyone scrolling Rewiring Aotearoa has probably filled out a survey already. Maybe try related organisations, groups where EV owners hang out. Those folks have already made big changes and are tired of petrol-head friends sharing EV fires stories, but they're the ones clearly interested in electrification, so those places might be the best way to go.

Andreas Keating

Thank you so much! yeah, I think you've satisfied all of our answers, and like perfectly we've really enjoyed conversing with you.

Lyn Dawson

Can I ask a question?

Andreas Keating

Yes!

Lyn Dawson

So, how many people are you talking with while you're here? And for the survey?

Andreas Keating

So. As many as possible, but we're in a time crunch. We're here for two months in total and have three weeks left to finish the website. So we have to stop at some point and start designing the website and then later we want to survey people on how good the website is and if it is any good. To see if we've done a good job!

Lyn Dawson

Okay! And are there just the two of you here?

Andreas Keating

It's actually three of us, but we have a teammate who's currently working on the website. So he wasn't able to attend today's interviews.

•••

Lyn Dawson

Well, good luck. Rewiring Aotearoa is excellent and influential. You're doing important work.

Andreas Keating

Thank you! And thank you very much for your time. You have a very good one. Bye!

Lyn Dawson

Bye!

XII. Simon Neale Transcript

April 17, 2025, 14:00 – 14:57 PM

Andreas Keating

So do we have your consent to do this interview?

Simon Neale

Absolutely!

Andreas Keating

Perfect! And may we use your name or do you wish to remain anonymous?

Simon Neale

You can use my name

Andreas Keating

Now that paperwork is out of the way. For the highest level of education that would include your master's degree? Is that correct?

Simon Neale

Yes, you are correct.

Andreas Keating

And for your current job title, which one would you choose? I marked all of them down because I didn't know which one you would prefer.

Simon Neale

They look fine.

Andreas Keating

Who would you say your employer is?

Simon Neale

I'm self-employed.

Andreas Keating

Self-employed? All right. Perfect. How would you rate your experience and expertise in electrification in New Zealand?

Simon Neale

In the electricity industry? Really, really high. In electrification specifically, probably fair to average. ...

Andreas Keating

How would you describe the importance of electrification in New Zealand?

Simon Neale

I think it's critical as we transition to net zero 2050. We have to get off fossil fuels and we have to electrify, but we've just got to do it in a manageable way.

Andreas Keating

That's actually interesting you mentioned that because I do, later on, have a question about when you think New Zealand would reach net zero emissions, but that is a later question. In your own words, how would you describe New Zealand's state of electrification adoption

today?

Simon Neale

Domestic electrification?

Andreas Keating

Yeah, the state of electrification in general.

Simon Neale

Progressing, probably, but a long way to go.

Andreas Keating

Are there any examples or observations that illustrate your view?

Simon Neale

So, I live in an old house in Kauri. My gas heating furnace blew up a couple of years ago. I decided that would be the perfect time to get off gas and switch across to heat pumps. I got the heat pump. People I found to give me a quota. Their quotas were something like \$40,000. The new gas furnace was \$5,000 and so I'm still on gas.

•••

I think one of the real struggles is the cost of retrofitting versus say like a new build. New build is a no-brainer. Why would anybody put gas in on a new build? Why would anybody not put a smart, you know, build that smartly? But when you're retrofitting old places, it's prohibitively expensive. You can't get the green loans for things like that. You can get a green loan for an EV at 0% for three years, but you can't get a green loan to retrofit your house.

Andreas Keating

Yeah, we've heard that the barrier for most people who like switching their appliances to electric is the upfront cost.

Simon Neale

Yeah, because I mean we've heard from a couple of people that like, because the long term is always beneficial, but is that upfront cost. ... I mean that example that I just used before, because it was an internal system you had to go and shift all along. You know, there was ducting and all sorts of things to get around. So because it was an internal system, the cost of retrofitting was so great. What's my payback going to be on \$40,000? You know, \$36,000 spread, I need to live there for quite a while to get the arbitrage of gas versus electricity. And you're still sitting there, you know, when you've got a reticulated gas running into your house and a reticulated electricity running into your house, you're paying the two line charges. So even if I'd got rid of the gas central heating, I still had a gas oven and I still had gas hot water.

...

I wasn't paying \$36,000 difference to put that in. So that's an example of how it's not working particularly well. Whereas if I'm building a new place, I'll retrofit it and do whatever I want from the start.

...

A lot of us have what they call a furnace. So the way that we heat our houses in the winter is that you burn gas and the heat from it goes through electric fans and goes through ducts into your house.

• • •

So you have a furnace that sits down in the basement and the heat is pushed out through ducting into the house. But the diameter of the ducting is different for a gas based system than it

is for an electricity based system. To be able to shift it around, you've got to go through your house. Through everywhere. But that is a big expense.

Andreas Keating

So, you sort of answered this at the start already, but I want to hear more of what you think on this. When do you think New Zealand will reach net zero emissions?

Simon Neale

I mean, we've got an aspirational target of 2050. It's probably going to take a bit longer than that. So you're saying a bit longer than 2050? Yeah, I think it will take a bit longer than 2050. Maybe 2060. 2050 is pretty aspirational when you have governments that are changing as frequently as ours do and such sort of diametrically opposing views.

Andreas Keating

Yeah, switching off the government does have a big impact. We've heard that multiple times from other experts.

Simon Neale

Well, completely right. You had the previous government who were banning all offshore gas drilling forever, which meant that you were going to have to get off gas a lot quicker than 2050. But now you've got a current government who says bring it on.

Andreas Keating

Yeah, that's a good point. So what are the biggest challenges to displaying the benefits of electrification in New Zealand?

Simon Neale

I don't think there are issues with displaying the benefits of it. I think they're just plots. You can see it. Everybody knows about the star ratings for things and what's better. I mean, people probably aren't as educated as they could be as to how electricity works and what it all means. When you're involved in the industry or when you're involved in the sector a lot, it's like anything. You forget how much you know compared to other people and you just expect them to know it by default and they don't. When my kids all moved into their first flats, I'd just sit down and talk to them about how electricity bills worked and what it meant because they didn't have a clue. They had fucking no idea at all. And so a lot of people out there don't know. And so, I don't know, maybe have some better campaigns, but then a lot of people out there don't have the time or the care or the money to know either. So, the problem with this whole transition to 2050 thing is those of us that are rich are going to do it really easily and we'll make money out of it and you have your Mike Casey's who are busy out there putting in \$50,000 solar farms and exporting back onto the grid and making a whole lot of money. There's a **** tonne of people that don't have \$50,000 and there's a **** tonne of people that could never afford to put a new electric oven in, whether they want it or not. And there's a **** tonne of people that live in rental properties that don't own any of those things and landlords that are just doing everything that they can to maximise their profits. So, it's really easy for rich people. It's really easy for those of us that can afford to do it, to do it. But for a lot of people, they can't even afford to pay their electricity bill now. So, how the heck are they going to be able to pay for really expensive stuff to make their bill lesser?

Andreas Keating

Yeah, that is a very good point.

Simon Neale

Also, if you put solar panels in your house and stuff, you cannot put in solar panels if you have a condo or other apartments. So, most people, like young people, cannot afford a house yet. They're not going to look into solar panels. They're not going to do any of that. No, they're not going to do any of that stuff. It's never going to happen. If you start to encourage landlords or you get buildings to be up to a certain specification, that they have to have them, it's a bit like organic vegetables in food and stuff like that. We all say that we want it. We all say that it's great. We all say that it's awesome. And then when we work out how much that head of broccoli costs compared to the other one, we go, actually, I'll take \$1.51, thanks very much. So, my kids are all probably your age, you know, all going, yeah, it's really important that we have all these things. But when it comes to actually writing a check out and putting their money in, then they go, well, I can't afford to have that, so I'm not going to have that. So, unless you have some form of subsidisation or some form of regulation for housing, especially housing that, to your point, housing that you don't own, how do you do it?

Andreas Keating

Yeah, it really limits what you can do.

Simon Neale

Massively. So, those of us that have got the money are going to do it easy. And this transition to electrification will be great, right? I went out there and I bought the Tesla, and I'm not paying petrol anymore, and I've joined up with an electricity company where I get free power from 9pm until midnight, and so that's when it charges, so it costs me nothing to run. So, lucky old me, you know? But I had \$75,000 to pay for it, too. Meanwhile, some family in Porirua is driving around in a \$2,000 beaten-up Toyota Corolla, and they can't even afford to put petrol in it. But, I mean, the neat thing about your example about solar is that you're starting to see people like Lodestone, do you know Lodestone Energy? Lodestone is probably the biggest

solar generator in New Zealand, so they're a privately owned company, but they're setting up a retail product which they call Virtual Rooftop, which is basically, instead of you putting a solar panel on your roof, you just have part of a solar panel in their wind farm, in their solar farm, sorry, and so you're buying from the solar panel, it's just not your solar panel, you're just buying solar power from a solar retailer.

Andreas Keating

Interesting, so it's like "owning" or "renting" a solar panel elsewhere?

Simon Neale

Yeah, well, you're either buying a share in it, or you're just a retail customer of, you know, you put money in to have a share of the solar panel and it generates so much, or, you know, I mean, you've got losses and things that come into it, but yeah, it's a clever idea.

Andreas Keating

It's a really interesting concept.

Simon Neale

Yeah. Look it up, Lodestone, L-O-D-E-S-T-O-N-E. It's called Virtual Rooftop.

Andreas Keating

So then you kind of, they kind of gain an income a bit on that solar panel that they "own"?

Simon Neale

Well, they can, or they can just say, look, even if it's not an income, you can just say, I really want to, I really want to be able to power my home with solar energy, I can't put solar energy on, here's a solar generator that I can buy directly from. So you don't even have to buy into it. You can just say, you are a solar provider. And then I'm not stuck with all of the repair costs and the maintenance costs and all of the admin and actually getting to deal with this thing or move around that stuff, but yeah, so I think poverty is the biggest barrier to electrification.

...

Andreas Keating

So, just to recap. We've talked a lot about the cost barriers. You've mentioned Lodestone and their virtual rooftops, which is very interesting and we will definitely look into more. For our next question, we'd like to ask you which quantitative metrics you use to judge progress in electrification?

Simon Neale

To judge progress in electrification?

Andreas Keating

Yeah, in electrification.

Simon Neale

I think, it's a tricky one actually, I was going to say, you know, just like an increase in kilowatt consumption, but that's not necessarily the way that it's going to be because if you're transitioning to greater electrification and you've got more efficient products, then you should be able to replace more and provide more.

• • •

I think it would probably be a reduction in the consumption of alternative fuels. So just that mix, and you're starting to see that comes through a lot more when you look at things that a system operator puts out. So, if I'm seeing, you know, a greater, a greater output based on renewables versus gas, then I think that, but it's got to be a longer term play, right? Because the New Zealand electricity system is so dependent on hydrology. I mean, if you were using that as the sole metric and you did that in winter 2024, you'd be absolutely screwed because we were running out of water and burning out a lot of gas and you'd go, oh my gosh, our transition to electrification is going terribly, but in fact it's not, we just had a dry winter. So, I think things like that, you know, you don't want to look at, I mean there was the EVs, it was really good for a while. The sales of EVs was great, and then Larkson came in and he removed all the tariffs and you saw them plumber off the face of the earth. So, you know, what's that telling us as a country? Should they bring those back?

•••

So, I don't know, I think you've got to use a combination of things, but I'd always start by looking at it as a long-term transition away from fossil fuels and into renewables. There's some really interesting metrics about the retirement of some of the older combined cycle gas turbines and things and the replacement of those and stuff, but see we're not really capturing very well that embedded generation. So when Mike Casey puts his solar farm down at Cromwell, no one's really catching that. So that would be a really useful thing to be able to see for us to be able to capture at some kind of national level the change in the number of people that are putting a battery in a solar panel or a battery-solar panel or combo on their property. Because that stuff's going to start to get really, really important for local network companies. I don't know whether you've started to look at that?

Andreas Keating

Well, we haven't looked at that many companies, we're mainly focused on individuals.

Simon Neale

So if you're Wellington Electricity and you are responsible for making sure electricity gets to all of that, you're taking it off the transpower grid and you are distributing it to all of the houses around Wellington. You know, one of the things that you've always got to... we're always focussing on in the winter time is what I call the peak capacity. You can't squeeze more electricity through a line than the line can actually carry. And if you try to do that, you start to have brownouts and blackouts and all these things, and supply becomes really compromised. And so you need to forecast really, really well what you think demand's going to be. So that when you're building your system or you're reticulating the system, just remember, one of the things that New Zealand's got that they've had for a long time is this thing called ripple control. Have you heard about that?

Andreas Keating

No I cannot say I have.

Simon Neale

So when people put their electricity whole water cylinders in their houses, they often have what they call the ripple relay switch on them. And what that means is that you can have electricity coming to your house and you can have it at two different prices. You can have a controlled rate and an uncontrolled rate. And the controlled rate has a separate metre with it, and it's basically your hot water. So I could be sitting in a controlled room in Wellington Electricity, and the peak could be coming up for winter, and I could be going oh shit, we're going to exceed it. Thank you very much. I can sit in that control room, I can push a button and I can turn off 10%, 20%, 50%, 100% of all the hot water cylinders in my region, right now. And only maybe only 50 of them are going to be heating, because the other 50 will be out of full heat. So maybe

I'll get half of them or whatever. And if you don't use hot water for an hour, you're not going to notice any of that because you've got the hot water stored in your cylinder and stuff. So one of the ways to do it is by using that ripple control, and that's why I keep it in the system. Now, if I'm in a well that's running electricity, and I've got a whole lot of people out there who have got solar panels on their rooms and generating their own electricity, or banks that are going how the hell do I forecast whether it's sunny or not or not sunny, or how much charge they've got in their battery or, it becomes much much harder for me to be able to forecast what you're going to be consuming from the grid, when you've got alternative sources of supply. And so that stuff, being able to know who's put solar panels in, being able to know who's got their own batteries in the house is really really valuable for the network companies, so they'll be starting to demand that anyway. But also really valuable data for you guys in your studies, because you go and, electrification you know, one of the signs that electrification is going well is we're seeing 3% compound growth annually in the installation of solar panels or something like that. So we're going to have like half a dozen military to catch them. Very valuable. Because especially, with all the changes and everything, at one point a certain metric could indicate something and then it indicates something. You get a dry winter, it all looks like it's going terribly. When in fact it's not. You don't see electricity consumption going up across the average household in the bloody Renew Era, which is a really expensive part of Auckland. You don't see average consumption going up, so you think, oh gosh, they must be really bad at electrification. But in fact what they've done is they've switched out all of their old assets to brand new assets that consume half as much, and they're actually twice as electric as they were, but you can't see that on the raw data.

• • •

Andreas Keating

So as you may already know we are working with AkaAke, and Rewiring Aotearoa, to basically make a website that, hopefully, it's good enough, it'll be an addition to Rewiring Aotearoa's website.

Simon Neale

It'll be what, sorry?

Andreas Keating

Like it will be an addition to their existing website, it'll be added there. And it's a hard task because they have an amazing website. We really like their website. So we're kind of doing these interviews and surveys to see what, so we're trying to motivate individuals and what would motivate those individuals and how to inform them better. So, what do you think would best motivate individuals to adopt electrification?

Simon Neale

Yeah, nothing speaks to people like money does. Yeah. So it's like what I was using before about my kids wanting to buy the organic broccoli, right, everybody wants it until you have to pay for it and then you go, hang on a minute.

• • •

Because they have so much stuff going on in a day. So that's where the whole social retailing concept starts to come in or a whole lot of these other interesting products that people are looking for. So you know, in the UK now, they have these, some of the retailers are coming out with these products where it's like a pump product, so you don't even need to buy it and you don't even need to control it. Basically, it's a little bit like what we do with solar panels, where those people were coming in and installing solar panels on people's houses and you were getting some offer but they owned the panels and then they would **** up because Blackrock, did you see that?

Andreas Keating

Yeah.

Simon Neale

Blackrock bought them and then they just let them turn to custard, right. So that was a good operating model. It was basically you'd see someone knock on your door and say, hey, want me to chuck some of my solar panels up on the roof and you know, you'll halve your electricity bill and you won't have to do anything with it. It's all good, right. There's products that are coming out in the UK now and you start to see them coming out here and there's a retail company here called Octopus Energy. Now Octopus is a subsidiary of Octopus Global. Octopus is the biggest retailer in the UK now. But they have all kinds of smart shit. So they'll have like a heat pump product where I come and I'll instal a heat pump in your house and basically what you do, I'm just making the numbers up here, but you pay me \$30 a month and I'll keep your house at 18 degrees and I'll control it and I'll do it all remotely and you don't do anything. So I sit there remotely and I turn your heat pump on and off and I manage it perfectly so that I can control your house. You do nothing, except just pay me \$30 a month. Same thing with EVs. They've got an EV product out there now that says I guarantee you that at any point in time when your car is plugged in, I guarantee you that your car will never get less than X percent because everybody needs X percent to be able to take the kid to hospital or go out for some emergency or something. I went out to get in my car because my kid had broken their leg and it was on fucking 0 percent charge and I needed 4 percent to get to the hospital and I'm going to be a little bit pissy with you. So you'll agree to some minimum and then we'll just say, alright, so I'll keep your car at a charge level for \$50 a month and I'll control it all remotely. You're going to take it because for those of us that are interested or care about it, we're going to be looking at your website anyway, right? We're going to be doing more and more and more. How do you

reach people? And other people that need it the most because they're the people that are actually running their properties the most inefficiently. The other people that are either living in the rental properties that have got no ownership dependent with leaky windows and shitty old insulation and whatever the heck it is or the other people who have got a crappy old oven, you know they own a house but they've got a crappy old oven and a seal and it's gone and it's looking like nothing but a can of food for \$50 for a new seal.

Andreas Keating

Yeah. That's one of the biggest reasons why we want to do a survey so we can reach more of the average New Zealanders so that we can better understand what they're looking for in such a website. This way, we want to refrain from surveying people in the Rewiring community because we want to avoid biased opinions. And of course everyone there will be in favor and well informed.

Simon Neale

Correct. They're all rich nerds like us. They're all fully into this and they love it, they think that it's cool. When I build my house in Central Otago, I will absolutely be soldering and battering it up the wazoo and making it as efficient as possible because I can afford to and I care about it and to your point, it's going to save me money. If I've got to live in this place for 20 years it's going to pay for itself. You've got Octopussy out there now who are looking at building zero consumption homes or zero electricity bill houses so when you're building a house, it could be designed to have zero people. Your electricity bill will be zero from day one but you've got to be able to, you've got to top in the town that you're talking to, they love you, they love everything you do, they love everything about electrification and they're buying right into it. Middle New Zealand, when they go to replace their stove, they probably will look to replace it with a better one and it shoots itself but they're not out there actively pursuing it and if

somebody did come along to them with a neat product that didn't cost them very much money that they could pay if I don't have to the banks were really good at this for a while and I think they're still relatively good but when I went to buy the Tesla, ANZ gave me a three year zero percent loan to buy it because it's a green loan, when you go and put double glazing in your house or insulation in your house they will give you a three year zero percent loan to be able to do that. If you could convert that into a more retail based product where you get a zero percent loan to put solar panels on for three years and then just pay it back at X, why would you not? So it's that initial outlay that people can't do so if you could get financial institutions partnering up with technical teams, like the heat pump guys, so ANZ ponies up with Mitsubishi heat pumps or whatever and starts going around and knocking on people's doors in the poorer suburbs because you can't put it on me, you can't put it on the website you can't put it on the news, you can't put it on this, I'm not going to look at it, I don't have time but if you knock on my door one day and you say, what kind of heating have you got in here? And they go, oh we just use the oven and you go. I'll tell you what we've got this thing where it costs you nothing to put a heat pump in and your house will be heaps warmer and you pay less, there's some really really interesting, it's a shame Miranda's not here but there's some really really interesting community based, social based things that are doing that at a small scale, but to do it at a big scale would be awesome I can send you through some details of a couple of people that you could talk to that are doing these things in smaller regions.

Andreas Keating

Yeah, honestly, we have done a lot of interviews with experts and stuff, and we're kind of nearing the end of...

Simon Neale

Oh, you're riffing it out? You're finishing?

Andreas Keating

In a sense, we kind of have little time left, because we have to, because it's... So our project is like two months, it's a university project. So then we're like, we have three more weeks left. Yeah, we have to narrow down the ideas. The interviews, we're trying to do like student surveys to get a bit like non-biassed view.

Simon Neale

There's still 50% of the people out there that can't afford, time-wise or dollar-wise, to be able to do any of those. There's 50% of people out there that don't live in their own home. If electrification, apart from your EV, if electrification is actually all about domestic electrification. Because the big places are doing it, Fonterra's doing it, Blue Steel's doing it, they're all going from coal furnace to electric furnace, and they're all doing it because the combination of carbon taxes and increasing fuel prices is forcing them to do it, so it's making money. So the industry's going to do it just fine, don't worry about that. We've just about got rid of the last of our wood processors, which is good, because they were a dying business anyway. Whilst they blame the electricity price for leaving, there's actually a combination of the electricity price and decreasing commodity prices and increasing input prices, and you can't be a... Nobody wants pulp and paper anymore. We don't write anything. We don't do anything, we don't buy books like we used to. So all of those things are all kind of changing around. So it's that great untouched. So we'll get so far, but maybe that's like 60% zero, and the other 40% zero, someone's going to have to help. At first when we did our community interview, we were hoping to get some negative feedback from people, like we don't like this transition or something like you mentioned. But the community that Rewiring has is just such a supportive community. Of course they are. Which is why you've got to interview outside of that community to get the... Of course they are, they love it. Half of the Rewiring community are providers of the technology, so they're right behind it.

Yeah, we love it because you're going to buy our stuff. That's why we kind of designed this survey to kind of do what you said, like kind of... Well, surveys are answered in a regular fashion, right? We're thinking of sending it out, finding a community to send it out that's not a Rewiring community or a community that's pro-environmental. Not even negative, just a community, right? We can send it out and get their opinions and see what their feedback is. Yeah, so we could get you team email addresses for people to send their survey out to. That would touch a completely different community to the Rewiring community if that would be useful for them. But that's the hard bit. Your website's going to get looked at by anybody in Rewiring. It's going to get looked at by... I mean, why do Rewiring want to build another website or add on to their website? What's wrong with Aker's website?

Andreas Keating

So they want to motivate people. They want our dashboard to serve as something closer, something more friendly to people. We're adding to this project as finding a solution to motivate people. We're not 100% that they're going to use our dashboard. They might make modifications to it once we have handed it to them. That's going to be something... We've worked on several things for them. Hopefully they use it. It's really interesting that you mentioned their website is already so good.

Simon Neale

Well, this is the thing. We're all guilty of going. There's lots of things that are okay out there, but we can do something better. It's like, do we want to add a 15th website that looks at some of this stuff to the mix so when you Google something it tells you to... Or do we want to work with... I don't know, have you had a good look around that Aker website?

Andreas Keating

Yeah, we have. We've been reviewing case studies where we analyze websites to see what works and what does not. We cited them a lot in our paper too.

Simon Neale

Yes, they do a lot of bits and pieces. ERAN is the organisation that I'm with. It's doing a lot of educational stuff about how you can use less power or how you can manage your power bill, but it's not really about electrification. But Aker had a really good... They made a short film, like a skitty thing a while ago, where they built a little replica house. Have you seen that? And they lifted the roof off and said, when you're building a home you can put this in or you can put that in or you can do this or you can do... Have you seen that? No, we haven't. I looked up their website and the thing that caught my eye is they talk about community stories. They share a lot of stories about people... Yeah, they had a campaign a little while ago. I'll send you the link to it. It was quite interesting as well. But that sort of merging of things, I just think there's a whole lot of clickbait. Just asking a question.

Andreas Keating

No, you're right. It is a good question. So Rewiring Aotearoa saw that two of us were CS majors so they wanted us to make a website. So we're trying to help and provide a dashboard that they can hopefully use.

Simon Neale

And that's great. They might give it to another website at some point to use or there might be links to all sorts of things. You could link it from anywhere or do whatever you wanted to do.

Andreas Keating

But you are right, we have a question because the first thing we did, I remember, we looked like we were great, so many ideas, what can we do? And we looked at their website and it's a very strong website. It has so much. It is a challenge seeing what we can do to add to it. Yeah, we felt like every every idea that we came up with to add on to a website, we would then find that they already had it on their website.

Simon Neale

Well, they're clever geeks, right? If you look at Mike Casey, for example, hell of a smart guy. He made his fortune with an IT business in Sydney. So this guy got rich off his own bat by building up, I don't know what it was, it was a recruitment thing or something. ... He sold a Sydney-based IT business for about 20 million and then decided to move to New Zealand and electrify a charity auction. That's amazing.

Andreas Keating

We talked to his project manager, like an orchard manager. So he has invited us to go to the farm to visit. I don't know if we will have time, it's in Queen Town, it's quite far.

Simon Neale

Yeah, but if you're over here this far, you should go to Cornstead. It's in Cromwell. You should go. Have a week off at the end and go. It's a beautiful part of the country. I would think about it. Seeing a full electric farm, I've never seen a fully electric farm. It has to be one of the few in the world. Yeah, and he's being invited everywhere. But the whole reason that this guy's doing this is because he sold a 20 million dollar business, right? This is his hobby. And it's actually just turned in, it's morphed into this incredible new career for him now, which tends to happen to these people who are entrepreneurs. But the only people that can afford that, that can do that are the rich people. Do you think the family in Mangere, where there's five people

sleeping in one room, do you think they even know about Mike Casey and his electric auction? They've got no idea. But it kind of serves as an example for other farms. Don't get me wrong, it's fantastic what he does. And the fact that all of his IP is all freeware, and he shares everything that he's doing, right? He's talking about the electricity system that he's put in. So don't get me wrong, I think the guy's doing incredible stuff. Amazing stuff. And he's showing everybody that it can be done. And he'll absolutely lead the charge globally, I think, on that stuff. I mean, he's being invited to the States to speak, to AgriSector, about what's going on with these things and these bits and pieces. So he's great, but he's not touching the untouched. And no matter how great your website is, it's not going to touch the untouched. So just think a bit about what defines the success for you guys and your project. As a result of this, you can come up with this amazing product, tool, whatever you want to call it, that means that 20% of New Zealand farms end up being fully electric by the year 2035. What an awesome outcome. How cool would that be? It would be an amazing thing. But yeah, you're not going to be able to be the answer for everyone. Because there's a whole lot of everyone out there that the answer can only be through social intervention and financial assistance. Not everyone's going to believe they can save money. Not everyone's telling people it's not going to cost them anything, but they're going to save money. If they go and save \$20 a week, that means a heck of a lot to me. That would make my life quite different. And that's not what your website's going to touch. So if you've got a professor or a supervisor or whatever you're doing there, and they're sitting there going, we need to work out how to get this website up and running so that it reaches out and really encourages everybody to want to look at switching the old oven out to a new oven, I'm just going, mate, that's **** impossible. I can't do that. I can't do that for this whole section of the population. Because they're never going to go there. Sorry, what other questions have you got? Honestly, going off the bandwagon,

Andreas Keating

Simon Neale

The more the better. You're right.

Andreas Keating

So on the topic of websites, are there any existing visual solutions or pictures or graphs?

Simon Neale

I think the Echo one that I talked to you about is quite useful from a household perspective. And I'll send you through the link to the specific little thingy-it or whatever that kind of thing is that I watched. Yeah, I'll have it for you for that. It's clever.

Andreas Keating

That would be perfect. Are there other online businesses that are fairly well in communicating progress for electrification?

Simon Neale

I think the Rewiring stuff is good. They do a good job. Mike Casey and Rewiring are really, really active on the socials. I mean, I've only got LinkedIn. It's the only social event that I've got. But they're really active on that. Very strong profile. Yeah, really strong profile on all the shares. That's good too.

Andreas Keating

So why do you believe the Rewiring website is really good?

Well, I just think it's good for me because I'm interested in seeing what's going on. I'm a geek and I like looking at their geek stuff. So it's good because that suits my interests.But it's only good for people like me who are interested. We're already quite active, right? ... All right, we've got a couple more minutes.

Andreas Keating

Yeah, yeah. We have a last question... or comment actually. So, normally we'd ask for other experts, but since we don't have a lot of time. We've run out of time for more experts. So you said you'd send us emails for non-biased people?

Simon Neale

Yeah, I'll talk to Miranda. It might not be until next week that I send you the email list of people that you could send a survey to, but I'll definitely send you the link to the ICA house thing. Have a look at that.

Andreas Keating

That will be perfect. Yeah, well, yeah, that will be it. Thank you very much for your time.

Simon Neale

You're very welcome.

XIII. Jaydan Salzke Transcript

April 17, 2025, 16:07 - 16:54 PM

Andreas Keating

So, OK, so more demographic questions. Your highest level of education, we've looked at your link. I have a master's degree in climate and science. And policy. Is that correct?

Jaydan Salzke

Yes, I haven't finished it, if that matters. I'm finishing at the end of this year, but yeah.

Andreas Keating

Oh yes. It's fine. It's perfect. And for your job title, but ecosystem lead. And your employer at Rewiring Aotearoa.

Jaydan Salzke

Yep.

Andreas Keating

Perfect. OK. So how would you rate your expertise in electrification and New Zealand? It can be if you wish or anything.

Jaydan Salzke

Oh. I've got 8. Maybe because I feel like I'm a lot more educated than the general public, but compared to some of my colleagues, I'm not educated at all.

Yeah, well, that's still good. How would you describe the importance of electrification in New Zealand?

Jaydan Salzke

I now understand that it's probably the most important thing we can do this side of 2030 to achieve our climate ambitions. So if I had to rate it 10 out of 10.

Andreas Keating

Perfect. All right, in your own words, how would you describe New Zealand state electrification adoption today?

Jaydan Salzke

I'd say we are lagging behind. Not for technological reasons, but for political and social reasons. That, yeah, our adoption. We're kind of poised, we're poised to do a lot, but we haven't yet actually realized that. And I have lots of encouraging conversations with community members where the people who are now getting very vocal about it are very excited about it. They want to pass on the Gospel of electrification. But yeah, I don't think our adoption is nearly as far as it could be yet.

Andreas Keating

That's a good answer. Are there any examples that you believe or observations that you believe illustrate your view?

Of why it's not of why we haven't gone to find adoption yet. I think the one I keep coming back to because I'm Australian is the fact that we have about 3% rooftop solar penetration whereas Australia had 40% average just the other day. That feels like a big one for me. And the fact that then people, whenever I present that to community groups, because I do lots of speeches or present on behalf of rewiring. A lot will go. Oh yeah, that's because we're not as sunny. As Australia and the for rooftop solar doesn't make as much sense here. And that's just not true either. The and. So yeah, there's a couple anecdotes here.

Andreas Keating

Yeah, well, we've heard that Australia has, it's very interesting. We were speaking during our previous interview. They said that even in certain areas. In Australia you have to pay when you overproduce to sell back to the grid, right?

Jaydan Salzke

Yeah, that's a brand new thing that I just brought in. It's not great, but it's their way of going instead of addressing the infrastructure issues that we have or predicting like doing a good job of predicting the future, where there's going to be a ton more EVs, it's their way of just bandaging a problem. Unfortunately, yeah.

Andreas Keating

Yeah.So when do you think New Zealand will reach net zero emissions?

God, it's so hard to. I was with one of my colleagues last night too, and he was talking about like, what does? What? What? What were they? Was he talking about basically like 2050 like all the things that would have changed and I was like, I can't even. I've only been alive 26 years. Like I can't imagine what another 20 years will do to society.

Andreas Keating

That is good.

Jaydan Salzke

Look, I don't. I don't think it'll be before 20. I'm gonna go. I'm just gonna go with what? We said it would be, which is 2050.

Andreas Keating

OK, *perfect*. *I mean*, *yeah*, *it is a hard question*, *but we yeah*. *What are the biggest challenges to display the benefits of electrification in New Zealand households?*

Jaydan Salzke

Normalization is a big challenge. That's like what? What helped it go really fast in Australia and this will happen in New Zealand. But in terms of how fast it will happen, we don't know. Are people seeing their neighbors doing it? And therefore they want to do it too. And people hear from the people at their church about their savings and they, they, they're at a school PT or whatever those things are called PTA meetings and the other parents there are talking about how much they saved money. On their rooftop. So like that normalization of it. Is yet to be a thing here because again, we have like 3% solar uptake. It's very normal to have a heat pump in it in New Zealand, although less normal than I actually thought it was. I'm in one of the flats that got one for like I'm a renter and we got one for free. I don't know. The landlord probably paid for it. I don't know, but it just turned out one day and we weren't cool. That's become very normal. And then in Australia, for example, in terms of people talking about? He pumps in knowing what a heat pump is. But solar and a few other electric machines haven't yet. Can I get you to repeat the question one more time because I had a second thought and I think if you say the question again, I'll remember the second thought.

Andreas Keating

Of course. What are the biggest challenges to display the benefits of electrification in New Zealand households?

Jaydan Salzke

I think the other one too is seen as a rich person. If you have a lot of money, you can do it. And if you don't. Yeah, it's the Tesla driver problem, right? Is that the people who own Teslas are the rich and you don't feel like that represents you. And so that's normalization as well. It's like you don't feel like it represents you until it's available to you and people around you are doing it and being supported to do it because it's not going to happen.

Andreas Keating

Yeah.

Jaydan Salzke

Organically, for our low income communities, yeah.

Andreas Keating

Yeah. But we just have the conversation with the expert before you. He also mentioned that it is the most popular. Population in New Zealand is like people who cannot afford much stuff that we are looking forward to motivating them like they're just looking forward to, like beta electricity bills. They're looking forward to going to work and getting paid for it. So they have too many things to overwhelm them. Yeah, there's much going on. There's too much that they have going on in their lives for them to worry about actually is what we found and also not just that, but we feel like from the comments we've received and answers we've received like the upfront cost does set people back right, not every. Can afford it or some cases where economically it might not make sense or. Here and there. So yeah, yeah.

Jaydan Salzke

Yeah. The front cost is the biggest thing. Rewiring and solving. It's like our main reason for existence I now underst is how can we solve the upfront cost issue? I think that's another big pillar that surrounds the upfront cost issues such as how do we solve it for rental and how do we solve it? For Mara, like Marai and Melody and how do we solve it? Like people who are old enough to access loans like that, that is seen as a valuable thing for the bank. So. There's the kind of things around the upfront cost issue, but certainly that's the biggest barrier.

Andreas Keating

I feel like from the conversation we had before. He said he is pretty good with his income and everything, but he also doesn't want to switch out to electric appliances because it's too much for him. Like if he goes electric, his whole house, he has to get a new conducting vent and everything and the whole system. Gonna cost him like 50,000. So like, he's like, that's not something he wants to spend money on. I have a question about

that 'cause. So he mentioned he has an old Villa. So it'd be very expensive for him to replace. His appliances and machines, he didn't replace his car because I feel like that's more of a doable thing. But like for his heating systems and everything. Because he said no, he didn't just want to do one thing. He wanted to electrify everything. If he was doing and they, he said it was, what, 50,000?

Jaydan Salzke

Yep.

Andreas Keating

There's quite a bit, so I was wondering, is that a very common thing in New Zealand where there is it? Are there a lot of old houses or houses that are electrified, do you think?

Jaydan Salzke

Yeah, they're definitely nuances to it. Like there's some houses where, like they've had gas forever now and like the pipes have, like the pipes already there. So they're like, yes, the cheaper thing to do in terms of upfront costs like the, the, the won't cost 50K is just to keep using those pipes. But the lifetime cost thing is different. And so and and I'm. I do certainly hear stories of people who like they're getting quoted these ridiculous figures to remove. The fossil fuel. Appliance from their house and so like I mean I just go well, just turn it off then just like obviously isn't ideal because it's still there and maybe it doesn't look nice or whatever and and you have a mental thing where you're like, I don't want something that.Useless. Sitting in my house. But if it's going to cost you 50K to do it, I'll leave it like it's like a fireplace that you never use. That's that's not. I don't think that's a huge deal. Yeah. So there's definitely fringe cases of it. I don't think of one of the

problems I think about. With many things, I think this applies to many different circumstances. Is that those fringe cases become the dominant story, so it's the same with EVs that have caught on fire. Is that, like everyone knows, the EVs can catch on fire because we hear those news stories and those stories get told a lot, but it's like they catch on fire less than in a petrol car.

Andreas Keating

Mm. Yeah.

Jaydan Salzke

And so. But like, that doesn't matter as much, because those are the stories that get told. So I think we're going to continue to have the stories about, oh, it would cost me 50K. And the unfortunate thing, I think what happened there is that would then put us someone who it's not going to cost them 50K. And really, that 50K isn't such an issue if you just don't get rid of the gas. To my understanding, that's my understanding of it, yeah.

Andreas Keating

Yeah, you're right. I do feel like people, well, as humans, really. Kind of like listening a lot to the negative, like news writer information. That's like, that is a good word. So you.

Jaydan Salzke

Yeah, it's the same. When people say, oh, I asked a solar installer and they said that my roof isn't tilted the right way and so it doesn't make any sense. Whereas like Josh on my team tells me, and again I'm not the energy nerd, but Josh is much smarter than I am. And he's like, no, at least 80% of New Zealand houses would still save money from getting rooftop solar and have roofs that can take rooftop solar and get the benefits from.

So I'm like. These fringe cases and these people getting like one opinion of one star. Installer who maybe is working on what they learned five years ago at a course like yeah, I don't think that's the truth across the board anymore.

Andreas Keating

Yeah. So you mentioned you went to Australia to see how you could measure progress. So you're the perfect person to ask this question to which which would be, which quantitative metrics, and when would you use to judge progress and electrification in New Zealand?

Jaydan Salzke

I think it's all the uptick has to be one of them. I think it'd be cool. I don't know how this works. So again, that's your issue to figure out. I think it'd be cool to include how much people's bills drop and how much people save financially. Because that's massive. Like, that's one of the big reasons we're doing it. Obviously emissions like how much of that emissions is attributable to energy now versus. In 20-30. I don't know if that really helps us with measurements over the next two years though, because like, I don't know if it's if we're gonna, it might be incremental between now and two years time solar uptake. Like there's some of the obvious ones, like how much gas we import, how much coal we import. We need to talk a little bit less about how renewable our grid is, because we're already at 80% or whatever it is like and we need to talk more about how much we're using fossil fuels for. The stuff in our homes, the appliances. How much?How better off we're able to keep our hydro storage for those dry days and and the days where we have peak energy use, that could be another quantitative thing too, yeah.

Yeah, storing energy is like a big problem because even though you're making energy from like a solar or something, the solar, they have to store it and then they have to send it to people. And while people who're gonna like it, lose. Like 10% of the production already. So it's like a big thing.

Jaydan Salzke

Yeah, yeah. Which is funny to me because I hear you say that and like. In an ideal world, yeah, we don't lose 10% in that transmission. But my brain goes. But we're accepting the fact that in our petrol car only 10% of the energy used to combust that field source actually results in the car moving forward. So in that case, we accept 90% loss of energy. But like when it comes to solar.

Andreas Keating

A very good thing.

Jaydan Salzke

And transmission is like 10%. Oh, that's a big issue. Like. Yeah, it'd be nice to solve that. I agree, but that's a way back from going. We need, like let's let's do it, you know.

Andreas Keating

Yeah, you're right. And not just that, but like the petrol for example, the gas station has to get there somehow, right? And normally get there through trucks that are burning diesel
or petrol as well. So it's, you know, it's not super efficient and it does take a lot of energy from what I understand. I'm not a super, but it takes a lot of energy to create liquid energy, right. Kind of like petrol.

Jaydan Salzke

Yep. Yeah, you're onto.

Andreas Keating

But my good point you raised. So what metrics do you use? Oh, there's. I'm sorry. All right. Yeah, this one. So the next questions are kind of more focused on our website because we're kind of designing a dashboard to hopefully add to the rewiring website which is a really good website. So it's a challenging thing, but what visuals do you believe would best convey the benefits of electrification in a motivational way?

Jaydan Salzke

Yeah. I mean like charts are cool. There's not a funny thing to say. You got the data nodes, you think charts are cool? Surely. But like a pie chart? That's like we are. We work here or we are here, or we're going here. That's probably where my brain starts.Is we going? That would be cool. I think maps are also cool. Like to show how much of the country has electrified. Like and so it's not. Just like the map, the New Zealand.Glyph is filling up, but it's like looking how electric Christchurch has become and maybe that brings a bit of competition to Auckland to be like, why aren't you as electric as Christchurch is? That could be quite a cool visual and some other map features. Like I like big numbers, but my problem with big numbers is if they lack context, they don't actually motivate you. So I like the question about motivation. Like if we just include

372

how many kilowatts? Like I still don't really understand what a kilowatt is. And I've been in this job for six months. And so like, I don't think, I don't think that's gonna mean anything to people. Maybe in dollars, will 'cause everyone knows what dollars are, but I don't think a big number that involves kilowatts is or even as much as I'm a climate nerd, I don't think a big number around CO2 really helps. Percentages are a bit better. And then you can be like, oh, we have slashed 10% of New Zealand's emissions. I don't know when that's gonna happen. That could be six years from now, but we've slashed 10% just by doing this like that. That would be again easier to understand, but I do think numbers have to have a bit of a caveat. Someone on our slack. I'll see if I can find out while we're talking. So they don't hold us up, but someone asked recently who shared a really cool visualization thing. That did a good job. Of this, I'll see if. I'll see if I can find it, unless you guys know what I'm talking about. Up to that very vague description.

Andreas Keating

OK. No, honestly, that would be probably if you could set up. Because yeah, I do.

Jaydan Salzke

Yeah, I'll. I'll try and find that.

Andreas Keating

I do agree. With what you said with the numbers that without context right are not very motivational like we looked at, A2 looked at a lot of case studies on websites and we found a couple websites that were very well done like the first. One that comes to mind was the Indian government's website to raise awareness on identification and climate change. And it's very well done, very interactive. A lot of graphs. Almost no text. That kind of like that backs up what you're looking at in a way. And there's like, I feel like that's also, yeah, like you said, important right to kind of put in context everything 'cause. Otherwise, it's like you said, view them as numbers.

Jaydan Salzke

Yeah. Actually, let's be really selective about the numbers we put and add text and adjust those numbers because if we're like, no one's going to read that context, probably. But so the number needs to stand on its own as well as have some real suitable like receipts. That people can Fact Check it.

Andreas Keating

That's a very good insight. So going back, sorry, going back to the previous question about the visuals, can you recall a visual presentation that or any any visual presentation that particularly motivated you? Like any website, any video, it could be videos anything kind of like the way it described.

Jaydan Salzke

Yeah, I mean, I'm obviously quite biased towards. I like rewiring a little bit.

Andreas Keating

We're like that. We like it so much.

Jaydan Salzke

Yeah, I and I think a lot of how Mike presents it is really quite good too. If you've had a chance to check out any of his videos of him talking, I think he's very good at that cut through. I like that I might just talk a bit vaguely. I really like it when it's humanized, like

the thing I love most about the have you guys been on the electrify 2515 website? No, that's cool. It's for the like rewiring Australia their pilot program. What I like most about their website is that when you open it up, there's a picture of people on there and it makes it obvious that this is for people. So I really like it when visuals are like, yeah, the stories behind it like my background is in teaching and then in copywriting and now in climate. And always what I've tried to do is storytelling like I don't think numbers and graphs and stuff work. For some people. But I think the rest of the people need a compelling story. And so yeah, I think I respond personally a lot better to the stories than the others. I didn't have specific examples. Sorry, but.

Andreas Keating

No, no, don't be sorry. That's why that helps because we're kind of like seeing how we want to display information in our website and that's so we're also thinking of doing a survey to kind of reach out to non experts in a way. So I think you're sending it to communities and that's one of the questions we have, which is what type? How do you prefer can?

I can't exactly remember what it actually says, but it's something around the lines. Like, how would you prefer? Data to be presented. I think we have personal stories and stuff like that. Like that you just went like comparisons as well. Like you mentioned before. So yeah, that helps a lot.

Jaydan Salzke

Yeah. I quite like it and I think about things. I think it's true that things do just need to look pretty as well at some point, like people will respond better if things look like I love what Tesla does. I don't have a story, but I love what Tesla does on their app, where people from the community have shown me that the battery is literally sending power to my downstairs. My upstairs and back to the grid or to my EV or whatever it might be. And I have this really cool visual like it's a flow chart or a diagram or whatever you want to call it, but it's also just very pretty. And that makes you want to go back on that more or like when I use Genesis for my power and when I login it doesn't. This part of the app doesn't tell me anything, but I love how pretty this little house is, you know like.

Andreas Keating

Yes. Yeah, design is important.

Jaydan Salzke

That makes me more interested in it. Yeah, in the like the progress bar, which is the more actual helpful thing. Or the big dollar figure, but this helps me engage with the page as well. So like I said.

Andreas Keating

Yeah, that's great. Thank you. Thank you. That's a good insight. And what? What did you say? The app was with the test lab and you mentioned electrical. Oh, perfect. OK, we have a rabbit. OK, OK, so. This is kind of a similar question, but are there any existing visual solutions like pictures, graphs or other online presence with that farewell in communicating progress for electrification or climate targets, are you assuming?

Jaydan Salzke

I like what planetary boundaries do. It's probably not quite as pretty as what we're talking about, but it's very clear in terms of. If you know what the planetary boundaries are. That looks like they are called planetary boundaries. Have you seen them?

Andreas Keating

We haven't.I've marked it down to look at it. Number I don't think we've looked into that one.

Jaydan Salzke

I'll give you the very quick version of it, it looks like. Here's 2023. It looks like this. Where the home is in the middle of the earth. Sorry, in the middle is how much of this is climate change CO2 emissions. If that's how much the Earth can handle. And here's where we actually are in terms of exceeding that boundary. And then the next one over might be like. Ozone depletion, and it does the same thing. And so it shows us what the safe level is, but then it shows us how far over that we are. So quiet. I quite like that. It also very much shows that there's eight different ones. It's easier to compare it across time. It's not super pretty, but it's very informative.

Andreas Keating

I kind of like the way it displays that information, like the planet. That's a very creative way to do it, though. We will look into it, that's for sure.

Jaydan Salzke

Yeah, another one that's quite similar is donut economics. And they do very similar things. Yeah, donut economics. Where they measure how much we have exceeded our social foundation. So, like poverty, education, etc. It is like it goes into the middle and how much have we exceeded our planetary boundaries? Which elect climate change and ozone depletion. They do it on the outside as well, so I think that's I think they do a good job of it as well. I also like bubble charts where things are bigger if they are bigger. Did that make any sense?

Andreas Keating

Yeah. I think they're kind of, yeah. Well wait, displaying information. Well, yeah, these are. We'll definitely look into that honestly, because there's so many ways of, like different charts and ways of displaying information that everybody has. We haven't had the same answer for this for like a preference in this. So everybody said different things, which is cool to see and we'll kind of, yeah, we're kind of exploring all and to see and inform ourselves a bit better. Why do you believe these are effective for communicating with the public?

Jaydan Salzke

Well, I mean the, the, the stories one I think is because people don't relate to abstract concepts. People relate to people. And so that makes it more real. Anything that involves like dollar figures, again that people can relate to that I, I think relatability I guess is the real answer. Even the fact that there's a picture of Earth in that planet thing I can understand the fact that we shouldn't, we shouldn't go. Above what our earth can contain. And so, yeah, I guess that they're easy to understand. At a quick glance, but they're relatable. Yeah, that'll be my answer.

Andreas Keating

Perfect. So when have an interview? Anyone to live in a condo or apartment? So we would like to know, like, do your condo or apartment have solar panels or they have like, oh, everything is like electric fire or anything.

Jaydan Salzke

So we don't have solar panels or a battery, but everything in the house is electric. I'm just a renter, so I didn't control any of this, but electric resistive water heating and then electric heat pump and then an induction cook top.

Andreas Keating

OK, perfect. Do you have an EV car by any chance?

Jaydan Salzke

No, unfortunately both my flatmates have petrol cars and then I drive an E bike. I ride an E bike.

Andreas Keating

Oh, it's pretty cool. OK, again. We haven't had anyone run an E bike, so I would like to invite you too. Est make it different from a normal bike like a. Is it like a bicycle? Is that what? Yeah, a bicycle is OK.

Jaydan Salzke

Yeah. Yeah, it literally just looks like a bicycle.

Andreas Keating

So for those do they from? From what I understand, because I'm from Vietnam, we have a similar type but you can charge it and you can use it like a small scooter. If it ran out of battery, even paddling it and then it.

Jaydan Salzke

Yeah.

Andreas Keating

Become like generating electricity. Is that like the same type?

Jaydan Salzke

So the battery is just removable off the back and I take it off and I put it on charge for like one or two hours. So I've never timed it and it goes back to full. If on a couple of occasions I've it's never run out on me, but. I've had some weird technical faults in the past, and in those cases I can still pedal. It's just a lot heavier if you're pedaling without the battery because it is a bulkier bike than just a road bike. But I love it mostly because. Auckland is very hilly and I have no problem on any hill with an E bike.Plus I get to be outside. I don't really want to be trapped in my car or trapped in traffic. I had a car back in Australia, a petrol car and just like I just think it makes you a W human, you just get angry at other people and you just like you hate your life. You become very insular. You think the world is an apartment to get. You stop being curious about the world around you, whereas like on my ebike I'm constantly stopping and checking out a cafe. Bookstore or Pulling over to the side of the road just to check check something on my phone or send someone a message or like I can do all that stuff so much more easily because I'm I'm a lot more mobile, but I do drive a lot of EVs I dro. 1:00 today. Because I used a car, the car sharing services vary quite a bit, especially for work. So yeah, I do. I do Dr. EVs a lot as well, even though I don't.

Andreas Keating

OK. Yeah. My next question was, do rye like a bite like a E bike to your work? Because a lot of people I feel like they don't want to do that because, like all sweaty and like, they don't like to start our day with, like, sweatiness.

Jaydan Salzke

Yeah, yeah, I do ride it to work and I don't sweat because it's an ebac I would. I wouldn't personally ride a normal back to work for pretty much that reason you just said. But if I want to put in zero effort, I can basically put in zero effort. I just turn up the E functionality as high as it goes if I want. If I feel like putting in the effort she doesn't often I'll turn it down. So I don't find the sweat saying no concern, yeah.

Andreas Keating

EBay is great. I have one back in Spain and I truly love it. Well, I ride around my dad a lot and they're. I think they're great. So it's even cleaner than an EV.

Jaydan Salzke

Yeah. It's just, it's just a lot harder to convince people to give up a car for a bike. Whereas I did it for climate reasons. You can usually convince people if their climate is interesting. I've come to understand that lots of people just wanna do the thing that they've always done. They just wanna heat their homes. They just wanna drive a car. They just want to and that's why we have the problem of people replacing lack for lack is because they're just. To it, they're used to going to the fuel pump. They don't understand that there's a

better way, and so if we can replace like or almost like, which is an EV, great. If we can't. If we can get them to go to an E bike or to public transport, even better. But an EV is just as good. And we, we don't need to sacrifice better for the sake of hope that we might reach perfection.

Andreas Keating

I think you're right in. Yeah, just the convenience of a car, right? You can go anywhere with a car, but I'd argue well, at least, at least in in Europe, when I'm doing stuff in the city, I prefer either walking public transport or there's even, like, electric motorcycles that you can like, you know, this Flamingo scooters well, the same it. Works the same way, but like with a small moped, it's electric and stuff, so it's more convenient but. Yeah. And riding bicycles as well. Electric bicycode. This is very convenient for cities, but I understand that if you want to go and do something that's outside of the city. Yeah, you kind of. It's harder when you don't have a car. That is true.

Jaydan Salzke

Yeah, totally. That's where I get stuck because I live in Auckland Central, so 9090 to 95% of my getting around is easily covered by an ebike or a little bit of public transport like a train or a ferry. But it's when I feel like going on a road trip, going to the beach, going and picking up a marketplace thing that's an hour north. That's when I need a car.

Andreas Keating

Yeah. Oh, perfect. I think that's yeah, those are all the questions. Actually one more question, an important question. Are there any communities that you know of that we can reach out to? Because we're because we're planning on sending the survey out and it'll be helpful to have communities that are. I mean we would prefer some community unbiased like it was like a little bit. Skeptical or they was like. Oh, I don't really know what identification is. Like we would love to hear from them.

Jaydan Salzke

Yeah, that's tricky. I know all the biased ones.

Andreas Keating

I was gonna say if biased ones are also fine though honestly.

Jaydan Salzke

Yeah, yeah, I can do similar things in terms of what I have. I think there's like 50 people in our group chat now of these community groups that like my job is just to support the Community Electric communities that we start around the country. And I have a group chat. I wanna say 5055 of them. So I could reach out to them for it. But in terms of getting to like general public people, it would just be like, hey, can you get your friend to do this? So I asked some Baba, most of my friends in the climate conscious people said they're probably biased, so maybe yeah.

Andreas Keating

Yeah, that's fine, because it's OK. Sorry it brings up another question for me. OK, if you have someone who is really skeptical and they don't like it, oh, I don't care about the environment. I only care about what benefits me or something like that. Like, how can you convince them to change to other verification?

Cost. Yeah, I literally, I don't talk about. Sorry, not cost savings. I need to talk about costs. I don't like that. Saving rates. I don't use it when I'm working on rewiring. I don't talk about emissions much. Less I find out that the person is a climate interested person like I am because that's my background. So it's the thing I care about, but it's not what others care about as much. And so I'm always talking about savings. Even if I haven't realized most of them myself, because I'm a renter, so I pay 220 bucks a month for my electric machines, I probably it's possible that I would actually have a cheaper electricity bill if I was using fossil fuels just because I can. Put solar on my roof, but like that might not be true, though I don't know. Yeah, I usually talk about savings with the people who are skeptical, and if they're really, really, really skeptical, I show them the graphs, and if they're even more skeptical, I put them in touch with a Josh or someone in our team who will have that debate with. Them based on facts. If they're too skeptical, I just. We don't need to win you over anyway. We'll just commence everyone else.

Andreas Keating

Very well on to. Yeah, very true. I did like the Super skeptical put you in contact with Josh. That would convince him for sure.

Jaydan Salzke

Yeah. Have you talked to Josh? Have you met Josh?

Andreas Keating

Yes. Yeah, we have. Yes, we have. It's funny because we have a paper site over our background and then we have an interview with him and with no surprise, that was nice. Yeah, it was nice speaking to one of the people.

Jaydan Salzke

Yeah. No, he's the perfect person for it.

Andreas Keating

Well, I think, yeah, we've kind of reached the end of all my questions. That was perfect. Yeah, if you have any suggestion for our dashboard or what you think what you focus on, we would love to hear it too, yeah.

Jaydan Salzke

OK. Oh yeah, I really do want to find out if I can do this visualization thing that someone from our team sent through. It might have been Australia, but I I don't know if I'm gonna have success finding it. You guys don't when I say that nothing comes to mind here.

Andreas Keating

No, no, not immediately. I think the one that you're saying is the one we use for our case study. Wait, let me go to an Australian website or wait is it? OK, one second here.

Jaydan Salzke

On a huge delay with this call too. Like sometimes I cut you guys off.

Andreas Keating

Yeah, I noticed that a little bit. There's a bit of a delay as well, but I don't know if this morning it was fine. It's been acting up recently.

Jaydan Salzke

OK. Oh yeah, this is it. Yeah, that's the one.

Andreas Keating

Oh, OK. Because Jenny sent us this, and we based this on our case study.

Jaydan Salzke

Can you? Oh, awesome. What's it called? I wanna get it too.

Andreas Keating

Climate Council org dot au.

Jaydan Salzke

OK. Climate council. Time of momentum monitor. Yeah. Yeah, I quite like it because it's very simple, very clean. I like a one page website. It's got like it uses green for good numbers, red for bad numbers like just that really basic stuff. It does well. And it's not. It's not talking about recycling, which is nice.

Andreas Keating

Yes, well, we've heard that recycling is a very small percentage, right?

Jaydan Salzke

It's nothing. It's like, yeah, on the list of actions that you can take in your life to mitigate your personal emissions. They ranked sixty actions. It was #59. So it's pretty useless. Yeah. Yes, I'm glad you found that website. I'm gonna. I'm gonna save it because I quite like it. *Mm hmm. We've actually, yeah, we've heavily based our design on the website off of this one 'cause. We really liked the way it displays information, the way it can touch on stuff. It's it's. Yeah. Yeah, very organized, very neat. A big thing is that.*

Jaydan Salzke

Yeah. The other one. Oh, sorry. You go while I'm pulling up the other one. No, you go first.

Andreas Keating

The big thing we see is like if we showed this to. And he has a problem finding information. And we also tested out from one of the interviews with a community member and he also for the no other Jennifer yeah he also has a problem don't know what to navigate so. On that a bit to make it more. Easily navigable. All right. Yeah. Yeah.

Jaydan Salzke

Yeah, I think that's. I think that's very fair feedback, to be honest. What I was gonna say is I like what rewiring Australia has. Can I share my screen on this or should I just send you a link?

...

I like that rewiring Australia did this and I don't think they get much use out of it. I don't know if they use it much and I kind of raved about it till I rewrote the team and everyone was like, yeah, that's kind of cool. But I think it's very cool. Which is it's just if you just Google, like, electrify my electric rewind Australia, what you do is you just. Put in your electricity. So I used to live as a groom in Australia and it's just very simple. It's just a bunch of like it literally is just a bunch of numbers, but every single one of these I

understand like a percentage versus like the amount of jobs that will create versus the amount of money that it will get And it's. I just feel like it's very well laid out and then you can dive into the detail underneath if you want. Like this is what we're talking about. Context. But like if people never scroll past this first part, which I used to work in marketing, we know that people. Don't really scroll.Websites. That's great. They've gotten all that they need to know.

Andreas Keating

Yeah. OK. That's a good way to go. That's a good point. Mm hmm. Yeah, sorry, I've I've also. I've marked it down along with the planetary boundaries and donut economics to check out later. We'll look into it.

Jaydan Salzke

Oh yeah. Well, from my minority climate background. Yeah, guys, we gave you all climate ones. But let's yeah, that's cool. Yeah. And if you can get screenshots of that Tesla app too, I think that they do a very good job.

Andreas Keating

Yes. Oh yeah, the snap as well. Yeah, the test is like testing the battery or Tesla. I don't even know what it's called.

Jaydan Salzke

I have never used it myself.

Andreas Keating

A Homer, or it's for the it's for the what do you call the Super PAC better or something like that, right? Is it called super?

Jaydan Salzke

Yeah. Oh, yeah. If you just, I just Googled Tesla Battery app and there's heaps that come up. It's so pretty.

Andreas Keating

Let's say. I want a glimpse of this.

Jaydan Salzke

Oh yeah, it's for the yeah, it's for the power wall. So it's called. I think diagrams are good. We've had a lot of success too, at rewiring because of our diagrams. And that's what Tesla's doing well here too is that they have the home, and then they've annotated on the home where the battery is, and they've annotated where the EV is and how much is going from the battery to the EV. So I think the diagrams work well too.

Andreas Keating

Perfect. Yeah, it is very well made, very elegant like you said.

Jaydan Salzke

I mean, Tesla is a software company, right? They're not really a car company, so.

Andreas Keating

Yes, that's right. That is true. Perfect. Thank you very much for meeting with us and thank you so much for sending us so many contacts. That was super helpful. Yeah. Yeah.

Jaydan Salzke

Well, I'm glad I had to have to turn a few people away. I was like, no, they told me I have too many.

Andreas Keating

Yeah. I'm sorry about that. We're so sorry. We tell each other. Like on Monday, we tell our professor was like, oh, we only have like 7-8 expert interviews. And he was like, OK, good enough. And then after I email you like you send me another like 7 of it. And then I was like, OK. Oh, now I know we have like 15 of them. He was like 15. He was like, yeah.

Jaydan Salzke

That's awesome. No, I only felt bad that I was sending them to you one at a time by email. I was like this is so inefficient, but I just want to send it to you as soon as they tell me that they are thin, so that's good.

Andreas Keating

We really appreciate it. It's good.

Appendix M: Community Interview Transcript

I. Steve Charles Transcript

April 10, 2025, 4:03 PM

...

Tue Lac

How familiar would you say you are with the topic of electrification?

Steve Charles

I'm quite familiar.

Tue Lac

OK, can you describe how electrically electrified your house is? For example, like heating, cooking, heating water, cooling, or something.

Steve Charles

You say everything except the stove. I've still got a gas stove, but we've got electric hot water. Electric heating. 2 EVs. And solar. Yeah, so everything except the gas stove.

Tue Lac

OK, *I see*. *Can I ask*, *like*, *what's stopping you from changing to an electric stove?* ...

Steve Charles

Yeah, stove top. OK. I'm sorry. What's stopping me from electrifying it? Nothing's stopping me, except I converted it from electric to gas. Ten years ago, before, maybe I was so aware. I mean, the cost is quite low. We only use 11 gas bottles per year, or a little bit less. And I

think it's actually one of the things I like. I don't think there are a lot of benefits in changing it. Because it's it's, it's sort of a high-power appliance that's used in the peak periods. So it's sort of like doing some peak shaving for them.

Tue Lac

From the grid, yeah.

Steve Charles

But yeah, I'm just waiting, basically until it's at the end of life, I guess. But I'm not anticipating it'll save because when I will be using it and it's electric, it'll be in the peak periods. And so I guess there are some health benefits of coming off gas, but there's also a requirement to change some of the frying pans, some of the cooking equipment. Because I would go to. Induction. And not not all, not all. You know, frying pans or sauce pans work with induction.

Tue Lac

Yeah, that's understandable. How do you view the importance of electrification in New Zealand? Like, yeah.

Steve Charles

I think it's very important, especially. You know, especially with vehicles, we were importing all that, all that petrol and diesel. Then there's a huge opportunity to save money for the country and make our own energy and use it rather than, you know, import it all and use a third of it.

Tue Lac

I see. You said your house is mostly. I wonder if you have an electric vehicle.

Steve Charles

Yes, yes, two electric vehicles, yes.

Tue Lac

Like. Oh, can I ask why? What makes you consider switching to electricity?

Steve Charles

Well, initially, it was probably for technology. But then later with the second car, it's more just. So I don't have to buy petrol anymore. It feels good, feels good to not have to go to the petrol station.

Tue Lac

I see. It's just out of curiosity. Like in the US. It's really hard for you to go to a charging station and recharge at home forever for you to charge your car up. Like, do you have this problem in New Zealand or?

Steve Charles

I mean, it takes a long time to charge at home, but I also take a long time to sleep, so. I plug in when I get home, and I do have quite a fast charger, so it only takes 3 hours to charge. But, even if I previously, when we were just charging on the slow charger, it easily charges in the time that I, you know, have dinner and go to bed. And wake up in the morning.

Tue Lac

I do have a quick question. For long distances, do you find it tricky to find charging points?

Steve Charles

No, I don't. No. Are we our vehicle for traveling long distances? It has quite a good range. So many times, we get to our destination without having to find a charging point. And I'll try to book accommodation that'll let us stay overnight.

Tue Lac

And would you say it's hard to find accommodation with those with that infrastructure?

Steve Charles

No, no. Everywhere that I've asked, let us plug in. We just use a normal PowerPoint. Because we're always there long enough to charge.

Tue Lac

All right. Perfect. Thank you. You said your house has a solar panel. So, OK, there are a lot of questions about vehicles. So if you charge your vehicles, like, is it gonna overload your solid panels, like do you have to use energy from the grid? Or is the solid panel energy gonna be enough for charging your car, your appliance, and everything at home?

Steve Charles

Well, it always depends on our electricity plan, and at the moment our electricity retailer allows us to use electricity for free between 3:00 AM and 6:00 AM. So I'm always the car scheduled to charge by itself between 3:00 AM and 6:00 AM, and all the solar power we sell. So we're not charging with the solar because it's much more cost-effective at the moment. Meant to sell the solar and to charge up at night. Yeah, I've had the solar for 10 years, and in that time, the plans have always changed. And we used to have our hot water schedule to heat up in

394

the sunshine because that was the cheapest thing to do. But. They always change the incentives, and the retailers have different offerings. So it just changes how I operate.

Tue Lac

OK, what would you do? What would make you feel more confident or excited about switching to the electric machine in your house? Like I know most of your machines are at home, is like a really electric supply. But like, what could make a change? So you feel more comfortable changing it, or what? What would've happened before you had electrified all your devices? Yeah.

Steve Charles

Yeah, all I'm thinking about is the gas stove as well. What would make me more confident? Well, if I were, if I was confident that I wouldn't cost more to operate or that it was cheaper, I guess. So that's what made me convert most of what I've got, 'cause I knew it would be cheaper. And I guess I haven't changed the oven because I'm not convinced there will be any cheaper. Or what do you call it? The stove I haven't yet.

Tue Lac

What kind of information made you decide to switch? Was it purely cost savings?

Steve Charles

Uh. No, it's probably not. Purely cost savings. It's just a big driver. Just trying to think of one of the examples. So I mean, with the car, it was, it was to try out new technology. What else got converted? So the heating was already electric, although we had a fireplace. Took the fireplace out so it's more convenient, I guess. Thinking of the heating. And what else have we got? Like reliability, I guess. With the thing of electric hot water cylinders, they're more reliable

than gas. But. Yeah, I mean, it's also, I feel. It's kind of bitter for everyone to be electric and make our energy. From everything.

Tue Lac

OK. Yeah. I was gonna ask that, but. Our project is like a dashboard or a website, something that everyone in the public can go and see and the website is like to motivate people to change to electric machines, like appliances.

Steve Charles

Not yet.

Tue Lac

What is the type of like? I see. Like, if you go to a website like what type of visual? Like charge images like comparison or etcetera. Do you think it would work best for everyone to understand, like the benefit of switching to an electric appliance?

Steve Charles

What's the question? What sort of website?

...

Tue Lac

Were there any websites or visuals that you saw when you had? Not electrified that that motivated you to. So you see indicated in the cost savings and you see motivated by the common good, what tools, what resources helped you gain that understanding? Yeah. Well, I was on Facebook quite a lot. With, like, the EV owners group. I think they are rewriting some sort of good graphics. The sort of you know, like fun and cartoony. And colorful. And sort of succinct. Yes, I suppose that's the main thing. It has to be. Not too much detail. It has to be quite visual. And. You know, a small amount of information is hard. Don't have that. Do so. And it's always nice if it's interactive. You know, if you can mouse over something and it adds a bit more detail, or yeah, something like that. I think it always always feels good when you can mouse over stuff.

Tue Lac

OK, that's it. Great idea I.

Steve Charles

Probably doesn't apply to cell phones, but.

Tue Lac

Yeah. We plan to make it as visually appealing as possible, but we also consider adding a charge like. Graph or like a pie chart or something, it's like.

Steve Charles

The graphs are helpful.

Tue Lac

Yeah. Would you think it would be helpful, or would you think it's like if we just have normal? Graphics, and then just write paragraphs and then explain why. How is this? Or do you think adding a graph to it is gonna be a lot of help?

Steve Charles

I was just going to say graphs count as visuals, don't they? Compared to paragraphs and Yep.

Tue Lac

So you mentioned your Facebook EV group. Were there any specific posts like that that you saw that convinced you?

Steve Charles

No, I don't think so. I mean, that's probably it. Yeah, that's probably it. It probably is. Kinda happened after I got the vehicle, to be honest. But it's just building up learning for getting the next vehicle. So it's yeah, it's probably not part of the convincing process, I suppose it's. Most people will probably join it after getting one. I'm guessing I'm not sure.

Tue Lac

OK. If you were to convince a friend to go electric, fire their house, or get an EV, what would you say to them? Like, how are you convinced? Yeah.

Steve Charles

How would I convince them? Well, I think. Some arguments don't work with some people, but cost kind of works with everyone. And the other one, I think, that can be good, is that everyone likes to be a Kiwi. You know, like everyone likes to support New Zealand-made. So I think that's a good argument. Yeah, I just got a new kind of bumper sticker, and it says. What did it say? This is supporting Kiwi, not OPEC.

Tue Lac

That's a good snicker. OK. Let me see. Oh, do you think most people around you, like families or neighbors, or friends, are gonna open to switching to electric appliances?

Steve Charles

Yes, I think so, yes.

Tue Lac

Our team is open to like if they haven't switched yet, like, do you think they would open to switch?

Steve Charles

Yeah, I think so. Yeah, I've managed to convince my parents to switch their gas boiler to a heat pump, it took. It took a couple of years, but. They're finally convinced. I think I didn't convince them in the end. Or maybe I just planted the seed, but then the daily charges are going up and up, and it's crazy for someone to pay for gas that they're not using all summer, so that they can use it in the winter. I think everyone's open to it. They are just some people. Don't know what they don't know.

Tue Lac

OK, this is a good question. Yeah, we're gonna ask that, OK. So since we are making a website and we worked with some experts, we would like to know if you could ask an expert in home electrifications. What would you ask them?

Steve Charles

How? Well, how can we best convince people to make the switch?

Yeah, we have the same questions. Really good question. Yeah. Do you know any friends or any members who might be interested in, like, having an interview with us? Yeah. They don't need to be like that. An expert or they don't need to know a lot about electricity and electrification. We would prefer someone who's more skeptical about electrification, if you know any, yeah.

Steve Charles

Yeah, I'm sure there are some people I could volunteer with. Yep. Should I email you or something?

Tue Lac

Yeah, if you could email us the name, that would be great. Yeah. And yeah, the contact details. Yeah, to ask to invite them to an interview. That's perfect. Yeah. That sounds fine. Don't have any other? No. I mean, that's what I think is really good. Thank you so much. We have a lot.

Steve Charles

Alright. No problem. Got through and recorded time. Hey.

Tue Lac

Yeah. Well, yeah. Yeah. But you gave some great answers, some good quotes. I mean, you're the first non-expert we interviewed. So we didn't know the range of time yet. So it's like a run sort of, but.

Steve Charles

Oh yeah. Yeah, yeah. I mean, I still thought that this idea for interviews was sort of advertised on this rewiring. Group. You know what it's called? WhatsApp group and she said you guys were looking for everyday New Zealanders, but I think we're still probably not quite every day New Zealanders because we're part of this rewiring organization. So I guess that's the way you're trying to get down to some. More standard, non-electrified people.

...

Oh, maybe I can. Yeah, I'll flick some e-mail. e-mail addresses, yeah.

Tue Lac

That'll be perfect. Thank you very much.

Steve Charles

Good luck with your project.

Tue Lac

Thank you. Have a very good day.

Steve Charles

OK. Cheers. See you soon. See you later.

II. Tony Stephens Transcript

April 15, 2025, 11:00 - 11:52 AM

Ben Marsh

Do we have your consent to do this interview?

Tony Stevens

Yes.

Ben Marsh

And may we use your name or do you wish to remain anonymous?

Tony Stevens

Well, as far as I know we're using my name. That's fine. Yeah.

Ben Marsh

All right. Now we've got a couple of demographic questions. What is your highest level of education?

Tony Stevens

Uh, graduate diploma as opposed to your graduate degree, I guess, I say. graduate diploma.

Ben Marsh

What is your job title? I tried to find you on LinkedIn, but I couldn't find you.

Tony Stevens

I did have a LinkedIn account. Though it may have lapsed. It might have been set to the U.S. I've searched under New Zealand and can't remember whether I opened it there or here. Anyway, I guess you'd say I'm retired now. I'm not officially of retirement age, but I left my job nearly two years ago.

Ben Marsh

Thank you. How familiar would you say you are with the topic of electrification?

Tony Stevens

I'm reasonably certainly more than the average person. I'm not sure how to answer that there turns out to be any categories to go into...

Ben Marsh

I mean, it's really an answer in your own way. It's just to get a vibe. You can say one through five or one through ten.

Tony Stevens

Then more than the average person. So three.

Ben Marsh

and can you describe how electrified your home is right now?

Tony Stevens

I'm gonna say 100%. Really? well, I'll make the caviar in the months, the winter months of June and July here, which to this day I still have a hard time getting my head around. then we

pull from the grid then. We could, if we wanted to, probably conservative energy, but our utility provider, and it actually differs, they're called meridians, and give us credit for anything. We export. And right now we're 750 plus dollars in credit after two years of having our solar PD system put in, uh and so we just use some of the credit debt, so we pay no utility bill. We also pay no petrol or gasoline bill because we haven't EV that we charged for. um so I'm not sure how to answer that exactly in terms of 100%. I think we certainly could be 100%. We do fall from the grid for a couple of months a year.

Ben Marsh

I mean, that's better than 99.9% of Americans and probably 99% of New Zealanders, very impressive. In your own words, how would you describe the current state of household electrification here?

Tony Stevens

On average, I joined the rewiring Aotearoa because I'd like to help move things forward...

Ben Marsh

Do you think people around you, family, neighbors, friends are open to switching to electric appliances? If so, why or why not?

Tony Stevens

Appliances are super particular. bars. I would think that they're open to it. I suppose it's all I mean, even in our case, for instance, we eventually want to do a I in the name. use the stovetop and thank you. We want to change that, but we probably won't until our stove goes, you know, to put. It is electric. Oh, sorry, so no, we have no gas appliances and yeah, everything for

us is electric already, but we could do more conservation. So anyway, to answer your question about other people being open, I would think so, but I would guess most people are probably the same or not gonna change until kind of required to as it were, and then they'd look at alternatives. not nearly as bad as we think. I mean, a lot of applications just have Alexa and they're gonna be sold they're the best case scenario. We convince people to buy when they need your place.

Ben Marsh

How do you view the importance of electrification?

Tony Stevens

Oh, I' view it hugely important because we're such a small nation that any inner energy independence I think would be really good for the country not to have to rely on things coming from overseas and so I see it as almost a no brainer but convincing the rest of the world of that, I'm not sure where even the rest of New Zealand, I don't know. especially because

• • •

Ben Marsh

So. I'm sure you're familiar with this. GOE has a cherry farm.

Tony Stevens

Yes, I am well, I haven't met him or anything, but done a little bit of texting, yeah. telling us how hard it was his manager was telling us how hard it was for him to get electric directors and he has to fly all the way to California and to talk to them and it just seems like um I newest technology is hard to get there. Yeah, I mean far technology in general, and we' you know, uh hereolaming and hardvirment are the versions of uh not gonna get the names of the electronic stores in the states, but anyway, um the point being that when I first came here, it usually seemed like it was anywhere about six months too a year lack of war the latest de greatest since I since then, it's it's almost instantaneous, as far as I can tell, or simultaneously better worth. um so that's gotten better whether or not, yeah, the newest tech likenings like electric contractors to show on. I believe it. Yeah, that's that's really, I mean, that's out on the bleeding edge for the US on magic..

Ben Marsh

It's interesting you say that, though. it's caught up or at least it's getting better now?

Tony Stevens

I'm sure it's still lagging behind in the bleeding, so well, I imagine for I don't know, like uh Iowa corn farmers or Kansas corn farmers or somebody. you know, it becomes an obrander to some degree, if you've got to buy a new cycle of tractors, you get your ones that are as automated as possible, and then at night you go and plug them in and then during the day you you let them run electrically and you sit in it and you do your finances while the things drives itself around the field, you know, probably. So I imagine it's out there, but I don't know what the cuptake is or it is, but it's hard because the only place that has really done it is his cherry bottom, you know, that's like the only place is really being tested. I'm glad that it's the first in the world to be fully electric. only one. I hope for a trip down there. I would at point.. I didn't know that was impressive. it's probably one of the 99%. definitely. um so, when you were making we should go to be part of the lineup over here. I'm in it anyway. if we could do those just for the hell of it...

Ben Marsh

Your house. was it already electric when you bought it?

406

Tony Stevens

Correct! No gas at all. We upgraded the dishwasher and put in a more efficient hot-water unit during remodeling, but everything's electric. But that again was just part of some remodeling of the house we had to do anyway, so yeah, and it's interesting because one of the big things about electricity that people know I really appreciate is when you switch from those official machines to those eicher ones, you are reducing emissions because you're reducing that peak load. you know, and the fossil fuel that has to burn. I don't know if you're making the burns peak low, I'm familiar with it. I am now, it's only been in the last year or so that I've got to really learn about things from. interesting because we have our expert interviews and then we have our non expert interviews, but because they're all coming for rewire we have up, they're all expertenuated, you know, they all know about their eload, sohat versed and it yeah,

Ben Marsh

One big benefit of efficient electric machines is reducing peak load. Are you familiar with that?

Tony Stevens

Only in the last year or so.

Ben Marsh

When researching EVs, what comparisons convinced you?

•••

Tony Stevens
Mainly longevity of batteries and overall value. Every review ended with "I'd buy the Tesla." Tesla was 20 k more, but we lucked into a neighbor's used Model 3 at 10 k under market...

Ben Marsh

When you were looking at that when you were on YouTube, what were the comparisons? What were you looking at?

Tony Stevens

Uh oh, well I fell out of Australia called the Electric Viking. Electric Viking. Viking, and he's been a big EV advocate in general. ... I just saw it in a video the other day. um in the UK for solar a guy called Gary does solar? was a site that I' paid a lot of attention to. ... One another, too, of a guy named Ben, something who does a lot of debunking of people saying, the battery is exploding. ...So basically. Electric Viking (Australia); Gary Does Solar (UK); a debunker named Ben Sullins who tackles EV-fire myths...

Ben Marsh

So if you were thinking about switching things like theoretically if you had a gas stove or a gas and water here, uh what kind of information would help you decide?

Tony Stevens

Clear comparison of up-front cost versus lifetime savings. People need a quick synopsis before details.

Ben Marsh

What visuals motivate you?

Tony Stevens

Well, I guess it's always the toss up between slightly more cost up front versus to cost over time. So somehow if it I don't be sold is the right word, but if it could be stated in something that makes cost over time, something you leap forward to rather than just the sticker price, that seems to be a good thing.s of the biggest issues it's like it's really hard to think about that big picture when you're looking at an extra, like you said, 20,000, it's hard to think, well, the long run, I might save some money. ... Graphs showing cost-down and adoption-up together; simple maps showing which regions are leading or lagging; anything positive rather than doom-and-gloom. ...

Ben Marsh

So what would you say if you were trying to convince a friend to electrify?

Tony Stevens

Oh, a friend. Sorry. um gosh, I just often go immediately, it just feels so good to have the control in my hands. But now I do get to tout things like um I'm not not that I ever thought I was gonna, but I'm making money off my house minimal behind but, you know, no no cost more. You're making money, but you're also not paying if that's the main thing that's all I was ever looking forward to not being paying the utility. and additionally, I haven't visited a petrol or gasoline station in a year and a half, you know, I literally have not gone to one. Just that, you know, I get up in my car's ready to go in the morning if I need it and don't have to don't have to think about it in the slightest, so the convenience factor is really good, but that's kind of an in EV thing if you're just talking about going electric, going solar, then yeah, I guess mainly that the poison in my hand and I'm not paying the utility company and what, so I'm making a lot of savings...

409

Ben Marsh

I'll be back in a second. Can you ask the next one?

Andreas Keating

Yeah. so. I am interested in hearing more about what you mentioned about how control is important. I was also looking into it and not only does it give you control and protection from the volatile prices of the gas, petrol, diesel, but it also, in the case of the protection against weather events, right?

Tony Stevens

imagine there's an earthquake that has a power outage in your neighborhood and you're kind of, if you have batteries, you're protected from that, right? Well, and recently, uh, and I'm not sure there's other companies that have it, but we have the test power wall and that just happened to be by chance. That's what this company that did our install used. and they have what's called a storm. So it saw that there was a storm coming unless it was only a couple of weeks ago and just immediately started pulling from the grid to make sure the battery.. I didn't know that was that. that's, there I'm sure it's not the only company that has yet Florida on. Yeah, it's cool. I think that's kind of a cool feature. And yes, my wife, uh who is actually in school here in Rollington at Victoria University, is a geologist by training. She said, no, if the 80 earthquake hits and Nelson is right on a phone line. and um I want to have energy. And I was kind of surprised because she's usually the more financially risk averse, I guess. So I was kind of surprised that she was going, yeah, let's double the cost of the system and get the battery back up. and uh anyway, uh so that uh that's a great thing, yeah, to know that we could do it. and I also like I thought she had, you know, if the energy really goes out for the whole neighborhood,

we put some plugging strips out on the street and let people charge their phones, you know, and I think that would be wonderful. That would motivate a lot of people to switch.

Ben Marsh

I think that makes sense. Is there um any question you'd ask an electrification expert?

Tony Stevens

I'm satisfied, so I don't know that I really have questions. um, which is an enviable position to be in, I suppose, but uh, that's that's interesting. I hadn't thought about that. I mean, if I could, I'd like to , in fact, like to add another battery so that I literally could start trying to make money off of them, buying it low and selling it, because there is a company here that'll put you on to that exactly. that I'm aware of, but I don't know what I want. ... I'd like to know when "vehicle-to-home" will be mainstream so my car battery can back up the house. ...

Ben Marsh

Thank you, Tony. Is there anything else you would like to share? Like any questions?

Tony Stevens

No, I hope any of this information helps somehow!

Ben Marsh

Absolutely! Definitely does. Thank you for your time.

Appendix N: Email Templates

1. NZ Greetings and sign-offs

Kubutaka	English	Occasion	
Kia ora	Hi/greetings/hello	Informal greeting	
Tēnā koe	Greetings/hello (to one person)	Formal greeting	
Mōrena	Good morning	Time-specific greeting	
Ahiahi mārie`	Good afternoon/good evening		
Pō mārie	Good night (peaceful night)		
Ngā mihi	Kind regards / Thank you / Cheers	Sign off	
Kia pai tō rā	Have a nice day		

Sources:

https://www.auckland.ac.nz/en/on-campus/life-on-campus/maori-life-on-campus/revitalising-te-r eo-maori/kuputaka/greetings-and-sign-offs.html

2. NZ Expert email sent out to the expert and community interviews

Subject: Interview Invitation - WPI Research on Electrification and Sustainability

Kia ora [Recipient's Name],

I hope this email finds you well. My name is [Your Name], and I am part of a student project team from Worcester Polytechnic Institute (WPI) currently collaborating with Ara Ake and Rewiring Aotearoa on a research initiative focused on Aotearoa, New Zealand's progress in electrification and sustainability. We are developing a visual dashboard aimed at clearly and effectively communicating the benefits of electrification to the public, and we believe your expertise would greatly contribute to the quality and impact of this endeavor.

Our project includes:

Investigating key metrics that communicate the value of electrification (such as cost savings, emissions reductions, and grid resilience).

- Researching and developing an interactive dashboard that illustrates New Zealand's progress in adopting electric appliances and reducing reliance on fossil fuels.
- Gathering feedback from experts and the public to refine this dashboard so it can best serve New Zealand communities.

We would be honored to interview you about your perspective on New Zealand's electrification landscape. Specifically, we hope to learn about:

- The most critical data or performance indicators you monitor in this field?
- The challenges and opportunities you see for accelerating electrification in homes, businesses, and the agricultural sector?
- Strategies or practices you have found effective for engaging and motivating stakeholders.

The interview would last approximately 45–60 minutes. Our team is located in Wellington, we would be more than happy to arrange it via video conference at your convenience. If, by any chance, you happen to be available to meet in Wellington, we would also be happy to meet with you in person. With your permission, we would record the interview to ensure we accurately capture your insights. Participation is completely voluntary, and you may decline to answer any questions or withdraw from the interview at any time.

We kindly request your response regarding your availability, as well as any preferences you may have for the date, time, or format of the interview. If you have any questions or concerns, please feel free to let us know. We truly appreciate your time and consideration, and we believe your expertise will be invaluable in shaping a resource that supports the continued progress of sustainable energy initiatives in Aotearoa, New Zealand.

Thank you for taking the time to read this invitation. We look forward to the possibility of speaking with you soon.

Ngā mihi,

Andreas Keating [Student Researcher]

Tue Lac [Student Researcher]

Ben Marsh [Student Researcher]

Worcester Polytechnic Institute (WPI)

Email: gr-rewiring-d25@wpi.edu Phone: +64 290 261 8061

3. NZ Expert Time Available Respond

Kia ora [Recipient's Name],

Here are our available times to meet:

- Monday: 11:00 AM 5:00 PM
- Tuesday: 11:00 AM 5:00 PM
- Wednesday: 11:00 AM 3:00 PM
- Thursday: 11:00 AM 5:00 PM
- Friday: 11:00 AM 5:00 PM

Please choose a time that works best for you, ideally one hour. Also, let us know if you're based

in the Wellington area so we can arrange an in-person meeting or a Zoom call.

Thank you so much, and we look forward to connecting with you!

Ngā mihi,

Andreas Keating [Student Researcher]

Tue Lac [Student Researcher]

Ben Marsh [Student Researcher]

Worcester Polytechnic Institute (WPI)

Email: gr-rewiring-d25@wpi.edu Phone: +64 290 261 8061

4. USA Expert email sent out

Subject: Interview Invitation – WPI Research on Electrification and Sustainability

Dear [Recipient's Name],

I hope this email finds you well. My name is [Your Name], and I am part of a student research team from Worcester Polytechnic Institute (WPI), a university based in Massachusetts, USA. We are currently collaborating with New Zealand-based organizations Ara Ake and Rewiring Aotearoa on a research initiative focused on electrification and sustainability. Our team is developing an interactive visual dashboard to help communicate the benefits of electrification to the public. We are reaching out to experts in the U.S. and New Zealand whose insights could meaningfully inform and enhance our work, and we believe your expertise would be incredibly valuable.

Our project includes:

- Investigating key metrics that communicate the value of electrification (e.g., cost savings, emissions reductions, grid resilience)
- Designing a dashboard to illustrate progress in the adoption of electric technologies and the reduction of fossil fuel use
- Gathering expert and public feedback to refine this tool and make it more impactful for various stakeholders

We would be honored to interview you about your perspective on electrification in the U.S. and/or globally. Specifically, we're hoping to learn more about:

- Key data or indicators you find most important in this space
- Challenges and opportunities for accelerating electrification across sectors (residential, commercial, agriculture, etc.)
- Effective strategies for engaging communities and motivating adoption

The interview would last approximately 45–60 minutes, and we're happy to meet via video call at your convenience. With your permission, we would record the conversation for internal reference to ensure we accurately reflect your insights. Participation is entirely voluntary, and you are welcome to skip any questions or withdraw at any time.

Please let us know your availability and any preferences you have for the date, time, or format of the interview. We truly appreciate your time and consideration. Your input could play an important role in shaping a tool designed to inform and inspire sustainable energy adoption in New Zealand and potentially beyond. Thank you for your time, and we hope to connect with you soon. Best regards,

Andreas Keating [Student Researcher]

Tue Lac [Student Researcher]

Ben Marsh [Student Researcher]

Worcester Polytechnic Institute (WPI)

Email: gr-rewiring-d25@wpi.edu Phone: +64 290 261 8061 (NZ mobile)

5. Community Survey Social Media Post

Kia ora e hoa mā! 🌿 🗲

We're a group of students from Worcester Polytechnic Institute (WPI) (from the U.S.) who travelled to Aotearoa New Zealand to learn how people feel about electrification. We're building a dashboard to help inform and inspire folks to make the switch to electric, and we need your help!

Take our super short survey (less than 5 mins). It's open till Thursday, April 24th.

Ngā mihi nui for your time and tautoko! 👏 👏 👏

https://qualtricsxmpy3blgml9.qualtrics.com/jfe/form/SV_7TWIoC2RmjAd8fY?Q_CHL=qr



6. Community Survey email sent out:

Kia ora [Recipient's Name],

We hope you had a lovely Easter weekend! We're currently sending out our survey as part of our project, and we were wondering if you could share it with your friends, family, colleagues, or neighbors (anyone living in New Zealand, especially those who aren't experts in electrification). We're also trying to do some street surveying, but with time running short, any help in spreading the word would mean a lot to us.

Thank you so much for your support, and we hope you have a great ANZAC weekend! Ngā mihi nui,

Tue Lac



7. User Survey email sent out:

Kia ora [Recipient's Name],

I hope you're well! We're currently distributing our user testing survey for the project, and we were wondering if you'd be willing to share it with your friends, family, colleagues, or neighbors (anyone based in New Zealand).

Here's the link: https://wpi.qualtrics.com/jfe/form/SV_2aUimudLTePwh6u

Since this part of the study involves viewing and interacting with our dashboard prototype, we cannot run man-on-the-street surveys. Also, the website is not mobile-friendly. It's best viewed on a laptop or computer.

Again, thanks so much for your ongoing support!

Ngā mihi nui,

Tue Lac



8. User Survey follow-up email sent out:

Kia ora,

We hope you're well! We're a team of students from Worcester Polytechnic Institute (WPI) in the U.S., and you recently participated in our survey. Thank you again!

At the end of that survey, we asked if you'd be open to receiving a follow-up for user testing.

You're receiving this message because you kindly said yes.

We're now sharing our user testing survey and would love your help again. It involves

interacting with our Website prototype, so it's best completed on a laptop or desktop computer

(it's not mobile-friendly at this time).

Survey link: https://wpi.qualtrics.com/jfe/form/SV_2aUimudLTePwh6u

If you're able, please consider passing this along to friends, family, or colleagues in New

Zealand who might be interested.

Thanks again for your support, we very appreciate it!

Ngā mihi nui,

Tue Lac



Appendix O: Atlas.ti AI analyzed



Figure O.1: Example of Atlas.ti AI analyzed tools without any modifications.



Figure O.2: Example of Atlas.ti AI suggested themes without any modifications.

Q ATLAS.ti Web	Code Manager Q Search 7				= Filter	+ New Code n+c	000
Q Search	Name ***		000	Groups •••	Quotations •••	Comment ***	÷
Document Manager Code Manager	Barrier Identification	Details		O Al Codes	57		
Quotation Manager	> Barriers Identification	♥ 22		O) Al Codes	□ 20		
阳 Memo Manager	> Communication Gaps	♥ 45	•	O) Al Codes	□ 44		
₀ D] Views	cost saving		•		□ 0		
岱 Conversational Al	Dashboard Layouts				□ 0		
U Paper Search	Motivation				□ 0		
	> Motivator Insights	> 59		O) Al Codes	□ 28		
称。Drainat Cattinga	> Motivators Exploration	17	•	O) Al Codes	1 7		
••• Help & Support	> Practical Needs	> 69		O) Al Codes	51		
← Close	> User Perspectives	ℕ 117		O) Al Codes	\$ 95	Feedback & Help	
TL Tue Lac	> Visualization Opportunities	♥ 66	•	O) Al Codes	□ 46		

Figure O.3: Example of Atlas.ti code manager.



Figure O.4: Example of Atlas.ti document page.