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SYSTEMATIC COLONIZATION: THE COPRODUCTION OF ELECTRIFICATION AND COLONIALISM IN NEW ZEALAND

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To my wife, Amber, without you none of this would have been possible

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Abstract

The central of argument of *Systematic Colonization* is that in New Zealand's transition to electric power is inseparable from its colonization. This dissertation integrates energy history, the history of technology, and New Zealand history to provide new perspectives on how colonial authorities, British settlers, and Māori used electric power infrastructures to colonize and decolonize New Zealand. I investigate four electrification projects in New Zealand between the 1880s and 2000s, showing how each shaped and was shaped by colonialism.

In the first two chapters, I argue that the rhetoric around and development of electric lighting and power systems in Reefton and the Phoenix Mine played a critical role in how colonial authorities and British settlers came to envision New Zealand as the ideal colonial. In each of these case studies, boosters argued that electric power systems made New Zealand more technologically modern, self-sufficient, and less of a financial burden on Great Britain. Next, I examine the role of electrification in New Zealand's transition to Dominion and argue that the new government continued to employ colonial rhetoric in its plans to create a national grid. As New Zealand expanded it electrical infrastructure in the twentieth century, regulating bodies continued to insist that electric power production should be centrally governed and directed toward making the country self-sufficient. In the final chapter, I look at the ways in which Māori decolonized the grid by building geothermal power stations to service their communities and reclaim their physical and cultural resources.

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Introduction

Driven by Malthusian fears of over-population and pauperism, Edward Gibbon Wakefield (1796-1862) proposed a process of government intervention in the distribution of land in the colonies known as, "systematic colonization."[1] Nowhere in his plans for the settler-colonies does Wakefield argue for the implementation of electrical technologies. However, he stressed the significance of implementing modern technologies, extracting natural resources in the most efficient means, and increasing centralized bureaucratic authority.[2] From the beginning, New Zealand's electrification embodied Wakefield's vision for a systematic and controlled colonial state.

Why study electrification in New Zealand? To answer this fully requires an understanding of the advocacy for non-fossil fueled production of electric power in late-nineteenth century Great Britain. These early debates over electricity generation demonstrate that fossil fuels were not considered by all the sole option for electrification, and that the British electrical community viewed certain methods and structures of generation (i.e. wind, tidal, decentralized) as fitting for sociocultural British values of efficiency and self-sufficiency. The definition of New Zealand's self-sufficiency hinges upon the "self." For settlers, self-sufficiency signified their own hardiness and fitness to colonize, settle, and profit from land. Whereas, for the colonial government and later Dominion government, self-sufficiency denoted the colony's ability to grow independent of the Empire's protection, administration, and financing. These conversations took place across the British Empire; Canada, South Africa, New Zealand, British

[1] *The Collected Works of Edmond Gibbon Wakefield*, ed. Muriel F. Lloyd-Pritchard (Glasgow: Collins, 1968), 178–87.
[2] Wakefield, *A View of the Art of Colonization: With Present Reference to the British Empire: In Letters Between a Statesman and a Colonist* (London: John W Parker, 1849), 44, 273, 497.

Honduras, India, China, and Japan all provided lengthy records of electrification projects within the formal and informal Empire. However, New Zealand's place within the British empire, as a site of special promise, "The England of the Pacific" makes it a particularly valuable site for illuminating a key characteristic the transition to electric power; it was not an inevitable next step for industrialization but a concerted effort by colonizers and the colonized to achieve political goals.

Not only does New Zealand's electrification resemble Britain's but also advocates for electrification wielded the country's identity as a British settler-colony, or its Britishness, as a justification for adopting electric power technologies at all. For many, electric power and its requisite technological systems represented the progress of Britain's long imperial project. Not every New Zealander identified electricity with the Empire, but the industries they worked in adopted electric power; the cities they settled utilized public electric lighting; and, in the case of the Māori, electric power infrastructures displaced them from their lands. Electrification in its intent and form was inseparable from the imperial politics of British colonization of New Zealand.

Energy Transitions: Historiography

In recent years, the sociopolitical impact of electric power systems has resurfaced as a major topic in mainstream and scholarly literature, stimulated by such energy-related concerns as global warming, over-population, and increasing energy inequality.[3] Environmental historians,

[3] Histories of electrical science and technology have been popular for decades. I do not mean to suggest that the topic was ever unfavorable. Mainly, I would argue that recent historians, sociologists, political scientists, and anthologists feel the need to respond to energy crises in their work. These are two of the most recent and well-received of such works. Vaclav Smil, *Energy and Civilization* (Cambridge: The MIT Press, 2017); Richard Rhodes, *Energy: A Human History* (New York: Simon and Schuster, 2018).

cultural historians, historians of technology, and political historians have made significant contributions to the history of electricity and electrification, with approaches that vary from the history of systems building, to the growth of use and demand, to cultural explorations of electricity's meaning. This dissertation tackles the subject of electrification using the historiography and intellectual framework of *energy transitions*. An energy transition refers to a structural change in energy systems including a shift in energy resources, energy distribution, and energy use. These transitions take place over prolonged periods of time in which people, governments, and companies seek more satisfactory means of utilizing energy for power, light, and transportation.[4] The scale of the transition to electric power expands the timeline, geographic scope, and number of power sources involved in electrification. While electric power systems were constructed at the local level, the shift is also representative of global transitions in how people harvested, stored, produced, and consumed energy. Although this study uses examples from New Zealand, categorizing its electrification as an energy transition works to connect its changing energy infrastructure with global electrification.

Understanding electrification as an energy transition provides a better framework for questioning the construction of electrification as an inevitable outcome of industrialization and explaining the role colonialism in the change of energy systems.[5] First, the concept expands on earlier systems building approaches by defining energy systems as more than a collection of fuels and technologies. Energy systems are complex socio-technological systems that involve not only the technologies associated with production but the humans that design and make the

[4] Vaclav Smil, *Energy in World History* (Boulder, CO: Westview Press, 1994).
[5] For a more detailed review of current energy transition scholarship see the special issue of *Science as Culture* 22, no. 2, especially the introduction essay. Clark A. Miller, Alastair Iles, and Christopher F. Jones, "The Social Dimensions of Energy Transitions," *Science as Culture* 22, no. 2 (2013), 135–148.

technologies, manage energy distribution, and use and consume energy. Efforts to change energy systems, therefore, must account for the broader social and economic assemblages built around energy production and consumption. Second, framing shifts in energy systems as part of longer transition disrupts ideas about the stability or predetermination of power sources by locating the sociocultural influences that motivated the search for new energy systems. And finally, studying shifts as long-term presents a normative opportunity to describe the broad socioeconomic impact of changes in energy systems. The consequences of an energy transition go beyond the economic costs of new energy. There are immediate and far-reaching sociopolitical consequences of new energy systems that redefine how people live, work, and govern.[6] Recognizing these consequences shows how energy transitions have benefitted oppressive political regimes but also moments how energy systems have been used to challenge oppression.[7]

Studying how energy systems transform is aided by and builds on existing scholarship that treats energy systems as sociotechnological systems.[8] Since the 1950s energy analysts have used the term energy transition to describe major changes to how countries use energy but they frequently downplay the profound social and political disruptions such transitions portend.[9]

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[6] For a short case study about a local energy transition connected to global shifts see, Andreas Malm, "Fleeing the Flowing Commons: Robert Thom, Water Reservoir Schemes, and the Shift to Steam Power in Early Nineteenth-Century Britain," *Environmental History* 19 (2014): 55–77

[7] Benjamin Sovacool, *Energy and Ethics: Justice and the Global Energy Challenge* (New York: Palgrave Macmillan, 2013), 11–13.

[8] For more explanations of the sociotechnical see, Wiebe Bijker and John Law eds., *Shaping Technology/Building Society: Studies in Sociotechnical Change* (Cambridge: The MIT Press, 1992); Merritt Roe Smith and Leo Marx, *Does Technology Drive History: The Dilemma of Technological Determinism* (Cambridge: The MIT Press, 1994).

[9] P.C. Putnam, *Energy in the Future* (New York: Van Nostrand, 1953); J. Darmstadt , P.D. Teitelbaum, and J. G. Polach, *Energy in the World Economy: A Statistical Review of Trends in Output, Trade, and Consumption Since 1925* (Baltimore: The Johns Hopkins University Press, 1971); F.W. Geels, "Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case study," *Research Policy* 31, no. 8–9 (2002): 1257–1274; F.W.

While useful for their dense empirical observations of economic and resource trends, such studies often lack the historical nuance to adequately explore how and why certain societies produced and used energy in the way they did. By contrast, environmental and energy historians have done more to describe the depth of the social, political, and economic drive to change energy systems and explore the impact of energy transitions.[10] Andreas Malm's *Fossil Capital* and Christopher Jones's *Routes of Power*, respond to earlier literatures that rely too heavily on deterministic assumptions about the progression of energy usage.[11] For Malm, who is concerned with the British shift to fossil fuels during the Industrial Revolution, the transition did not occur for obvious reasons of cost or resource availability but rather because fossil fuels offered a means of maintaining more control over labor and production. The further expansion of fossil fuels stemmed from the ability to concentrate labor/production and expand profits. Along similar lines, Jones's argues that the transition to a "mineral" energy regime (fossil fuels) in the United States during the late-nineteenth century, depended on energy industries taking advantage of existing energy supply networks (like roads, rivers, or pipelines) to convince people of the need for shift in energy usage.

Geels, "The multi-level perspective on sustainability transitions: responses to seven criticisms," *Environmental Innovation and Societal Transitions* 1, no. 1 (2011): 24–40.

[10] White's book is a foundational text in environmental history because of the masterful way he developed the river (the environment) as a historical actor on a level with the more traditional human actors. Richard White, *The Organic Machine: The Remaking of the Columbia River* (New York: Harper-Collins, 1995), xi-x; Besides her analysis of energy, the main theoretical contribution of her work is the utilization of "envirotechnical" to explore just how deeply technological systems are embedded in nature. Sara Pritchard, *Confluence: The Nature of Technology and the Remaking of the Rhône* (Cambridge: Harvard University Press, 2011), 19-20

[11] Christopher Jones, *Routes of Power: Energy and Modern America* (Cambridge: Harvard University Press, 2016); Andreas Malm, *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming* (London: Verso Books, 2016).

Understanding the sociopolitical impact of transitions to electricity is of course not an unprecedented move in the history of technology or electrical history. In fact, energy transition literature draws heavily on existing approaches to energy history, such as Large Technical Systems literature, cultural histories of electricity, and political histories of electricity.[12] What is new is the ways in which treating electrification as an energy transition positions research to challenge the inevitability of electrification. Thomas Hughes transformed the history of electrification and the history of technology more broadly with the publication of *Networks of Power*, which compares the electrification of London (Great Britain), Berlin (Germany), and Chicago (The United States).[13] He explicitly rejected determinist approaches to the history of electrical technologies. Hughes argued that electrical systems were not immune to social influences and that they in turn shape cultural and political processes. Hughes argued that electrical systems were not immune to social influences and that they in turn shape cultural and political processes. Technological success and failure could not be fully explained in terms of cost, system efficiency, or safety.[14] Along with many other social constructivists of technology at the time, Hughes located the political and economic factors of electrification at the center of

[12] For a review of Large Technical Systems approaches see, Erik van der Vleuten, "Understanding Network Societies: Two Decades of Large Technical Systems Studies," in *Networking Europe: Transnational Infrastructures and the Shaping of Europe, 1850–2000* (Sagamore Beach, MA: Science History Publications, 2006), 279–314

[13] Thomas Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Baltimore: Johns Hopkins University Press, 1983); His concepts about invention were expanded upon in *American Genesis: A Century of Invention and Technological Enthusiasm, 1870-1970* (New York: Penguin, 1989)

[14] In his introduction to Palestine's electrification Ronin Shamir provides a useful introduction to Hughes and offers reflections on his contributions to the study of electricity thirty-years later, *Current Flow: The Electrification of Palestine* (Stanford: The Stanford University, 2013), 3

inquiry, while also keeping the technology central to the story.[15] In essence electrical systems, and indeed most large technological networks, cannot be properly investigated separately from their social setting. Electrification is part of a "seamless web" of connections between people, machines, and the environment.[16] Allowing for such a breadth of analysis, this method broadens how we define the construction and maintenance of energy infrastructures. Electric systems must account for the input of politicians, scientists, administrators, legal operatives, engineers, entrepreneurs, and business people because all of these perspectives respond to technical problems and are involved in the development of electrification. Over the last three decades, historians of electricity have maintained similar approaches to Hughes, offering narratives of electrification that treat electrical systems as massive social and technical networks.[17] The vast majority of them approach electrification from a national perspective, often, although not exclusively, connecting electrification to nation-building. Several European scholars have

[15] Wiebe E. Bijker, Thomas Parke Hughes, and Trevor Pinch, eds., *The Social Construction of Technological Systems in the Sociology and History of Technology* (Cambridge, MA: The MIT Press, 1987).

[16] Hughes and other social constructionists describe the relationship between science, technology, and people as a seamless web, rather than try to neatly delineate between those categories in narratives. Thomas Hughes, "The Seamless Web: Technology, Science, Etcetera, Etcetera," *Social Studies of Science* 61, no. 2 (1986): 281–292.

[17] These are the majority of national-electrical histories I have consulted, a few of these include French scholarship but I do not possess the skills to properly analyze all of the non-English contributions, though I understand that global scholarship on electrification still heavily relies on Hughes. For instance, the *Association pour l'historie de l'electricité en France*, has sponsored conferences and publications since 1983. There are of course many more histories and many of them go into more detail about Hughes. Timo Myllyntaus, *Electrifying Finland: The Transfer of a New Technology into a Late Industrializing Economy* (London: ETLA, 1991); Jonathan Coopersmith, *The Electrification of Russia, 1880-1926* (Ithaca: Cornell University Press, 1992); Erik Van der Vleuten, "Electrifying Denmark: A Symmetrical History of Central and Decentral Electricity Supply until 1970" (PhD diss., University of Aarhus, 1998); Vincent Lagendijk, *Electrifying Europe: The Power of Europe in the Construction of Electricity Networks* (Amsterdam: Aksant, 2008).

examined national electrifications following his model.[18] Despite the proliferation and success of Hughes' approach, there has been some useful critique of his emphasis on "natural" system growth. For instance, his insistence that the demand for electricity and scale of the systems could only result in expansion returns to the same kind of technological determinism he critiqued.[19] Still, his description of the scale of growth involved in the process of electrification is useful and the impact of his work remains evident thirty-six years later.[20]

Historians of energy transitions seek to not only explain the large sociotechnical systems that produce and distribute energy but also explore how energy consumption is culturally constructed. Therefore, energy transition literature borrows heavily from cultural histories of electrification and energy. As David Nye argues in *Electrifying America*, electrification was not

[18] In Italy, the *Storia dell'industria elettrica in Italia* has appeared in five volumes (volume three comprises two books) starting in 1992. In France, the *Histoire générale de l'électricité en France* was published in three volumes between 1991 and 1996. They also published a research guide which gives detailed information about journals, historical studies, and useful archives concerning the history of electricity in France. See Arnaud Berthonnet, *Guide du chercheur en histoire de l'électricité*, Éditions La Mandragore (Paris, 2001).

[19] Hughes and other LTS scholars have made major contributions to the theoretical structure around such systems. Wiebe E. Bijker, Thomas Parke Hughes, and T.J. Pinch, eds., *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge: MIT Press, 1987); Renate Mayntz and Thomas P. Hughes, eds., *The Development of Large Technological Systems* (Frankfurt am Mainz: Campus Verlag, 1988); and Olivier Coutard, ed., *The Governance of Large Technical Systems* (London: Routledge, 1999). For an overview of LTS research see Van der Vleuten, "Understanding Network Societies: Two Decades of Large Technical System studies," in *Networking Europe*, ed. Van der Vleuten and Kaijser, 279–314.

[20] Histories of electric power grids as LTS has not been an American and European phenomenon. There have been a number of great studies focusing on the relationship between states and electric power. This does not include the number of non-English authors and pieces I have yet to review. For a few suggestions see, Ryoshin Minami, *Power Revolution in the Industrialization of Japan* (Tokyo: Kinokuniya, 1987); Joseph A. Sarfoh, *Hydropower Development in West Africa: A Study in Resource Development* (New York: Lang, 1990); Anto Mohsin, "Lighting 'Paradise': A Sociopolitical History of Electrification in Bali," *East Asian Science, Technology, and Society* 11, no. 1 (2016): 1–26; Xu Yi-chong, *Sinews of Power: The Politics of the State Grid Corporation of China* (Oxford: Oxford University Press, 2017).

a "'natural' or 'neutral' process; everywhere it was shaped by complex political, technical, ideological interaction."[21] In *Electrifying America,* David Nye details how electricity became part of American life, both to the approval and dismay of citizens. Some Americans expressed ambivalence to new electrical technologies; they proclaimed to enjoy new conveniences yet despised the use of electrical technologies for controlling laborers in factories and the corruption in street lighting companies. This "culture of electricity" is most brilliantly drawn out in his use of Muncie, Indiana as a microcosm for watching electricity reshape and become a part of American culture.

A particularly relevant set of cultural histories for the purposes of this dissertation analyze of the culture surrounding British nineteenth-century electrical and energy science. Appreciating the British "culture of energy" is crucial for understanding the ready reception of, and at times skeptism toward, electric power systems in Britain and its colonies as historians such as Barri Gold, Crosbie Smith, and Jennifer Karns Alexander have shown.[22] Locating

[21] There are other useful cultural histories of electric power. Bill Luckin, *Questions of Power: Electricity and Environment in Inter-War Britain* (Manchester: Manchester University Press, 1990); Wolfgang Schivelbusch, *Disenchanted Night: The Industrialization of Light in the Nineteenth Century* (Berkley: University of California Press, 1995); Ronald Kline, *Consumers in the Country: Technology and Social Change in Rural America* (Johns Hopkins University Press, 2000); Linda Simon, *Dark Light: Electricity and Anxiety from the Telegraph to the X-Ray* (London: Harcourt, 2004); Though largely focused on nuclear energy much of this book focus on New Zealand's electrification debates in the mid-20th century, Rebecca Priestley, *Mad on Radium: The Atomic Age in New Zealand* (Auckland: Auckland University Press, 2012); David Nye, *Electrifying America: Social Meanings of a New Technology, 1880-1940* (Cambridge: MIT Press, 1990), 138–139.

[22] For more on the scientific and technological relationship between the scientists and engineers working to improve both theoretical and physical heat and steam engines, see Crosbie Smith, *The Science of Energy: A Cultural History of Energy Physics in Victorian Britain* (Chicago: University of Chicago Press, 1998);) Jennifer Karns Alexander, *The Mantra of Efficiency: From Waterwheel to Social Control* (Baltimore: The Johns Hopkins University Press, 2008); Barri Gold, *Thermopoetics: Energy in Victorian Literature and Science* (Cambridge: Boston University Press, 2010).

excitement and anxiety about energy in literary, political, educational, and scientific texts demonstrates the cultural depth of electric power in the British world. Energy physics and popular interpretations of the theories that developed therein "had an undeniable appeal for those who sought one rule to rule them all."[23] This was especially true of natural philosophers and scientists like Herbert Spencer and William Thomson.[24] For many, an all-guiding principal of the conservation of energy represented God, and for others promoted British liberalism and colonialism. That is not to say that every colonial politician or public intellectual wielded energy physics as a justification for the British Empire. Rather, it resonated with British colonialism's ideas of uniformity, universal rules of law, and the domination of Nature.[25]

All of these approaches offer useful theoretical tools for describing an energy transition such as New Zealand's electrification. For example, Malm and Jones each usefully explain how the shift to new sources of power like coal or petroleum did not occur simply because the resources were available or more efficient. Instead, energy transitions happened because new systems facilitated the political and socioeconomic aims of certain groups. Energy transitions were not predetermined or inevitable, especially the shift to fossil fuels. I build on these arguments by showing that, far from being simply an "obvious next step", electrification gained adherents because it aligned so well with British colonial aspirations for New Zealand and empowered political authorities to argue for increased central governance. This dissertation will expand the timeline typically associated with the implementation of electric power systems in New Zealand, and give more attention to the global scope of electrification. Allowing for a

[23] Gold, 72.
[24] Smith, 143.
[25] Iwan Rhys Morus, *Frankenstein's Children*, 184; Bruce Hunt, *The Maxwellians* (Ithaca: Cornell University Press, 2005), 100.

longer timespan better accounts for the sociopolitical motivations behind a transition that predates dreams of centralized power production or grids. For instance, I will tie early-nineteenth century colonial patterns of resource usage to the rhetoric of electrification boosters' during the late-nineteenth century. Furthermore, the energy transitions framing allows a broadening of the scope of study to include energy resources required for electrification. For example, New Zealand's electrification relied on settler and Māori utilization of water and geothermal resources, a reality that had profound implications for New Zealand's social history.

Similarly, the systems and LTS literatures argue that technology must also be seen as it interacts with actors and institutions outside of a purely "scientific" context - in short people and the networks in which they operate must be taken into account. Electrical systems grew at an rapid rate at the turn of the twentieth century and systems literatures do an excellent job showing how they expand, consolidate, and at times stagnate.[26] They did so through an amalgamation of governmental, private, and corporate funding. They emerged as a result of the collective innovation of individuals and laboratories and the creation of new professions such as electrical engineering. Furthermore, electrical systems spanned massive geographic spaces. LTS perspectives are essential to telling New Zealand's stories as even the remote lighting of towns and mines were connected to the simultaneous construction of large electrical systems elsewhere, especially throughout the British Empire.

At the same time, much systems-building and LTS studies of electric power tend to rely too heavily on national boundaries. On one hand this is useful because it demonstrates how

[26] An interesting study of the international financial mechanisms that allowed for the rapid demand and spread of electrical technology. The authors provide a dense and encyclopedic review of electrification from around the world, William J. Hausman, Peter Hertner, and Mira Wilkins, *Global Electrification: Multinational Enterprise and International Finance in the History of Light and Power* (New York: Cambridge University Press, 2008).

embedded political systems, like national governments, were in the construction and implementation of electric systems.[27] On the other, this quickly becomes problematic in colonial spaces like New Zealand because the state itself is part of a global empire – neither colony nor empire should be conflated with the nation. As indicated earlier, even though this study focuses on New Zealand, I treat its electrification as part of a global energy transition. We cannot simply pay attention to the power companies, nationalized grids, or social advocates in electrical histories. In many histories of electrification, particularly the majority written about New Zealand, the complexity and scale of electrical systems have eclipsed the salience of ideological and cultural influence. As much as New Zealand's transition to electric power reflects the actions for and against the formation of a state, it is also about the cultural significance of electricity to British politicians, European settlers, and the Māori and the use of technology to enforce, ignore, and resist colonialism. The resistance to electric power or its associated infrastructure is just as noteworthy in shaping electric power usage as the networks that build and regulate it. And perhaps more importantly electricity itself is not a neutral energy source waiting to be used at the right time. It was an active and politically charged element of British society that made it attractive to certain classes and unattractive to others for reasons that have little to

[27] Gabrielle Hecht, *The Radiance of France: Nuclear Power and National Identity After World War II* (Cambridge: MIT Press, 1998); and Hecht, "Technology, Politics and National Identity in France," in *Technologies of Power: Essays in Honor of Thomas Parke Hughes and Agatha Chipley Hughes*, ed. Gabrielle Hecht and Michael Thad Allen (Cambridge/London: MIT Press, 2001), 256-257; All of these books offer examples of electrification being attached to nationalism and regional identity. Paul W. Hirt, *The Wired Northwest: The History of Electric Power, 1870s-1970s* (Kansas City: University Press of Kansas, 2012); Christopher Jones, *Routes of Power: Energy and Modern America* (Cambridge: Harvard University Press, 2016); Andrew Needham, *Powerlines: Phoenix and the Making of the Modern Southwest* (Princeton: Princeton University Press, 2016).

do with the actual capabilities it provides users.[28] For many colonial spaces in the British Empire, technocrats used electric power to delineate between "white" and "dark", reinforcing racial hegemony.[29] Electric power and electrical technologies in this dissertation demonstrate that energy shifts must be dealt with not only in the labs and board rooms but at the propagandist fundraisers and town council meetings too, and that the relevant people and places involved may not easily be thought of as co-existing under the auspices of the nation.

Technology and Colonialism: Historiography

The transition to electric power in New Zealand was both a colonial and imperial practice, a way of creating sociotechnical order that privileged white British settler society and their aims and goals. Throughout this dissertation, I use the terms colonialism, imperialism, settler-colonialism, and Empire as analytical categories to explore the history of New Zealand and its transition to electrification. These words are not synonymous. Colonialism is a practice of domination, which involves subjugation or exploitation of one people by another. Imperialism refers to the political apparatus that operates at the center of an empire. Colonialism can be an imperial act that necessitates invasion, whereas imperialism does not require the acquisition of land.[30] Settler-colonialism, distinct from colonialism, involves the displacement of indigenous populations by a settler society.[31] Settler-colonialism does not begin with the invasion of others'

[28] See, Iwan Rhys Morus, *Frankenstein's Children: Electricity, Exhibition, and Experiment in Early-Nineteenth Century London* (Princeton: Princeton University Press, 1998); For more on electrification in gender and professionalization see, Graeme Gooday, *The Morals of Measurement: Accuracy, Irony, and Trust in Practice in Late-Victorian Britain* (Cambridge: Cambridge University Press, 2004); *Domesticating Electricity: Technology, Uncertainty, and Gender* (London: Routledge, 2008).
[29] Moses Chikowero, "Subalternating Currents: Electrification and Power Politics in Bulawayo, Colonial Zimbabwe, 1834-1939," *Journal of African Studies* 33, no. 2 (2007): 287–306.
[30] Robert Young, *Empire, Colony, Postcolony* (Oxford: Wiley, 2015), 54.
[31] Veracini Lorenzo, *Settler Colonialism: A Theoretical Overview* (Basingstoke: Springer, 2010), 1–3, 17

land, nor does it end with the dissolution of imperial title, it is embedded in the legal philosophies and political institutions of Europe.[32] It is important to understand that while British settler colonialism is separate from subject colonialism (situations where indigenous peoples are not displaced by settlers), they both coexist in New Zealand and were impacted by the imperial policies of the metropole.[33] For the purposes of studying New Zealand, it is most important to understand settler colonialism as a product of British imperial policy that hoped to transplant British people, culture, and technology around the world. Most colonial policies and directives from Britain came from the Colonial Office, a government department headed by a cabinet member, but some initiatives came directly from the Prime Minister and the Crown.[34] New

[32] For more of a general historiography of post-colonial theory see, Edward Said is generally credited with introducing discourse analysis into the study of colonialism. In *Orientalism*, he critiques Western epistemic constructions of knowledge and its attachment to power. Edward Said, *Orientalism* (New York: Vintage Books, 1971); Gayatri Spivak argued that many colonial scholars continue present inaccurate histories by removing intermediary actors like colonial officials and attempting to construct narratives isolated from colonialism. He argued that this should be avoided as it obscures the truth. Gayatri Spivak, "Can the Subaltern Speak," in C. Nelson and L. Grossenberg, eds., *Marxism and the Interpretation of Culture* (Urbana: The University of Illinois Press, 1988), 271-313; Other useful studies include, Dipesh Chakrabarty, P*rovincializing Europe: Postcolonial Thought and Historical Difference* (New Jersey: Princeton University Press, 2007); Vivek Chibber, *Postcolonial Theory and the Specter of Capital* (London: Verso, 2013).

[33] Subject colonies refer to the territories where the existing indigenous population is not replaced by a white settler colony, rather the existing peoples form the majority of the new state under the control of the metropole. For many colonial theorists, demographics serve as the most useful tool for categorizing British colonies. P. G. Cain and A. G. Hopkins, *British Imperialism, 1688-2015*, 3rd edition (New York: Routledge, 2016), 91; D. K. Fieldhouse, *Colonialism: 1870-1945: An Introduction* (London: Weidenfeld and Nicolson, 1981).

[34] Throughout this dissertation, I will refer to the actions, concerns, and legislation from the Colonial Office regarding New Zealand. Parliament first established the Colonial Office to manage British colonial affairs in North America. However, in 1854, Parliament restructured the Office. All colonies but India remained under the direction of that Office, headed by the Secretary of State for the Colonies. Richard S. Hill, "The Policing of Colonial New Zealand: From Informal to Formal Control, 1840-1907," in David M. Anderson and David Killingray eds., *Policing the Empire: Government, Control and Authority, 1830-1940* (Manchester: Manchester University Press, 1991), 52–70.

Zealand's colonization was not an isolated act of colonialism; it was part of a transnational shift in Anglo-population and culture, often termed the *settler revolution*.[35] In New Zealand, settlement was continuous and complex. Settler and Māori efforts to use electric power systems to employ or alter colonial power make this struggle especially clear.

A key theme throughout this study is the relationship between technology and colonialism. For decades, colonial historians have used technology as an analytic. The materiality of technology aids in giving substance to the sociopolitical and cultural abstractions and ideologies in play in colonial spaces.[36] For instance, technologies offer concrete representations of British ideas about modernity because these technologies were explicitly defined by the British as modern. Observing how colonizers and the colonized used technology provides a means of exploring successful and failed colonial projects, challenging narratives of European social and technical superiority, and charting the clash between the imagination and the realization of colonial initiatives. Colonizers attempted to use technology to facilitate their visions and establish their superiority over others. Conversely, sociotechnological systems often change or fail and alter the visions of colonizers or work to resist colonization.

For decades, scholars have made significant contributions to the study of colonialism by exploring technological initiatives aimed at maintaining colonial holdings. Electrical technology was one of the foremost examples of British (and European) superiority for colonizers and indeed some subsequent historians. For centuries, European colonizers wielded technology as a

[35] I will develop this more in Chapter 2 with a discussion about the settler movement and how it impacted resource extraction. For more see, James Belich, *Replenishing the Earth: The Settler Revolution and the Rise of the Anglo-World, 1783-1939* (Oxford: Oxford University Press, 2009).

[36] For further critiques of abstraction in postcolonial history, see Fredrick Cooper, *Colonialism in Question: Theory, Knowledge, and History* (Berkley: University of California Press, 2005).

principle justification for their movement on and theft of others' lands.[37] Historians of technology have been complicit in continuing such justifications by over-simplifying the role of technology in the colonial process.[38] In these histories, technology is cited as a primary reason for successful European conquest and assimilation around the world, rather than dissecting the ways technology was used. Technological infrastructures (as well as "scientific" knowledge about them) such as the massive networks of ships, universities, telegraph wires, or railways facilitated imperialism and became one of the key methods of labeling a society as modern.

Besides dismissing Eurocentric approaches like "tools of empire," many scholars, like Rudolf Mrazek and Dewey Clive have also shown that the movement or transfer of European technologies into colonial spaces does not necessarily duplicate or perform the function assigned by colonizers.[39] For example, in *Engineers of Happy Land,* Mrazek asserts that technologies may mirror colonial purpose but more often than not they create new spaces in which that power is contested.[40] While some technologies were implemented in the Netherlands Indies as a reminder of home, a bulwark of Dutch authority, and a promise for a modern future for Dutch colonists, indigenous people frequently took up those technologies in ways that that circumvented the

[37] As Pratt argues in her book about the imperialism embedded in travel writing, technology consistently reinforced European justifications for Empire because it helped them to create distinguishing characteristic between the center and periphery. Mary Louise Pratt, *Imperial Eyes: Travel Writing and Transculturation* (London: Routledge, 1992), 72.
[38] One of the most prolific and often-cited authors on the relationship between technology and colonialism is Daniel Headrick. Headrick, Daniel R. *Tools of Empire: Technology and European Imperialism in the Nineteenth Century*. New York: Oxford University Press, 1981; Headrick, Daniel R. *The Tentacles of Progress: Technology Transfer in the Age of Imperialism, 1850-1940*. New York: Oxford University Press, 1988.
[39] For more see, William K. Storey, *Guns, Race and Power in Colonial South Africa* (Cambridge: Cambridge University Press, 2008); David Arnold, *Everyday Technology: Machines and the Making of India's Modernity* (Chicago: University of Chicago Press, 2013.
[40] Rudolf Mrazek, *Engineers of Happy Land: Technology and Nationalism in a Colony* (Princeton University Press, 2002).

power of the colonizers or made them question their own "superiority." In *Steamboats on the Indus*, Clive argues that the failure of steamships on the Indus River in the nineteenth serves as a powerful reminder that even "high" European technologies were by no means inevitably successful; technological failure is the missing story in the history of European colonies.[41] He dissects the implementation of the steamship in India to show that British ideas of modernity, efficiency, and progress were bound up in the steam engines and were assumed to be universal in their dominance. Yet these steamships failed to overturn the use of the "humble" boats on the Indus river and its tributaries, which were far better suited to the geography and economics of the region, during what is usually seen as one of the most expansive periods of the British Empire.

In studying New Zealand's electrification and colonialization, I incorporate theoretical approaches that reject notions of European technological superiority because it is neither true nor useful. We must prevent the recycling of racist and progressive visions of European empire. As the histories listed above have shown, technology is of major import in histories of the manifestation of imperial power because the British saw technology as a sign of their modernity and obligation to spread technology, knowledge, and culture into their colonies.[42] Technology did in some cases work to exercise power but more often than not technologies and their users created new identities and versions of modernity to counter the intentions of European colonizers. Providing such nuance in imperial histories will continue to uncover the spaces of resistance to empire, allow for the histories of the colonized to be told in more detail, and challenge the ghost of determinism that still haunts historical studies European colonial

[41] Dewey Clive, *Steamboats on the Indus: The Limits of Western Technological Superiority in South Asia.* (Oxford, 2014.)
[42] Duncan Bell, "Dissolving Distance: Technology, Space, and Empire in British Political Thought, 1770-1900," *Journal of Modern History* 77 (2007): 523–562.

successes. Although this dissertation explores a subject which superficially appears to be a thoroughgoing colonial success – New Zealand did rapidly electrify – it will highlight the unintended trajectories of these efforts over the long term. Electrification was far from an easy or obvious solution to New Zealand's desire for power. It was at times more difficult than, or failed to really improve on, existing systems. Although intended to enforce colonial authority, eventually it was also used by the Māori to decolonize New Zealand society.

Pākehā and Māori: New Zealand Historiography

In addition to incorporating and adding to the histories of energy transitions and technology and colonialism, this study builds on the historiography of New Zealand. Recently historians have argued that more attention needs to be directed toward the diversity of lived experiences in New Zealand.[43] First, the New Zealand story is not solely a settler, or *Pākehā* in Māori, story. For the remainder of this dissertation, I categorize non-Māori of European descent in New Zealand as Pākehā. The term accomplishes two things. First, it distinguishes between colonial authorities in New Zealand and those working from the Colonial Office. Second, by emphasizing the identity of settler in contrast to the indigenous Maori, it works to reinsert the Māori into New Zealand history, especially when records of Māori are scarce or non-existent.[44] Many of the islands' general histories, while including some Māori narratives, treat the history of New Zealand as the development of a national identity.[45] In general, both in popular and

[43] For a collection of essays outlining feminist approaches to New Zealand history see: Rosemary Du Plessis and Lynne Alice, eds., *Feminist Thought in Aotearoa New Zealand* (Auckland: Oxford University Press, 1998).
[44] For a detailed discussion of the term's usage in New Zealand by Māori and non-Māori, see Huhana Forsyth, "An Identiy as Pākehā," *AlterNative* 14, no. 1 (2018): 73–80.
[45] Comprehensive histories of New Zealand after invasion date back to the 1880s, see the following: G. W. Rusden, *History of New Zealand* (London: Chapman and Hall, 1883); William Pember Reeves, *The Long White Cloud: Ao Tea Roa* (London: Horace Marshall & Son, 1898). Keith Sinclair, *A History of New Zealand* (Auckland: Penguin, 1959); Keith Sinclair, *A Destiny*

academic circles, authors have been concerned with finding the nation or some unifying national identity which emerges out of colonial history.[46] The search for what makes New Zealand unique has been particularly prominent.[47]

Instead of following the model of national histories of New Zealand's settlement or electrification, my work follows the example of historians like James Belich, Vincent O'Malley, and the *Kaupapa Māori* scholars that have moved away from assuming British primacy in New Zealand. In *The Victorian Interpretation of Racial Conflict* James Belich argues that historians must carefully tread through the "New Zealand Wars," a series of conflicts between 1845 through 1872, in order to better understand what has often been treated as straightforward British victory.[48] He reconstructs the narratives of success and failures in the British and Māori conflicts throughout the period and shows that , unlike many armed conflicts around the empire, the Māori frequently defeated and resisted the British Army. They did not do so through happenstance or the failure of British command, as is so often claimed in the historiography of this period. The Māori united to wage war against the British and constantly readjusted their combat strategies, a

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Apart: New Zealand's Search for National Identity (Wellington: Nicholson Press, 1986); Michael King, *The Penguin History of New Zealand* (Auckland: Penguin, 2003).

[46] One of the first histories to Long White Cloud Sinclair; In perhaps the most thorough of the general histories of New Zealand, James Belich wrote *Making Peoples* and *Paradise Reforged*. Still, these are considered some of the most authoritative, though many point to its mistreatment of Māori history and social history more broadly. James Belich, *Making Peoples: A History of the New Zealanders from Polynesian Settlement to the End of the Nineteenth Century* (Honolulu: University of Hawaii Press, 1996); *Paradise Reforged: A History of New Zealanders from the 1880s to the Year 2000* (Honolulu: University of Hawaii Press, 2002); J. Pollock, "Cultural Colonization and Textual Biculturalism: James Belich and Michael King's General Histories of New Zealand," *New Zealand Journal of History* 41, no. 2 (2007): 180-198

[47] J. Phillips, "Verandahs and Fish and Chips and Footie on Saturday Afternoon: Reflections on 100 Years of New Zealand Historiography," *New Zealand Journal of History* 24, no. 4 (1990): 118-134

[48] James Belich, *The Victorian Interpretation of Racial Conflict: The Māori, The British, and the New Zealand Wars* (London: McGill-Queen's University Press, 1989)

characteristic approach that European racism was unwilling to ascribe to non-European peoples. By doing this Belich restores the agency of Māori warriors and leaders, and provides a more nuanced and less triumphalist understanding of the resolution of these critical conflicts. Along similar lines, Vincent O'Malley, in *The Meeting Place* moves away from the fatal impact approach, or the idea that British and Māori contact resulted only in the victimization of the Māori.[49] Instead, he revisits legal and mercantile relationships between Māori and Pākehā and argues that their interactions, particularly in the period prior to official colonization (1840), demonstrate a "liminal and hybrid world." Using these early exchanges, he maintains that New Zealand history should be defined by the dynamic and mutually constitutive relationship between Māori and Pākehā.[50]

While Pākehā scholars, like O'Malley and Belich have had a major influence on recent historiography in New Zealand, the most meaningful and influential revisions to New Zealand's history have come out of by Kaupapa Māori scholars.[51] Kaupapa Māori refers to an ontological base that asserts an understanding of New Zealand's history as a partnership between the Pākehā and Māori. As Tukuna Mate Nepe argues:

> Māori society has its own distinctive knowledge base. This knowledge base has its origins in the metaphysical realm and emanates as a Kaupapa Māori "body of knowledge" accumulated by experiences through history, of the Māori people. This

[49] This approach has been termed the "middle ground" thesis by many New Zealand scholars. Vincent O'Malley, *The Meeting Place: Māori and Pākehā Encounters: 1642–1840* (Auckland, New Zealand: Auckland University Press, 2012), 12.
[50] Ibid., 226.
[51] While important throughout this dissertation, the fourth chapter is the most involved in this theoretical approach. For more on the history and construction of Kaupapa Māori see, Henry, E. "Kaupapa Māori: locating indigenous ontology, epistemology, and methodology in the academy," in *Building the research capacity within Māori communities: a report on the proceedings of the wānanga* (New Zealand Council for Educational Research, 1999.) For a detailed study of the theory and its application see, Leonie Pihama, "Tihei Mauri Ora: Honouring Our Voices: Mana Wahine as a Kaupapa Māori Theoretical Framework," Ph.D. Thesis, University of Auckland, 2001.

> Kaupapa Māori knowledge is the systematic organization of beliefs, experiences, understandings, and interpretations of the interactions of Māori people upon Māori people, and Māori people upon their world.[52]

In particular, this body of scholarship demands the Māori perspectives, culture, and knowledge be applied to the history of New Zealand. This runs counter to the majority of histories of New Zealand because it depends on critical theories developed by non-Western scholars. Postcolonial scholarship has certainly been useful for critiquing the colonial powers in action in New Zealand but Kaupapa Māori scholars add that we must approach Māori history using Māori knowledge.[53]

This dissertation aims to destabilize progress narratives that describe the islands' history as a quest for "national identity." The quest for nationhood presupposes the teleological development from Polynesian homeland to a colonial outpost to an independent nation-state. Rigid understandings of New Zealand's national identity, particularly in the late-nineteenth and twentieth centuries stand as a euphemism for colonial systems of exploitation.[54] Instead, we must understand New Zealand's history as a complex intersection of British culture, international settler movement's, and Māori history. Confining New Zealand's history to the construction of a Pākehā-nation also reinforces nationalist ideas that minimize outlying or problematic narratives. As has been well established by the majority of post-colonial scholars purely national histories

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[52] Tukana Mate Nepe, "E hao nei e tneei reanga: Te Toi Huarwea Tupuna," Master's Thesis, University of Auckland, 1991, 4.
[53] Some of the best postcolonial theory, both for exploring the impact of colonialism and challenging Western-centric histories of technology, developed out feminist scholarship. Though I do not actively address gender in this dissertation, there is certainly room to explore the category of gender in New Zealand's electrification. Sandra Harding, *Sciences from Below: Femininisms, Postcolonialities, and Modernities* (Durham: Duke University Press, 2008), 2.
[54] Peter Gibbons, "Cultural Colonization and National Identity," *New Zealand Journal of History* 36, no. 1 (2002): 5-17.

focused on a single identity constrains the writing of history and reifies the existence of the modern state. Historians of other British colonies, particularly Canada, Australia, and South Africa, have increasingly established historical frameworks that allow for transnational and cultural approaches.[55] A history of New Zealand's electrification depends on this historiography because electrical technologies and knowledge circulated throughout the British world including colonial and present-day New Zealand.[56] At the same time, we must acknowledge the actors that resisted New Zealand's inclusion in the British world. In other words, shift away from making the British past the center of New Zealand's story. Most importantly, we must always engage with the lasting effects of colonialism.[57]

For this dissertation, I included as many Māori perspectives on electrification as the sources allowed, and pay explicit attention to the ways that Māori were implicated (politically, physically, or socially) in the sociotechnical project of electrification. Many of New Zealand's first electrical schemes were only possible because of the massive land grabs made by settlers and the New Zealand government during the 1850s-1880s.[58] Therefore, it is often impossible to accurately depict how Māori were, or rather were not, involved in New Zealand's early

[55] Here are a few collections of transnational histories about the British Empire. One of the central themes in all of them is that people are not limited to the boundaries established by nation-states. Kate Darian-Smith, Patricia Grimshaw, and Stuart Macintyre, *Britishness Abroad: Transnational Movements and Imperial Cultures* (Melbourne: Melbourne University Press, 2007), 1-17; Kevin Grant, Philppa Levine, and Frank Trentmann, eds. *Beyond Sovereignty: Britain, Empire and Transnationalism, c. 1880- 1950* (New York: Palgrave MacMillan, 2007); Angela Woollacott, *Settler Societies in the Australian Colonies: Self-Government and Imperial Culture* (Oxford: Oxford University Press, 2015), 1–2.
[56] For more on the production of and lasting impact of knowledge in colonial spaces see, Sandra Harding, *Science from Below: Feminisms, Postcolonialities, and Modernities* (Durham: Duke University Press, 2008): 203–205.
[57] A. Curthoys, "Losing Our Wa After the Imperial Turn: Charting Academic Uses of the Postcolonial," in A. Burton *After the Imperial Turn: Thinking with and Through the Nation* (Duke: Duke University Press, 2003).
[58] See chapter 4 for additional detail.

electrification. However, what is not recorded is in some ways as useful as the existing record. Throughout this study, I seek to align my research with Kaupapa Māori scholars to achieve a historiography that includes both Pākehā and Māori perspectives. The chapters where the Pākehā voices outweigh Māori voices are not intended to silence or obscure the Māori. Instead, the absence of their perspectives should be seen as an affirmation of the colonial intentions behind electric power infrastructures. While Māori history has flourished in the last two decades, particularly in academia, accessing primary source material is often difficult or impossible. Almost all archival sources from the nineteenth century are Pākehā or come from the Native Lands Courts. Moreover, many Māori records that are still extant are not readily available to scholars.[59] Given these limits, I have included Māori wherever material exists and accordingly use as many Māori primary sources as possible.

Chapter Summaries

New Zealand's transition to electric power is inseparable from British settler-colonialism. This dissertation investigates four electrification projects in New Zealand between the 1880s and 2000s, showing how each shaped and was shaped by colonialism. The first chapter argues that British colonizers used electric lighting in Reefton to fulfill visions of a settlement in the periphery, the superiority of British technology, and the possibility of a self-sufficient colonial town. It represented the fulfillment of a vision for the colony of New Zealand using a technology. Animated by politicians, electrical engineers/salesmen, and settlers Reefton's electrification became a model for settler colonial initiatives in New Zealand. Framing Reefton within the larger Empire connects the transition to electric power with broader colonial aims,

[59] Many Māori and indigenous communities have been exploited by scholars and rightly distrust Western "research practices. Linda Tuhiwai Smith, *Decolonizing Methodologies: Research and Indigenous People* (New York: Palgrave, 2013), location 3622.

such as establishing permanent colonies and a global British civilization. In order to succeed, New Zealand settlements needed to be prosperous, self-sufficient, and reflect Britishness. Reefton's population growth, gold mining prospects, and investors provided the framework for realizing the ideal New Zealand town. The proposal to electrify Reefton enlisted the existing infrastructures, namely control of the Inangahua River, to create the ideal settlement. Engineers appealed to the town's interest in self-sufficiency, or it ability to generate a profit, by offering a technological novelty that provided a "never-ending" supply of power to light the town and power mining equipment. Its transition to electric power demonstrates how an electrical infrastructure appealed to miners', settlers', and politicians' ideas about settlement. The town demonstrates how New Zealand's earliest electric systems served colonial interests, as much as it served local interests in lighting and power. Electric power promised to actualize the potential that people like William Gladstone, Julius Vogel, and Charles Hursthouse projected for the colony, so much so that other towns throughout New Zealand took notice and began to implement similar structures.

Advocates for its electrification hoped to exemplify the aims of the model colony, by increasing the mine's profits, conquering and utilizing natural resources, and highlighting British technological superiority on an industrial scale. The second chapter follows one such project at the Phoenix Mine. In 1886, the mine implemented a hydroelectric scheme to power mining equipment. The ability to utilize electric power in the frontier demonstrated the utility of lighting and fulfilled many imperial and settler visions for New Zealand. However, lighting only partially demonstrated the utility of electric power. Electrification needed to fully align with British and settler plans for building a prosperous and self-sustaining colony, which included resource extraction and manufacture. Gold mines were the first industry to explore the potential of electric

power application beyond lighting. The installation at the Phoenix Mine demonstrates how electrification, particularly hydro-electrification, allowed for the redistribution of productive industries that served imperial and settler interests while conquering New Zealand's unique landscapes. Once a barrier to expansion, New Zealand's vast river system came to justify the movement of New Zealand's industries outside urban spaces, allowing for industrial-scale production to align with British ideas of progress and New Zealander pastoral identity. Hydroelectric power at the Phoenix Mine transformed New Zealand from a Pacific *resource frontier*, a materially exploitable region in the colonial periphery, into a model colony ready for urban energy infrastructure.

The third chapter charts the connections of electric power infrastructures to settler colonialism in the establishment of New Zealand's first state-run hydroelectric dam, Lake Coleridge. Electric lights symbolized technological capability and modernity; however, for New Zealand, the relationship between progress and electricity had for decades been associated with New Zealand's advanced status in the British Empire and conquest of another frontier. Electric power had been used to bolster New Zealand's self-sufficiency and its economic productivity in service to the Empire. In particular, hydroelectricity had proven the most effective means of both achieving economic gain and establishing imperial infrastructures, such as lighting frontier outposts, mining gold in the frontier, and long-distance telegraphic communication. Across the Empire, the British enacted water regulations to control settler populations, marginalize indigenous peoples, and facilitate the introduction of new infrastructures. Historians and sociologists, often with distinctions unique to their study, classify this as *hydro-imperialism*, or the usage and control of water resources in a colonial setting. The completion of the power station encapsulates the successful conclusion of the Dominion experiment and the origin of

New Zealand's national electric utility that continued to operate under the colonial models of resource manipulation, centralized political authority, and theft of indigenous land and water rights in the name of technological progress and modernity.

The fourth and final chapter investigates the examines the impact and meaning of the Tuaropaki Trust's geothermal power station and the connected Māori-run industries. The generation of electric power by Māori Land Trusts disrupts the colonial pattern of electrification and offers a true alternative to patterns of exploitative energy production in New Zealand. Unlike the electrical enterprises at Reefton, the Phoenix Mine, or Lake Coleridge, geothermal energy is rooted in Māori culture and ethical energy practices. Māori investment, persistence, and environmental awareness in reclaiming Aotearoa's (Māori word for New Zealand) resources, such as those at the Mokai Geothermal Fields, are the primary reason for the success of these systems. In particular, the Tuaropaki Power Company's investment in geothermal energy, sustainable farming, and social justice represent the decolonization of earlier electric power systems in New Zealand. The majority of electrical history, in New Zealand and elsewhere, presents electrical technologies and the requisite knowledge to electrify as Western. Such perspectives on electrification privilege the success, dominance, and necessity of colonizers. Electric power provided the means to conquer nature, efficiently distribute resources, and justify the creation of a modern (British) state – in other words meet the promises of British colonialism. Yet, electric power has also been a way for the Māori to reclaim land, exercise authority, and protect their heritage, environment, and future. Much like recent historians have emphasized about Māori participation in war and the construction of New Zealander culture, Māori laborers and urbans users of electric power contributed to an intrinsic belonging to the nation. Even though Māori narratives in Reefton, Bullendale, and Lake Coleridge convey tales of

removal, absence, and conformity, Māori users and designers participated in the electrification of New Zealand. Pākehā used electrical infrastructures to facilitate their settlement of the frontier, expand their extractive industries, and legitimize a national government.

Electric power was not an afterthought of British settlers who had already colonized New Zealand. Electrification was integrated into colonial processes, such as communication, transportation, and resource extraction, bent on establishing the dominance of British settlers over the indigenous population and founding a self-sustaining colony. Following the success of Lake Coleridge, New Zealand's hydroelectric dams remained the favorite method of electric power production. In reaction to this pattern of electrification, particularly after the expansion of gas-fired stations, Māori Trusts used their legislated authority to reshape the country's energy policy by pursuing sustainable and globally just energy practices. Māori commitment to geothermal energy highlights the colonial structures still in place in New Zealand's electric grid, as well as the Waitangi Tribunal. In this chapter, I argue that the Māori, particularly the Tuaropaki Trust, used, and continues to expand, geothermal electric power production to reclaim agency, establish a diverse Māori economy, and develop a sustainable energy future for New Zealand. In New Zealand, the Tuaropaki Power Company demonstrated the ways in which Māori could reclaim their lands, promote environmental sustainability, and reconceptualize colonial models of electric power production that deplete resources, are concerned primarily with profit, and emphasize centralization. Amid the mounting concerns over climate change, geothermal energy has proven an effective aid for other forms of alternative energy by supplementing wind and solar farms during off-hours. The development of the Tuaropaki Power Company points to the ways that electric power companies can adopt ethical energy systems that can change, rather than replicate, colonial technological infrastructures.

Chapter 1:

"Endless Supply": Reefton's Electrification and New Zealand's Colonial Imaginary

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Introduction

> "Reefton is making a proud name for herself. She above all cities in the Southern Hemisphere, has started in the lead of utilizing the electric light for the benefit of her inhabitants. Magnificent Melbourne, stately Sydney, august Adelaide, with ambition Auckland, windy Wellington, critical Christchurch, and discursive Dunedin, are all left far behind in the march of progress, for Reefton has the electric light."[60]

During the 1880's New Zealand and London newspapers frequently paid tribute to the Reefton Electric Light Company. As with many cities and towns in late-nineteenth century New Zealand, and indeed the wider British Empire, Reefton drew the attention of Pākehā, entrepreneurs, and miners because of gold and its accompanying business potential.[61] The hydro-powered electrification of the town distinguished Reefton as a place of note in New Zealand and even within the wider British Empire. The interest of Reefton's town leaders in electric power mirrored British enthusiasm about the potential of electric power applications in metropolitan spaces in New Zealand, Europe, and North America. In a town filled with speculative investors and businessmen seeking profit from mines and miners, electric lighting and power systems held considerable appeal. Boosters of electric lighting and power systems constructed a rhetoric that appealed to a town filled with speculative investors and businessmen seeking profit from the mines and miners.[62] For them electricity promised to bring Reefton into the modern world.

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[60] *Weekly Press*, December 24, 1886, 1.
[61] Steven Eldred-Grigg, *Diggers, Hatters, and Whores: The Story of the New Zealand Gold Rushes* (Auckland: Random House, 2008), 192.
[62] Throughout the dissertation, I join other electrical historians in using the "booster" category to describe the network of engineers, salesman, politicians, and journalists that pushed for the introduction of electric power systems. The term describes the large network of actors and

Reefton's plan for electrification fit into the broader imperial imaginaries formulated by politicians, such as New Zealand's Premier Julius Vogel (1835-1899) and British prime minister William Gladstone (1809-1898), each of whom anticipated the development of New Zealand into a self-sufficient colony, fit to become a dominion, a "Britain of the South."[63] On the one hand, it is an imperial imaginary because Reefton's electrification aligned with British interests to reduce colonial spending and military intervention, and to spread of British culture within the settlement. On the other hand, the town's transition to electric power performed the colonial imaginary of local politicians, engineers, and the town's citizenry by demonstrating the colony's technological prowess and the fitness of settlers to master New Zealand's frontier.

A Colonial Experiment

In order to understand how Reefton fit into larger imperial imaginaries, it is important to understand New Zealand's place within the British Empire. In 1788, New Zealand and Australia both officially became part of the colony of New South Wales. Prior to the British invasion of *Aotearoa* (The Land of the Long White Cloud), the Māori and Moriori people populated the islands.[64] The Māori lived on the islands of the New Zealand archipelago, whereas the Moriori inhabited the Chatham Islands. Both cultures descend from Polynesian peoples that emigrated from Taiwan, Melanesia, and the Society Islands. Most anthropologists and historians place the

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discourages deterministic constructions of electrification as a natural next step, rather than a purposefully designed energy transition. Christopher Jones, *Routes of Power: Energy and America* Cambridge: Harvard University Press, 2014), 221; Andrew Needham, *Powerlines: Phoenix and the Making of the Modern Southwest* (Princeton: Princeton University Press, 2014), 40.

[63] Charles Hursthouse, *The Britain of the South* (London: Edward Stanford, 1857).

[64] This is the most common translation of *Aotearoa*, but it can also be translated as "land of abiding day" or "lone bright world." The exact origin of this word is unknown, but we do know that Governor George Grey used it in his 1855 publication of *Polynesian Mythology and Ancient Traditional History* (London: John Murray, 1855), 58.

settlement of New Zealand circa 1280 CE. The descendants of these settlers were the Māori. The separate settlement of the Chatham Islands by the Moriori occurred circa 1500 CE.[65] The Māori and Moriori people thrived in the islands for hundreds of years. Each region of the island developed distinct dialects, agricultural practices, hunting rituals, and warfare tactics.[66] For instance, the Chatham Islands' harsh climate led to strict anticannibalism traditions to control population, while the larger Māori tribes of the North Island practiced cannibalism and frequent warfare to mediate competition for land.[67] Throughout the dissertation I refer mostly to the Māori because British legislation regarding electrification and land confiscation generally referred to only the Māori. However, I want to stress that when I use the term Māori, I understand the Māori to comprise a vast and complex culture, not one homogenous people. Māori negotiations with the Europeans were not universally recognized by all Māori. The Māori did not recognize themselves as a unified political entity prior to European invasion and the continued usage of the category as wholly representative has led to cultural, legal, and philosophical conflict.[68]

In 1642, Abel Tasman (1603-1659) landed near Golden Bay on the northwestern tip of the Southern Island. Māori attacked his crew and the European sailors left to survey the remaining island. Four of his crew died leading Tasman to name the place "Murderers Bay."[69] In

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[65], Philippa Mein Smith, *A Concise History of New* Zealand (New York: Cambridge University Press, 2012), 20.
[66] A. W. Reed, *Reed Book of Māori Mythology* (Wellington: Reed, 2004), 15.
[67] G. J. Irwin, *The Prehistoric Exploration and Colonisation of the Pacific* (Cambridge: Cambridge University Press, 1992), 101-102; L. A. Nagaoka, "Explaining Subsistence Change in Southern New Zealand: Foraging Theory Models," *World Archeology* 34 (2002): 84-102.
[68] Ani Mikaere, "Racism in Contemporary Aotearoa: A Pakeha Problem," in *Colonising Myth, Māori Realities: He Rukuruku Whakaaro* (Wellington: Huira Publishers, 2011), 92-126.
[69] Vincent O'Malley, *The Meeting Place: Māori and Pākehā Encounters: 1642–1840* (Auckland, New Zealand: Auckland University Press, 2012), 29.

1645, the Dutch designated the islands the *Nova Zeelandia* after the Dutch province of Zeeland, which James Cook (1728-1779) anglicized in 1770 to New Zealand.[70] Cook began surveying New Zealand in 1769, under the guise of studying the transits of Venus, while he really planned to make the islands a British territory.[71] Cook returned to New Zealand on all three of his major voyages (1770, 1773, and 1778) during which he improved the mapping of the region and carried out both successful and unsuccessful negotiations with Māori for goods and guidance around the islands. Not to be outmaneuvered by the British, French explorers also sought territory in New Zealand. In 1772, Marc-Joseph Marion du Fresne (1724-1772) charted Spirits Bay and the Bay of Islands. After many successful exchanges, further miscommunication and theft led to the murder of du Fresne and massacre of his crew. While tragic for both the Māori and French killed during the conflict, the legacy of this massacre resulted in more devastating ramifications for the Māori. Reports of the event circulated throughout Europe giving the islands a misleading reputation as a dangerous frontier. Decades later, the memory of these events fueled violent resentment toward the Māori in legislation and warfare.[72]

By the 1790s, New Zealand became a trading hub for British, French, and American whalers and tradesmen. Pākehā traded metal goods, such as tools and guns, for Māori food,

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[70] Ibid., 14-15; There is mention of Portuguese exploration of New Zealand but it is not widely accepted among experts. The largely discredited work about Portuguese exploration of New Zealand comes from Peter Trickett, who suggests Cristocao de Mendonca (1475-1532) discovered New Zealand in the 1520s. Peter Trickett, *Beyond Capricorn: How Portuguese Adventurers Secretly Discovered and Mapped Australia 250 Years Before Captain Cook* (East Street Publications, 2007)

[71] A. Grenfell Price, ed. *The Explorations of James Cook in the Pacific: As Told by Selections of His Journals, 1768-1779* (Dover Publications, 1971), 16-17

[72] The French did lay claim to the island, "France Australe," but never organized settlement to the islands. Peter Tremewan, ed., *French Akaroa: An Attempt to Colonise Southern New Zealand* (Christchurch: University of Canterbury Press, 1990,) 178.

water, flax, and sex. Most reported peaceful negotiations but occasionally conflicts arose. From the beginning of British settlement, New Zealand's Anglo-society assumed an air of superiority as a British colony that would surpass earlier colonies, most notably Australia.[73] Historians refer to the early-portrayal of a superior New Zealand as the "Wakefieldian Dream" after colonial theorist Edward Gibbons Wakefield (1796-1862).[74] During the 1820s, Wakefield advocated for "systematic colonization," which included buying land from the Māori, paying high wages to settlers, and incentivizing passage to the colony from Great Britain.[75]

Over time colonial authorities and Pākehā adopted many of Wakefield's views, especially resentment toward non-British immigrants and the Māori, but his plans for a structured and primarily middle-class settler population became the foundation for many visions of New Zealand's future.[76] The New Zealand Association (1836-1839), later New Zealand Company (1839-1852), and the Crown government, enforced the idea that New Zealand would remain devoid of the "stain" of being associated with the transportation of British convicts as was the case with Australia. New Zealand represented a new moral standard for the British Empire to attract an adventurous and financially capable middle class.[77] Compared with the rural spaces of

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[73] Officially British settlement began in Australia in 1788, because New Zealand and Australia were both part of New South Wales. However, plans for a colony in Australia began in the 1770s either as a penal colony or colony for American loyalists. David Hill, *1788: The Brutal Truth of the First Fleet* (New York: Random House, 2008), 11.

[74] Historians use this category to broadly explain the hopes the British had for New Zealand. In addition, it can refer to the collective pride New Zealanders had about their colony. Philippa Mein Smith, *A Concise History of New* Zealand (New York: Cambridge University Press, 2012), 57.

[75] Raymond Bunker, "Systematic colonization and town planning in Australia and New Zealand," *Planning Perspectives*, 3, no. 1 (2007): 59-80.

[76] Cecilia Morgan, *Building Better Britains: Settler Societies in the British World* (Toronto: University of Toronto Press, 2016), 37.

[77] A British company formed to endorse and facilitate the creation of an English society on the islands, later called New Zealand. Edward Wakefield founded the company. The company established the towns of Wellington, Nelson, Wanganui, Dunedin, and Auckland, which

England, Pākehā saw New Zealand's rugged spaces, like Reefton, as in need of the right kind of technological improvements and imperial masculine vigor. Yet Pākehā and British-colonial boosters feared replicating the worst aspects of industrial developments in Britain, including urban pollution and slums. Electric power, especially hydroelectric-power, promised to bring proper urbanization, meaning no dirty smokestacks or massive factories which resulted in objectionable working conditions.[78] These ideals of New Zealand's colonial potential established a discourse echoed in the rhetoric around Reefton's electrification.[79]

All the talk about settlement however assumed and relied on the removal or decline of Māori populations to bring them to fruition. Settlers could only move into these areas if the Māori moved or were moved out. The colonization of New Zealand depended on Māori decline, real and imagined. The banishing of the Maori to create "empty spaces" was essential to convince settlers of the reality of this ideal New Zealand. The colonization and settlement of New Zealand depended on the appropriation of Māori persons, land, and resources. While historians have traditionally treated this as an uncomplicated triumph, in fact it is a complex story.[80] As James Belich argued, while historical successes may be debated, in the historical

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remained the major civic centers. The company functioned in a quasi-governmental role until the Colonial government and New Zealand association gained greater authority in the 1840s. Due to financial difficulty the company collapsed in 1858 after bringing some 15,000 settlers to New Zealand. Patricia Burns and Henry Richardson, eds. *Fatal Success: A History of the New Zealand Company* (Auckland: Heinemann Reed, 1989).

[78] Felicity Barnes, *New Zealand's London: A Colony and Its Metropolis* (Auckland: University of Auckland Press, 2013), 81.

[79] Reefton and the much of the west coast was referred to as the frontier or West Country. Thomas Wayth Gudgeon, *The Defenders of New Zealand: Bring a Short Biography of Colonists Who Distinguished Themselves in Upholding Her Majesty's Supremacy* (Auckland: H. Brett, 1887), 26.

[80] Many of the early national histories, some still considered canon, minimize Māori involvement in colonization or write only of their victimization. William Pember Reeves, *The Long White Cloud: Ao Tea Roa* (London: Horace Marshall & Son, 1898); Keith Sinclair, *A History of New*

record the inevitability of a British triumph has rarely been questioned. During the nineteenth century, and in subsequent historical works, the British treated the Māori removal as a single concentrated effort, when no such operation existed.[81]. Despite European portrayals, the Māori were a culturally and politically diverse group of people and an integral part of New Zealand's colonial society. The reception and interpretation of European invasion varied. Many *iwi*, the largest subdivision of Māori best translated as "nation," welcomed trade and relations with Europeans, while many ignored or resisted their presence on the island.

In the decades prior to the 1830s the number of British Pākehā increased from a few hundred to around 1,000. They mainly engaged in trading and missionary work. Their interference ignited what has become known as the Musket Wars or Land Wars (1815-1840) during which European migrants and Māori tribes fought over land rights. The vast majority of these conflicts occurred between Māori iwi, which, armed with European weapons, led devastating campaigns against old and new enemies.[82] Historians estimate that between 20,000 and 40,000 Māori were killed in this conflict with possibly thousands more enslaved by other hapu. By 1840, the Māori population shrank from 100,000 to between 50,000-80,000 whereas the non-Māori population rose by over 2,000.[83]

Zealand (Auckland: Penguin, 1959); Keith Sinclair, *A Destiny Apart: New Zealand's Search for National Identity* (Wellington: Nicholson Press, 1986).

[81] James Belich, *The New Zealand Wars and the Victorian Interpretation of Racial Conflict* (Auckland: University of Auckland Press, 1986), 312.

[82] Both Iwi and Hapu describe pre-European political and family arrangements of Māori peoples. An iwi refers to a massive grouping of families, clan and is probably most synonymous with nation. A Hapu is a subdivision within the iwi distinguished by closer familial relations. Rāwiri Taonui, 'Tribal organisation - The significance of iwi and hapū', Te Ara - the Encyclopedia of New Zealand, http://www.TeAra.govt.nz/en/tribal-organisation/page-1 (accessed 8 March 2019)

[83] Smith, 81.

British politicians and Pākehā portrayed the decreasing Māori population as a consequence of the Māori's barbarous traditions and justified their colonization on this basis. The high rate of Māori population decline in New Zealand furthered the idea of New Zealand's potential, in contrast to the "troubled" settlements of South Africa and Australia or the difficult colonization of India. To what extent did British settlement contribute to the extermination of the Māori? This remains a controversial and unresolved topic.[84] It is important to point out that despite British proclamations of total success, many Māori rejected British authority or superiority and succeeded in rebuffing both the British military and their legal administration. Yet, Māori over time did lose considerable land and rights to aggressive Pākehā settler and military campaigns.

For many Pākehā and British politicians, New Zealand's resistant indigenous population, geographic separation, and status as the last touched land on Earth, *terra nullius*, justified the beneficent civilizing mission of the British Empire, a mission run by sober middle-class British settlers. During 1830s-40s, British authorities and Pākehā rhetorically located New Zealand at the physical and racial edge of the world. As Ernst Dieffenbach (1811-1855), naturalist with the New Zealand Company argued:

> They [The Māori] are a people decidedly closer in relation to us, than any other; they are endowed with uncommonly good intellectual faculties; they are an agricultural nation, with fixed domicile, and have reached the farthest point of civilization which they

[84] Debates about the impact of Pākehā settlement on the Māori population range from definitive claims that European invasion, introduction of disease, and encouragement of trade in fire arms directly caused the decline, to claims that inter-iwi warfare resulted in the decline. The best studies suggest that both are likely true. Ian Hugh Kawharu, *Waitangi: Māori & Pākehā Perspectives of the Treaty of Waitangi* (Oxford: Oxford University Press, 1989); Michael Belgrave, *Historical Frictions: Māori Claims and Reinvented Histories* (Auckland: Auckland University Press, 2006); Atholl Anderson, Judith Binney, Aroha Harris, *Tangata Whenua: A History* (Wellington: Bridget Williams Books, 2015), 110.

possibly could, without the aid of other nations, and without the example of history.[85] Still, they feared that the absence of British guidance might lead to horrific war and decline in Māori progress towards civilization. For example, Governor George Grey (1812-1898) worried that granting Māori leaders too much power would, "draw back the mass of the native population to their barbarous custom."[86] This isolation of the island and misleading stories of Māori ferocity fabricated a terrifying "other" to juxtapose with British civilization. Colonial boosters believed necessary the removal, conquest, and assimilation of the Māori, and Moriori, because it demonstrated the success of the colony to potential middle-class British settlers, other British colonies, investors, and competing European nations. The fabrication of an "other" is a favorite tool of imperial efforts bent on establishing the metropole, in this case London, as the civilized center or example to follow.[87]

During the 1840s, the Colonial Office and Pākehā representatives passed transformational legislation that altered New Zealand's administration, and the relationship between the Pākehā and the Māori. Their aims were to strengthen the colony's identity foremost among the Pacific British colonies and develop industries which would enhance the colony's economic autonomy. First, in 1840 they signed a Royal Charter, and separated New Zealand from New South Wales under the direction of William Hobson (1792-1842). Shortly thereafter, Hobson co-authored the Treaty of Waitangi (1840), which established British sovereignty over

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[85] Ernest Dieffenbach, *New Zealand and its Native Population* (London: Smith, Elder, and Co., 1841), 14; For more on the construction of the Māori race see, Julie Evans, Patricia Grimshaw, David Philips, and Shurlee Swain, "Australasia: One or Two 'Honorable Cannibals' in the House?" in *Equal Subjects, Unequal Rights: Indigenous People in British Settler Colonies, 1830-1910* (Manchester: Manchester University Press, 2003), 63–87.
[86] George Grey to Lord Stanley, 22 April 1846, cited in Julies Evans, "To Keep within Proper Bounds…": Edward Eyre and the Colonised Peoples of Australia New Zealand, and the Caribbean," PhD Thesis, University of Melbourne, 1998, 174.
[87] Edward W. Said, *Orientalism* (New York, Vintage Books, 1978), 1–2.

New Zealand under his governorship and recognized Māori land ownership, giving Queen Victoria's government the sole right to purchase that land.[88] British representatives drafted the treaty and 500 Māori leaders signed. The Treaty of Waitangi is considered the founding document of the state of New Zealand. However, in London and New Zealand, Māori and British legislators interpreted the language of the treaty quite differently. Pākehā understood the treaty as a declaration of total British sovereignty, which granted the governor the right to govern all of the island's inhabitants. The Māori by contrast, at least in general, believed the treaty ceded sovereignty to the crown in exchange for military and legal protection. The Treaty of Waitangi remains one of the most controversial documents in New Zealand, and perhaps British, history. As with the Musket Wars, questions remain as to whether this treaty led to the New Zealand Wars (1845-1872), a series of armed conflicts between the Māori and New Zealand government. However, it is clear that the British government and settlers abused the purchase of land and participated in violent movements against the Māori after the Treaty of Waitangi. Meaning that Pākehā superficially adhered to the Treaty's terms because the driving for behind colonization was not Māori rights but the attainment of their land.

As settlement increased, settlers called for increased self-government, which they thought fitting for a truly "superior" colony. In 1846, Governor George Grey oversaw the signing of the first New Zealand Constitution Act, which granted increased self-government. The bill created municipal corporations, two provinces, a Legislative Council, and elected House of

[88] The Treaty of Waitangi is one of the most controversial documents in New Zealand. The signing is not acknowledged by many Māori to this day, nor was it acknowledged by many in 1840. Translations barriers, miscommunications, lies, and lost copies of the treatise have created a debate which, as of 2017, has only resulted in an official apology from the New Zealand government and minimal land settlements. Nicola Rowan Wheeler and Janine Hayward, eds. *Treaty of Waitangi Settlements* (Wellington: Bridget Williams Books, Ltd., 2012).

Representatives. The constitution suffered from lack of clarity and Grey himself argued that it removed Māori rights, which he famously championed. After a few years, in 1852, the government signed the second Constitution Act and it remained in place, although with a number of major revisions, until the Constitution Act of 1986. This act set up a bicameral General Assembly, eventually labelled Parliament, that consisted of the governor, legislative council, house of representatives, an executive council appointed by the governor, and six provinces. In 1877, due to ineffective management, the Crown dissolved the provinces.

Following the conclusion of the New Zealand Wars (1872), the British implemented sweeping land confiscation to punish the Māori for rebellion. This practice breached the Treaty of Waitangi and shifted the pattern of settlement in New Zealand because Pākehā could more easily acquire Māori land.[89] Between the 1850s and 1870s, global gold rushes in California, Australia, and New Zealand sparked a wave of Anglo-immigration around the world, many thousands ending up in New Zealand.[90] Most settlers came from Eastern Australia and Britain. In addition to the so-called "Anglo-Expansion", other settlers from around the world appeared in large numbers in New Zealand. Recently, historians have discovered a large Chinese immigrant population that in the past has proved difficult to track because they were left out of the official census.[91] The 1860s-1890s saw a collective increase of Pākehā in New Zealand by 100,000, thanks to the gold rushes and incentivized migration, enforced by political-businessmen like

[89]Smith, 82.

[90] Anglo-Expansion, a term Belich and others use to describe British and US movement around the world. I want to avoid carelessly adopting this term as it can be reminiscent of Fredrick Jackson Turner's apologist histories of Manifest Destiny and European superiority. However, it is useful for describing the scale of these migrations. James Belich, *Replenishing the Earth: The Settler Revolution and the Rise of the Anglo-World, 1783-1939* (Oxford: Oxford University Press, 2009), 12–14.

[91] Joanna Boileau, *Chinese Market Gardening in Australia and New Zealand: Gardens of Prosperity* (Springer, 2017), 2-3.

Julius Vogel (1835-1899), known for his work as Colonial Treasurer and as premier of New Zealand.

During this population explosion, mining towns like Reefton experienced massive growth and became more permanent settlements. More importantly, the 1860s saw the creation of a settler society– a transition from the focus on short-term resource extraction to relocation and population growth.[92] In New Zealand, this settler society comprised of "settler capitalists," Pākehā with capital to invest in businesses, and working-class migrants from England, Scotland, Australia, Germany, and China. These settler capitalists were not of gentlemanly origins, although they saw themselves as such, and many became quite wealthy. They created the thriving mines which played a major role in fueling and funding Reefton's drive for electric power.

Imperial Imaginaries

It wasn't merely population growth that spurred the interest of Reefton's town leaders in electrification. It was also the imaginary they came to share about the place of Reefton and electricity in a modernizing New Zealand. To be sure, the legal wrangling discussed earlier played a role in increasing settlement and investment in the island. More importantly, the imagination of what New Zealand's future could be opened places like Reefton to the possibilities of modernity, including electrification. The architects of this imaginary, operating with many different agendas, maintained a belief in the promise of New Zealand as a special

[92] The term "settler-capitalist' features prominently in economic histories of the British Empire. Historians frequently utilize the term to make explicit connections between British metropolitan influences in the settler colonies to forge an international financial system. Many of these historians maintain that these financiers, not industrials, were more involved in British imperial aims. Jim McAloon, "Gentlemanly Capitalism and Settler Capitalism: Imperialism, Dependent Development and Colonial Wealth in the South Island of New Zealand," *Australian Economic History Review* 42, no. 2 (2002): 208-209.

place for the expansion of British ideals and culture. New Zealand offered resources and opportunities unavailable in other colonies (and Britain itself). Politicians and authors alike positioned New Zealand as the "Britain of the South," arguing that it could emulate the best parts of Great Britain, such as political institutions and world-leading technological progress; and remove the worst, such as overpopulation and economic corruption.[93] These self-styled visionaries spoke from London to New Zealand and reached an audience of equal breadth. By painting New Zealand as an "emigration field," with the potential to create an improved Britishness, or cultural identification of Great Britain as home or center, and to become a self-sufficient yet inseparable part of the British Empire, this imagined ideal of New Zealand provided a framework that informed electrification efforts.[94]

> I believe that I am right in proposing the beautiful island of New Zealand to be the spot for the first stone of the temple of happiness to be laid, as it may be said to be in its infant state, and uncorrupted by any large collection of people; and more especially as it has been held sacred, and kept free from the contamination of the offenders from the mother country.[95]

Electric power systems provided a mechanism through which imperial officials felt they could maintain cohesion, through communication, markets, and technological infrastructure. It

[93] Critiques of Great Britain's industrialization were loudest from the working class and the Chartists and early Labour Party writers. Lyman Tower Sargent, "Utopianism and the Creation of New Zealand National Identity," *Utopian Studies* 12, no. 1 (2001): 1-2; Dominic Alessio, "Promoting Paradise: Utopianism and National Identity in New Zealand, 1870-1930," *New Zealand Journal of History* 42, no. 1 (2008): 22–41.

[94] Many historians argue that one of the most formative periods for British identity happened during the nineteenth century because of the spread of British peoples and culture around the world. In order to transplant their culture and justify colonization colonial authorities, settlers, and the Colonial Office collectively formed definitions of Britishness. Keith Robbins, *Great Britain: Identities, Institutions and the Idea of Britishness* (London: Longman, 1998), 206–207; Simon Featherstone, *Englishness: Twentieth Century Popular Culture and the Formation of English Identity* (Edinburgh: Edinburgh University Press, 2009), 1–8.

[95] Robert Pemberton, *The Happy Colony* (London: Saunders and Otley, 1854), 25.

bolstered the enthusiasm for New Zealand's self-sufficiency while calming feelings of anxiety at the thought of an irrelevant Great Britain.[96]

The imaginary constructed by colonial authorities and Pākehā was largely built on the concept of utopia in New Zealand. The language used to describe the benefits of electrifying towns like Reefton utilized many of the frequent tropes of a utopian New Zealand. A utopia is an ideal society or as James Belich argues in *Paradise Reforged*, a "bewildering array of heavens on Earth."[97] As scholars like Lyman Tower Sargent, Lucy Sargisson, and Dominic Alessio have argued, the meaning of utopia in New Zealand changed throughout the course of the nineteenth and twentieth centuries and varied between Pākehā, Māori, and British government officials. The various utopian descriptions of New Zealand portray the country as an Arcadian paradise, a destination where socioeconomic advancement is achievable, distant from the Old World, a land of racial superiority (for white settlers and Māori) and a successful political exercise in colonial administration.[98] Colonial officials and settlement boosters deployed utopian rhetoric to convince settlers of the promise of New Zealand and confirm the superiority of the colony. Mining towns like Reefton align with the rhetoric that encouraged settlers to emigrate and take a chance in New Zealand frontier to profit from investing in mining companies or move to the frontier to mine gold. However, further work is needed to locate how Reefton fits within the broader construction of utopias in New Zealand. For this study, the concept of imperial imaginary works better as an analytic tool for describing the rhetoric and visions that Reefton fulfilled. While a useful term in the historiography, the frequent usage of utopia by historical actors and subsequent historians

[96] Thomas Dixon, *Weeping Britannia: Portrait of a Nation in Tears* (Oxford: Oxford University Press, 2015); Kenton Storey, *Settler Anxiety at the Outposts of Empire: Colonial Relations, Humanitarian Discourse, and the Imperial Press* (Vancouver: UBC Press, 2016).
[97] Belich, *Paradise Reforged*, 22.
[98] Alessio, 21–22.

risks conflating the variety of "utopias" in New Zealand. Since Reefton was not explicitly discussed as a utopia, it is more useful to point out the ways it connects to utopias and other imperial visions.

For decades, sociologists, historians, and literary theorists have used the concept of the imaginary to question and add depth to understandings of the relationship between Britain and its Empire. They have consistently challenged the assumption that the Empire was characterized by a single unified vision; indeed such a vision did not exist. Tracing the imaginaries at work in Empire, they have studied how analysts can render layered pictures of modernity, imperialism, and British identity.[99] This is not complexity for its own sake but rather a necessity, for Empire exists as much in military and legislative action as in the rhetoric of morality and progress used to justify the British Empire. Addressing colonialism through the imagination grants agency to a greater range of actors. The metropole and colonies produced mutually constitutive sites of knowledge and experience, which renders older models that isolate the colony from the center increasingly suspect. Historical case studies of gender, class, literature, and technology demonstrate the importance of understanding the imagined spaces of the British Empire as an imaginary, which is used to define what is British, and conversely, what is not.[100]

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[99] Alan Lester, "Imperial Circuits and Networks: Geographies of the British Empire," *History Compass* 4, no. 1 (2006): 124–141.

[100] Acknowledging the problems inherent in adopting terms such as modernity, I hope to draw attention to the way the British and New Zealand settlers used terms like modernity alongside technology as part of their program for promoting the British Empire. Historians such as Daniel Headrick in *Tools of Empire* have effectively demonstrated that the British saw modern technology as a tool for achieving a vast empire. The realization of that goal or the superiority of British technology has, rightly so, been criticized by recent historians. Nonetheless, understanding British imperial motivation requires charting their usage of technology as the key to modernity. For more see, David Arnold, *Everyday Technology: Machines and the Making of India's Modernity* (Chicago: University of Chicago Press, 2013); Clive Dewey, *Steamboats on the Indus: The Limits of Western Technological Superiority in South Asia* (Oxford: Oxford University Press, 2014); Antoinette Burton points this out by describing the British struggle to

In order to tie together empire and electrification, the imaginaries must be collective. The imperial imaginary that concerned New Zealand was made as much by the British enactment of imperial power as those Pākehā who portrayed New Zealand as the ultimate example of successful colony. Reefton's electrification performs a sociotechnical imaginary, a vision for the future that embedded electrification and empire within each other. [101] By framing Reefton's electrification this way, we add "social thickness and complexity" to the project by showing how the shared ideas of a few individuals led to the communal adoption of a vision for electric power and what ought to be the dominant energy source.[102]

William Gladstone (1809-1898), Julius Vogel (1835-1899), and Charles Hursthouse (1817-1876) all wrote about the potential of New Zealand, each contributing something to the collective imaginary taken up by electricity advocates. Their perspectives represent an imperial and a colonial imaginary constructed around New Zealand as place where British imperialism and colonial self-sufficiency thrived. The colony reflected, "everything of England, in short, but the soil."[103] These aspirations were based on the social and resource potential of New Zealand, the efficiency and spirit of Pākehā, the conquest and assimilation of the Māori, and belief in their

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explain its empire or assign it an identity as "fantasy structure," *After the Imperial Turn: Thinking with and Through the Nation* (Durham: Duke University Press, 2003), 6.

[101] I have adopted the concept of sociotechnical imaginary from Shelia Jasanoff's work, which defines it as: "…. collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology." Sheila Jasanoff and Sang-Hyun Kim, eds., *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power* (Chicago: University of Chicago Press, 2015), 4.

[102] Routes of technology transfer and technique are not linear but manifold and multicentered, for more see Liliane Hilaire-Perez and Catherine Verna, "Dissemination of Technical Knowledge in the Middle Ages and the Early Modern Era: New Approaches and Methodological Issues," *Technology and Culture* 47, no. 3 (2006): 543.

[103] George Butler Earp, *The Emigrant's Guide to New Zealand: Comprising Every Requisite Information for Intending Emigrants, 5th edition* (London: W. S. Orr and Co., 1849), 48.

colonial mission.[104] They based this sociotechnical imaginary on the political proclivities of New Zealand's colonial government, the self-sufficiency supplied by the country's resources, and British technological superiority. Electric power promised to be the ideal means to meet that expectation.

William Gladstone, a titan in Victorian politics, saw in New Zealand the possibility to establish the ideal colony. In the larger Empire, he is most noted for his commitment to "home rule," the idea that colonies ought to be ruled by their own citizens, especially but not only Ireland.[105] His commentary on New Zealand's Second Constitution in 1852 provides useful summary of the imperial plans for New Zealand. He stated:

> My belief is, that the highly intelligent community you have founded in New Zealand more thoroughly reflects the spirit, the character, and intelligence of England than almost any other among all your colonies, and my opinion is, that they will exercise so clear an intelligence. In discerning what is for their own good, that they will rectify the error of our crude legislation, and will, extricating themselves from this complexity, attain to a unity of system and a clear and accurate discrimination of power.[106]

Gladstone's ideas about New Zealand resembled those expressed by most British politicians. The Colonial Office, and certainly the Pākehā, believed that New Zealand provided a superior model

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[104] This is just a sampling of people who had visions for New Zealand. For more, see Lucy Sargisson and Lyman Tower Sargent, *Living Utopias: New Zealand's Intentional Communities* (Burlington, VT: Ashgate, 2004), 1–37.

[105] Home Rule is most often, and somewhat incorrectly, associated with only Ireland. There were similar movements in India, Scotland, and New Zealand throughout the 19th century. D. George Boyce "Gladstone and Ireland," in Peter John Jagger, ed. *Gladstone* (London: The Hambledon Press, 1998), 118–121.

[106] Gladstone is referring to the first and ultimately ineffective constitution of New Zealand written by the Colonial Office in 1846. The document was rejected by Governor George Grey and underwent major revisions that final took effect in 1852. Gladstone, like many other officials, felt that the government in New Zealand would be able to develop a better system of government than the Colonial Office. William E. Gladstone, *Speech of the Rt. Hon. William E. Gladstone, M.P. on The Second Reading of the New Zealand Constitution* (London: John W. Parker and Son, 1852), 18.

to older subject and settler colonies. Governor George Grey exclaimed that:

> Her Majesty's Government may rest satisfied that there will be soon no more prosperous or contented Settlements than those which have been established in the Southern District of New Zealand.[107]

New Zealand could avoid the stigma and troubles of earlier colonies, like Australia and South Africa, because of the types of settlers moving to the island and the government's displacement of the indigenous population.

What is most noteworthy is Gladstone's usage of the word "reflect," that New Zealanders reflected the spirit, character, and intelligence of England. By reflect, he really meant constructing or duplicating a cultural Britishness. Authority figures in Britain and New Zealand, like Gladstone and Grey, maintained that the islands would indeed become the "Britain of the South" or the "England of the Pacific." New Zealand was imagined in this rhetoric as a place for the British, not the Māori or non-British immigrants. From the end of the nineteenth and well into the twentieth centuries, New Zealanders strived to maintain their Britishness through writing, advertising, and eventually film.[108]

As a politician, author, and entrepreneur who served as premier of New Zealand from 1873-1875, Julius Vogel's speeches and published works offer the clearest examples of the sociotechnical imaginary Pākehā politicians constructed around electric lighting. Prior to his premiership, Vogel played a significant role in the formation of the Australasian Light, Power, and Storage Company and its subsidiary the New Zealand Electric Lighting Company, Ltd.[109]

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[107] George Grey, "Colonial Dispatch," August 31, 1846.
[108] Barnes, 65.
[109] Electric power companies were promising investments for men like Vogel at this time, particularly as the larger companies, like Thomson-Houston or Brush, purchased smaller companies. Harold Passer, *The Electrical Manufacturers, 1875-1900: A Study in Competition Technical Change, and Economic Growth* (Cambridge: Harvard University Press, 1953), 110.

Furthermore, he advocated for New Zealand's federalization and for a particular vision of New Zealand's place in a larger Empire. In 1874, he wrote to James Ferguson the governor of New Zealand:

> I hope that the British possessions will in time be consolidated into a mighty Dominion, and the British Colonies become, not dependencies, but integral and inseparable parts of an Empire.[110]

Note especially his use of the term "dependencies." New Zealand's potential resided in the qualities which could make it a less dependent and more productive a part of Empire. In 1878, still vying for a change in New Zealand's status, Vogel published *New Zealand and South Island Seas* and argued:

> No land on Earth has before it fairer promise. The bond people share there and the resource potential provides a way to maintain common interests.[111]

In the text, Vogel detailed the people and islands' resources as a way to argue for the colony's federation. The bond and common interest he spoke of is the "reflection" of Britishness that Gladstone described. The term "resources" refers to a number of exports, but also to the country's energy potential, such as its rivers, to which he referred repeatedly. Vogel described a New Zealand with the potential to be the ideal product of settler colonialism, both in its ability to maintain British culture and politics and through its landscape's prospects for self-sufficiency.

It wasn't just boosters like Vogel who advocated for increased settlement, many Pākehā composed guides to life there to encourage people to move. One of the most famous of these

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[110] This is an extract from a letter from Vogel to James Ferguson. It appears in collections of Vogel's paper and collections dedicated to imperial federation. Frederick Young, ed. *Imperial Federation of Great Britain and Her Colonies* (London: S. W. Silver and Co., 1876), 157.
[111] Vogel later published a paper by the same title in a longer book. However, this passage comes from a paper delivered to the Royal Colonial Institute. Julius Vogel, "New Zealand and the South Sea Islands, and Their Relation to the Empire," *Proceedings of the Royal Colonial Institute* 9 (1878): 164–223.

works is Charles Hursthouse's *New Zealand: The Britain of the South* (1857). Notably he sought to attract the right kind of British citizens to the "natural gifts" of New Zealand and prevent them from going to America or Canada. They could leave overcrowded England and find a spacious, but civilized, society in New Zealand.[112] Hursthouse called himself a New Zealand colonist and a former visitor in the United States, Canada, Cape Colony, and Australia, although he wrote and promoted this book while living in London. The book's focus on the individual settler obscured his larger imperial aims, namely that Hursthouse was on the payroll of the New Zealand Company. His two-volume work sought to convince a primarily English population, that with a little effort, their fortunes would be made in New Zealand. For interested readers he claimed, "I should have much pleasure in attempting to afford it by replying to any communication sent to my town address, 28, Thavies Inn, London."[113] Despite his exaggerations in the early pages of the book, Hursthouse composed a lengthy argument for moving to New Zealand during the 1850s-1860s.[114] He based his claims on the promise of growing industries and the need for more settlers to run these industries, pointing to government incentives for settling and using success stories of recent emigrants to drive his point home. Unlike Gladstone and Vogel, Hursthouse's work, and the many others like it, were widely read and likely played a great role in influencing settlement to New Zealand and, more importantly, settler expectations for the colony. Settlers expected growing industries and productive landscapes, particularly those who made their way to

[112] Hursthouse, 5.
[113] Hursthouse, 8.
[114] Some historians, like James Belich, find that his work merges history with, "propaganda and prophecy." While I agree that Hursthouse's work should not be cited as an accurate portrayal of actual opportunity in New Zealand, the sentiment and imaginary he constructed were certainly representative of the way New Zealand was promoted from the 1840s onward. James Belich, "Colonization and History in New Zealand," in Robin W. Winks, ed., *The Oxford History of the British Empire*, vol. 5 (Oxford: Oxford University Press, 2001), 182.

mining settlements like Reefton.

Hursthouse bragged about numerous qualities of New Zealand, such as its moderate climate, agricultural prospects, and unparalleled self-government in the British Empire, each worth a study on their own. For the purpose of understanding the imaginary which many in Reefton would take to heart, it is worth noting the chapter in Hursthouse's book where he explores New Zealand as a "mineral kingdom." In this chapter, he quotes earlier surveys of the country which speculated that New Zealand would likely provide vast mineral wealth, including gold, coal, iron, and copper. He quoted Governor Robert Fitzroy's (1805-1865) prediction that, "beneath the productive surface of these teeming islands are mineral stores as yet hardly known."[115] Hursthouse stoked his readers' imaginations by arguing that New Zealand offered:

> …the world's most precious ores and metals; and they have sometimes lain, almost under our very eyes, undetected for years. It has been so in America, in Africa, in Australia…Hundreds of shepherds roamed the plains of Victoria for a quarter-century little dreaming that they walked on gold. And though no country has less need of mineral wealth than New Zealand, a few years may prove her as rich *below* the surface, as she is above and on it.[116]

Hursthouse's argument captures the hopes many settlers and investors held for New Zealand during the last half of the nineteenth century. It sidestepped arguments against the search for gold by citing other examples of gold finds beneath colonies after decades of occupation. Later in that chapter, he hedged his argument by suggesting that the real wealth of New Zealand would be agriculture, but left the reader to wonder at the hidden wealth beneath the soil.

Unlike some of the later literature that promised miners immense wealth and sparked the gold rush in New Zealand, the remainder of the chapter indicated that the mineral wealth,

[115] Governor Fitzroy was an English navy officer and scientist. He is most well-known for his role as captain of the HMS *Beagle* on Charles Darwin's famous voyage. Hursthouse, 144.
[116] Hursthouse, 145.

whether in gold or coal, would add to the increasing economic sustainability of New Zealand as a British colony that had been expensive to settle and protect. Economic sustainability is related to but separate to the discussion of self-sufficiency, which was more the aim of individual settlers than the Colonial Government. For Hursthouse, establishing New Zealand's mineral wealth meant stabilizing the economy and promoting a self-sufficient colony. New Zealand needed to remain economically viable. After the initial rush for gold in New Zealand, especially on the southern island's west coast, towns like Reefton belied the get-rich-quick mindset of many enthusiasts and instead adopted practices conducive to the development of a long-term mining industry. Ultimately electric power, for both lighting and powering mining equipment, presented regional mines with the ability to extract gold from deeper in the ground, thus sustaining their operations longer. Although Hursthouse's writing predated the introduction of electric power in New, the imaginary he constructed for New Zealand's future harmonized with policies mining towns like Reefton adopted to promote their longevity as an economically viable (and maybe essential) part of the Empire.

Electric technologies allowed Pākehā to adapt British ideas about technological modernity, while forging their own image of self-sufficiency. The tracts written by Gladstone and Vogel were not as widely circulated as travel writings like *The Britain of the South* or *The England of the Pacific*, but the imperial policies they wrote still shaped how settlers moved to and thought about New Zealand. Electrical technology embodied this imperial imaginary. Reefton, provides an example of how a small mining town fits into this narrative.

In the case of Reefton, and New Zealand itself, these imperial visions were attached to ideas of self-sufficiency–both economic and political– and a craving for technological prowess. Within the context of the British Empire self-sufficiency refers to both a colony's ability to self-

govern and remain economically stable. This passage from an 1869 New Zealand Institute lecture demonstrates that for New Zealanders (and the Empire) technological prowess offered the means to both secure and justify empire:

> Electricity and steam communication appear as the appointed agents of an All-wise Providence for building up the comity of nation; – for obliterating prejudices; – for throwing down restrictions on free intercourse in trade, science, literature, and all the generous amenities that should bind man to man.[117]

As its settler-colonies expanded in the late-nineteenth century, colonial officials saw the promise of an economically productive self-governing nation, like New Zealand, as a justification for their model of colonialism. In Reefton specifically, technological prowess through small-scale projects, meant overcoming the blighted image of an immoral mining town or the overcrowded urban space like London or Manchester, and offering instead a model of modern urban life.

New Zealand and the Electric Light at Reefton

As European natural philosophers like Alessandro Volta (1745-1827) and Michael Faraday (1791-1867) experimented on and theorized about electricity, British settlers in New Zealand developed an interest in electricity. During the 1840s, Pākehā often used references to electricity as a rhetorical device such as in this piece from the *Nelson Examiner and New Zealand Chronicle*:

> This is a question which has, at the present moment, forced itself upon our consideration, and we doubt not upon the consideration of every man who reflects on the condition of our country, with the force of an electric shock.[118]

The Colonial Office and Pākehā attempted to use electric power to exercise colonial authority even in the earliest electricity projects. The first electric utility in New Zealand was the

[117] "New Zealand Institute," *Wellington Independent*, September 7, 1869, 3.
[118] "What Are the Powers of the Government, and the Rights of the People of this Country," *Nelson Examiner and New Zealand Chronicle*, 24 August 1844, 97.

telegraph. In 1861, George Grey (1812-1898), during his second governorship of New Zealand, ordered the erection of a telegraph line between Auckland and present-day Hamilton to communicate along the Waikato River.[119] The telegraphic line heightened tensions between British forces and Kingites, the iwi that followed Kīngitanga or Māori King movement which did not accept British sovereignty.[120] The telegraph, and the accompanying networks (including roads, railroads, and power lines) effectively cordoned off existing Māori claims to the land and enforced British and later national government rule.

Although electric lighting proved useful in Europe during the 1850s, the telegraph remained the primary electric utility in New Zealand until the 1870s. In 1879, the first recorded public display of electric lighting appeared in a Wellington jewelry store, which illuminated "Messrs. Kohn & Co" from behind a royal coat of arms.[121] By the 1880s, discussion about the potential of electric lighting and electricity as a motive force for industry frequently appeared in the press in Great Britain and its colonies. New Zealand was no exception. The public's excitement centered around visions of an electrically powered future to match the urban centers of Europe and the United States. Engineers and "electrically literate" Pākehā entrepreneurs/politicians, such as Alexander Bickerton (1842-1929) and Charles Lemon (1834-1901), published articles and advised administrators and businessmen of the potential of

[119] Smith, 73.
[120] The *Kīngitanga* formed on the North Island during the 1850s to slow and eventually stop the alienation of Māori lands. The hope was that this "king" could deal with Victoria on equal terms. The monarch retains no formal legal or constitutional power in New Zealand, though they continue to be elected by participating tribes today. Ballara, Angela, 'Introduction: The King Movement's First Hundred Years': In *Te Kīngitanga: The People of the Māori King Movement,* ed. Dictionary of New Zealand Biography, 1–32. (Wellington: Auckland University Press, 1996.)
[121] Reilly, 11.

electricity.[122] The capital city of Wellington saw the first demonstrations of practical applications of electricity. In 1881, journalists excitedly reported on things like rugby and cricket matches lit by electric flood lights and speculated on the success of electricity in New Zealand. Two years later, Woodyear's Electric Circus lit their center ring using electric power. It was, "brilliantly illuminated by electric light…as light as the day." Electric lights appeared on ships, such as the S. S. Manapouri, lit by 170 Swan incandescent lights. Members of parliament visited the ship in June 1882, which then prompted the promotion of the electric lighting for the New Plymouth House of Representatives. Many of the components bore familiar names such as Siemens, Swan, Edison, and Brush. As one witty observer from the *Auckland Star* put it in 1881, "Electricity in Franklin's time was a wonder; now we make light of it."[123]

That the Pākehā were entranced by the possibilities and sheer wonder of electric modernity, including communication and power, is not surprising.[124] Most of the world was quite taken with electricity and its potential. New Zealand featured electricity in its electrical exhibitions and commercial advertising much like the press and industrial exhibitions in Great Britain. Throughout the 1870s and 1880s cities like Wellington and Christchurch held exhibitions that proclaimed the wonders of electricity.[125] Boosters styled New Zealand exhibitions similarly to British exhibitions and referenced British technological might in the

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[122] Alexander Bickerton, "Recent Advances in Electricity," *Proceedings of the New Zealand Institute* April 28, 1886, 608; "Obituary Notices: "Charles Lemon," *Journal of the Institution of Electrical* Engineers, May 30, 1901, 1247.
[123] *Auckland Star,* July 8, 1881, 2.
[124] The wonder at technological marvels manifested in many ways, such a sense of rightness and progress, anxiety, and ambivalence. Bernard Rieger, *Technology and the Cultures of Modernity in Britain and Germany 1890-1945* (Cambridge: Cambridge University Press, 2005), 20–22.
[125] It should also be pointed out that New Zealand newspapers printed many announcements for electrical exhibitions around the world from the 1860s onward. Given the wide circulation and success of their press, New Zealander's were kept apprised of electric power developments and excitement. Barnes, 201–202.

process. By the early 1880s, many Pākehā towns, urban businesses, and industries were actively pursuing ways to implement electric power.

Reefton was in many ways typical of towns that saw in electricity the chance to assert a modern identity. Reefton or Reeftown, sometimes called Quartzopolis, is a small town on New Zealand's west coast in the valley of the Inangahua River, an area Pākehā still considered the frontier during the late-nineteenth century.[126] During the 1870s, Pākehā built the town to provide a service center for the Murray Creek alluvial quartz reefs. The great expanse of quartz required well-funded investors to purchase crushing and mining equipment for the settlers to work. By 1872, settlers, miners, and investors had constructed homes, hotels, stores, and banks making Reefton a permanent home for some 3,570 citizens.[127] The high risk and speculative environment of Reefton fostered invention and attracted inventors and new mining technologies, including the Pelton wheel and hydroelectric systems. While removed from urban centers such as Wellington and Auckland, Reefton, by adopting an interest in electrical systems kept pace with the engineering and technological debates of the day.

In some ways, the settlement resembled more metropolitan centers in New Zealand because of the services it offered. The quartz fields of the Inanhangua River, which ran through Reefton, measured forty miles long. By 1886, Reefton hosted approximately 1,100 residents, comparable with many other mining settlements on the West Coast. Reefton attracted hundreds of goldminers, tradesmen, and wealthy investors seeking profit by providing services to mining

[126] The West Coast of the southern island was referred to as a frontier because it had recently been acquired from Māori *hapu*, who "sold" their land rights to the crown. To this day, that part of the country remains largely rural and undeveloped. They rely on the tourist industry and a few scant mines that remained until the 1950s. Rollo Arnold, *New Zealand's Burning: The Settlers' World in the Mid-1880s* (Wellington: Victoria University Press, 1994), 97.
[127] "Nelson Goldfields," *Otago Witness*, June 15, 1872, 10.

operations. For example, Reefton maintained its own stock exchange for the quartz and gold prospects. According to local newspapers and regional histories, beginning in the 1870s, the entire community engaged in speculating.[128] In 1882, one reporter counted some 7,500 telegrams from the Reefton Stock Exchange. This was the highest level of activity on the West Coast and the sixth highest in the country.[129] As with most nineteenth-century boom towns, the exchange made and lost fortunes. In 1886 some 22 citizens registered as share brokers or mining speculators. Popular stocks included the Welcome, Keep-It-Dark, and Globe mines. The Bank of New Zealand and the National Bank purchased the gold from and held the cash of Reeftonites. The *Inangahua Times* and the *Inangahua Herald* supplied the town with daily news and the latest mining profit figures.

The introduction of electric power added to Reefton's success and acclaim and is representative of how Pākehā imagined electric power would shape their ideal colony. Reefton thrived on the vibrant gold economy with an energetic population of miners, investors, and businessmen. Its predominantly single-male mining population established a need for temporary or transitional accommodation.[130] The town boasted no fewer than 17 hotels during the 1880s, where miners lived, socialized, and shared in regional brews.[131] As a result, Reefton appealed to engineers, who hoped to profit from electrical ventures. Accustomed to risky mining ventures and new mining technology, Reeftonites formed civic bodies to handle infrastructure proposals, and the town maintained enough capital to construct an electric system. However, neither the

[128] "Reefton Share Market," *West Coast Times*, July 17, 1877, 2.
[129] David Grant, *Bulls, Bears, and Elephants: A History of the New Zealand Stock Exchange* (Wellington: Victoria University Press, 1997), 49–50.
[130] "The Inangahua," *The Colonist*, May 14, 1872, 3.
[131] John Rosanowski, *Bottled Lightning: The Story of the Reefton Light* (Nelson: Cornwall Associates, 2001), 8.

civic infrastructure nor the settler movements alone produced Reefton's electrification.

In essence, global trends of the British Empire were played out locally in New Zealand. During the 1880s-1890s, New Zealand's newspapers, resembled, if not copied, England's press. The papers published articles and advertisements touting the benefits of electricity or comparing the merits of electricity and natural gas works. For instance, the "Electricity is Life" column from the *Thames Star*, frequently published on useful electrical technologies like toothbrushes, hairbrushes, and a curious "flesh brush".[132] New Zealand did not simply replicate the excitement of Britain. Speculations and hopes for electricity were tied to the ways electricity could benefit New Zealand, particularly protecting its status in Empire through potential applications like lighthouses and military port illumination.

Like many other mining towns, Reefton's electrification differed from the electric works of major cities like Wellington and Dunedin. Gold and other types of mining brought prosperity (or at least the idea that it could achieved) into boom towns throughout New Zealand. The prospect of electrical infrastructures added to that sense of prosperity and progress in a settlement. Reefton bustled with miners, businesses, and financial prospects during the 1880s. In 1883, Walter Prince, an electrical engineer and businessmen, paid a call to Reefton. There he lectured on the benefits electricity might bring to Reefton. At his lecture to the Provisional Committee of Reefton he claimed that:

> Reefton was singularly adapted for the introduction of a never-failing supply of electric power from its nearby river, especially compared to the existing gas system. It could be utilized for driving public machinery and powering regional mining equipment.[133]

According to many of the local papers, the talk resonated so well that plans to implement such a

[132] "Don't Suffer, But Use Dr. Scott's Electric Hairbrush," *Thames Star*, January 17, 1887, 3.
[133] "The Electric Light at Reefton," *Otago Daily Times*, March 9, 1883, 2.

system began.

Prior to his first appearance in Reefton, Walter Prince served as a consultant for R. E. Fletcher and Company, a Dunedin-based engineering and construction firm. Some historians suggest he worked for Julius Vogel's Electric Light and Power Company.[134] Other than working for these companies, little is known of Prince's early work or his education.[135] Based on the scheme he designed at Skipper's Creek for Phoenix Mine (see chapter 2), some historians have called into question his engineering knowledge and expertise. Still, Prince demonstrated some engineering skill because he persuaded experts and not just non-experts, of the validity of his projects.[136]

Prince's approach to pitching electricity was to offer a series of lectures and demonstrations. In 1886, while recovering from an injury between projects in other cities, Prince stopped in Reefton. Ever the showman, he brought with him a 1 kW dynamo and persuaded local businesses to display electric lighting. Oxley's Brewery, a popular spot for miners, and several hotels in town ran the lights. Over the next few weeks, Prince lectured and with the strong support of the town, helped to found the Reefton Electrical Transmission of Power and Lighting Company, Ltd. Prince was, of course, appointed electrical engineer and contractor of the company.

Prince's project for Reefton utilized hydropower, a decision which stemmed as much from the town leaders' desire to be self-sufficient as it did the geographical availability of water.

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[134] I could verify Prince's employment in Vogel's company. Martin, 18–20; Reilly 17–18.
[135] During my second research trip, I met with the writers of the "Powering New Zealand" documentary series and they had great difficulty locating informative source material on Prince.
[136] Prince held a number of demonstrations to show off the potential of the electric light and sell his system to the town. Walter Prince, "Electricity as a Motor," *Inangahua Times*, August 13, 1888, 2.

Thus, New Zealand's first recorded use of hydroelectric power, which Reefton's project was, drew not just on geography but ideals of self-sufficiency which had circulated through the colony since Vogel's early statements on the subject. The company proposed to divert water from the Inangahua River near a small settlement outside of town, known as Blacks Point and carry it via a water race, 2 kilometers down to a point across the river from Reefton. Engineers estimated that this volume of water could generate enough electric power to supply approximately 500 lamps, for street, business, hotel, and house lighting. The proposed power station would operate a 20kW Crompton bipolar dynamo. The construction proved more difficult than expected. Workers needed to build two additional water tunnels to bypass the main bluff in town, and frequently repair poorly insulated underground cables. The company buried cables, rather than hang them, because of a conflict with the telegraph company. Burying lines was a relatively new practice.[137] Despite the promises of engineers like Prince or idealists like Vogel, water turned out to be not so easy but they stuck with it because electricity appealed to broader colonial missions in New Zealand.

In the face of difficulties with design, supply, and finance, the town, as well as the rest of New Zealand, remained committed to the introduction of electric power.

> At present, great as has been the progress made I the economical production of electricity, there is still admittedly a large amount of waste in the process of changing this energy from one form to another. But as we have said, the difficulties are being gradually overcome.[138]

By the end of 1887, newspapers celebrated the progress on the flume.[139] Yet the actual opening

[137] Harry Orton, "The History of Underground Power Cables," *IEEE Electrical Insulation Magazine* 29, no. 4 (2013): 52–57.
[138] "The Future of Electricity: A Narrow Squeak," *Ashburton Times*, December 4, 1888, 3.
[139] "Mining," *Otago Daily Times*, December 14, 1887, 2.

in 1888 stalled, not uncommon for many nineteenth-century electrical ventures. First, the powerlines had to be laid and connected, which was not completed until April of 1888. The lamps for the street lights were not received until May. Despite Prince's initial cost projections of £1,800, the total cost of the project by this time was nearly £6,000. By July, all of the components arrived in Reefton but the water race, which had remained stagnant since January because a massive tree broke the flume wall in Black's Point. Finally, on August 1, 1888 the power station began setting up for an initial test.

Despite the complications, Reefton's first electrification project was heralded locally and far away as a real success. As he had before, Prince strongly encouraged a public exhibition and the town happily obliged.[140] An arc lamp was placed on a tall pole near the station and 16 incandescent lamps were installed on the interior of the building. A number of public trials were held during the first week and local and regional papers celebrated the success of the venture.

> "The light was much admired and perfectly steady. The trial is considered eminently successful."[141]

> "The success of the trial was complete in every respect, and it is needless to say Mr. Prince and the spectators present were greatly delighted."[142]

The largest exhibition took place in Oddfellows Hall on the main street of Reefton where paying customers could see 50 incandescent lamps from across the river at Black Point. Ever the salesman, Prince played to their desire to be modern. He even took time to try to advertise Thomson-Houston arc lamps because he was a representative for the British company in New Zealand.[143] Immediately following the week of the trial, subscribers began to be hooked up to the

[140] Walter Prince, "Electricity as a Motor," *Inangahua Times*, August 13, 1888, 2.
[141] "Electric Lighting at Reefton," *Otago Daily Time*, August 6, 1888, 2.
[142] *Inangahua Times*, August 1, 1888, 2.
[143] "Reefton Electric Lighting," *Thames Star,* August 27, 1888, 4.

system. The company set a charge of three pounds per light, per year. By September some 130 lamps were connected to the system.[144] Forsyth and Masters, a local hardware store was the first permanent connection, followed by houses on Buller Road. Newspapers reported people were charmed with the electric light and according to the *Inangahua Times* "the era of kerosene was over," meaning people began to reconsider how energy ought to be generated.[145]

The electric system in Reefton delighted much of Reefton's citizenry. Furthermore, its electrification harmonized with imperial imaginaries of those elsewhere, as is evident in this grumbling telegram from Sydney featured in the *Kumara Times*:

> If there is one place on the face of the earth which is left all the time it is the city of Sydney. …At Reefton, on the West Coast of New Zealand–a poor little mining township– the electric light is laid on the streets, and private houses are supplied… while this forgotten wart is lit up as before with the sickly yellow glare of an expensive gas system.[146]

Later in November, notice of Reefton's lighting trial appeared in the British publication *The Electrician* in an article titled, "Progress in New Zealand," which proclaimed the settlement's success in lighting the whole town.[147]

Prince's successful proposal emphasized concerns that resonated strongly with the imperial imaginaries articulated by Vogel and others. In particular, he emphasized the ways that electricity, especially hydroelectricity, could produce greater self-sufficiency. Prince stressed first, the issue of "never failing supply." The phrase appears in most of Prince's presentations on

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[144] 130-lamps is much less than contemporaneous stations like Pearl Street which was closer to 1,000 lamps but typical of other smaller projects around the world. "Summary for Europe," *New Zealand News*, September 6, 1888, 2. Michael Bryan Schiffer, *Power Struggles: Scientific Authority and Practical Electricity Before Edison* (Cambridge: The MIT Press, 2008), 309
[145] *Inangahua Times*, September 10, 1888, 2.
[146] "The Electric Light: Sydney and the Forgotten Wart," *Kumara Times*, November 17, 1888, 3.
[147] "Progress in New Zealand," *The Electrician*, November 23, 1888, 68.

his hydroelectric system.[148] The promise of never-ending supply of energy echoes many discussions of the future of electricity in Great Britain, particularly in the arguments of physicists and engineers such as C.W. Siemens and William Thomson on the potential of batteries.[149] Some physicists and engineers believed batteries a promising means of generating electric power on a large scale. In New Zealand, the prospect of an endless supply of energy, especially through hydropower, offered a way for towns like Reefton to produce their own power. It moved the colony away from a dependency on coal or installing increasingly expensive natural gas supply network for a steam driven power station. They talk about unending supply is connected to both local hopes for self-sufficiency and broader concerns within the empire about the potential loss of energy sources, something which plays out in terms of a discourse about energy efficiency.

For example, William Stanley Jevons (1835-1882), an economist and logician, and John Ruskin (1819-1900), writer and social theorist, wrote about the limits of industrialization or imperial resources.[150] Indeed, exchanges concerning the "Coal Question." In 1882 in the *New Zealand Times* an author offered this:

> In both [New Zealand and Australia] of them the stores of coal and forests of timber, comparatively speaking are scarcely touched. Let these new colonies take warning…once dug out of its bed, it can never be replaced–wood will grow, coal will not.[151]

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[148] "The Electric Light at Reefton," Otago Daily Times, March 9, 1883, 2.
[149] Thomson, Sir William, "Address to the Mathematical and Physical Science Section of the British Association." *The Chemical New and Physical Sciences Journal* 44, no. 138 (1881), 135-137; Thompson, Silvanus P. "Storage of Electricity." *The Electrician* 8:2 (1881): 22-55; C. W. Siemens, "Presidential Address." *Telegraphic Journal and Electrical Review* 11 (1882): 146.
[150] For Jevons and many others, coal was the center of British industrial capability. With the expansion of American and other European industrial capabilities, Jevons warned the British may no longer be able to keep up given the coal resources available to Great Britain. William Stanley Jevons, *The Coal Question: An Inquiry Concerning the Progress of the Nation* (London: MacMillan and Co., 1865), 105; On the other hand, John Ruskin expressed concern about the effect of industrialization had on British citizen, especially the neglect of the lower classes. He argued that such disenfranchisement would destroy the Empire from within. John Ruskin, *The Works of John Ruskin vol. VI, The Crown of Wild Olive* (Kent: George Allen, 1882), 150-153.
[151] "Home and Colonial Topics," *New Zealand Times,* July 31, 1882, 3.

Hydroelectric power, already gaining steam in Great Britain and its colonies by the 1880s, seemed a promising solution. Unlike the more famous hydroelectric exhibitions like Niagara Falls, Reefton showed how other seemingly ordinary colonial settlements might generate electric power. Prince himself argued, "The great aim of mankind has always been, since the advent of steam, to find an economical means for the subdivision of power." This, he would go on to argue meant moving toward a subdivision of electric power production to several small-scale hydroelectric works, instead of having production in one place. He therefore aligned with electrical specialists in Great Britain, like Sylvanus Thompson or James Blyth, who argued for decentralized arrangements using wind turbines or secondary batteries to electrify non-urban spaces.[152] While not explicitly connected to the electrification of Reefton, this British discourse strongly influenced broader imperial policy. The practical and moral anxieties about energy efficiency spoke to the role of sustainable energy supply in the expansion and maintenance of the empire.[153]

Second, Prince's system promised to help produce a colony that did not financially strain the empire, through more economic production of electric power. Many of New Zealand's resource practices from the earliest days of settlement adopted a rhetoric of pastoral utility, meaning settlers hoped to harness resources efficiently without falling prey to destructive industrialization. At first, such restrained utilization of resources developed out of necessity because of their dependency on Māori but eventually transitioned into a critique of over-

[152] Nathan Kapoor, "Who Has Seen the Wind: Imagining Wind Power for the Generation of Electricity in Great Britain," *Technology and Culture* 60, no. 2 (2019): 467–493.
[153] Crosbie Smith and M. Norton Wise, *Science and Empire: A Biographical Study of Lord Kelvin* (New York: Cambridge University Press, 1989), 799.

industrialization and exhaustive spending in England– to become a "better Britain." The implementation of hydroelectric power systems became a means of mediating this transition because it required the use of Māori land, allowed for industry outside of urban centers, and exhibited modern technology. Pākehā used the ambiguous laws surrounding Maori land ownership and the low price of land to convince Māori to move. By purchasing land in bulk from Māori owners, settlers and the colonial government could sequester Māori iwi, remove their access to communal resources, like water.[154] After the New Zealand Wars, Pākehā increasingly regulated extractive and production industries included logging, the introduction of new plants and animals, and the export of meat.[155] For instance, as part of Vogel's plan to bolster the longevity of the colony, Parliament signed the Forest Bill (1874) to establish state forests and prevent deforestation, not for conservation but for later profit. Their pursuit of hydroelectric power became inseparable from the drive to build a better Britain because it allowed for an affordable way to produce motive power for rural industries.

Prince capitalized on a culture that placed great value in high efficiency and low cost. He estimated that a turbine for a hydroelectric plant would total 1,800 pounds, whereas a steam plant with the same 100hp output would cost 2,800 pounds. Furthermore, he argued that the, "work expenses, cost of coal, engineer's attendance, and annual depreciation," would be much higher, 750-pounds per annum, whereas fuel, transport of fuel, and attendance would be minimal with the hydro plant, totaling only 300 pounds per annum. Other than the benefits of public lighting, Prince maintained that electric power systems were "infinitely cheaper" and more efficient

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[154] Richard Boast, *Buying and Selling the Land: Government and the Māori Land in the North Island, 1865-1921* (Wellington: Victoria University Press, 2008), 19-22.
[155] Peter Holland, Paul Star, and Vaughan Wood, "Pioneering Grassland Farming: Pragmatism, Innovation, and Experimentation," in *Seeds of Empire: The Environmental Transformation of New Zealand*, edited by Tom Brooking and Eric Pawson (London: I. B. Tauris, 2011), 51–52.

because the mines could harness both the electricity, and potentially the water power, for mining. In regions like Reefton this created more profitable and self-sustaining mining operations, which could dredge and crush more material for longer hours. Prince tapped into the desire for self-sufficiency for both New Zealand and Reefton, expressed in imaginaries of Vogel or Gladstone while simultaneously appealing to the investors and settler population.

Despite its general popularity, some criticized electricity and pointed out the problems with Prince's system. Despite the availability of water sources, hydroelectricity was by no means a "natural" or easy prospect for Reefton. One author in the *Timaru Herald* lamented that, "there is something in this particular proposal which is not far beyond experimental."[156] The author argued that Prince was too ambitious, did not know enough about electrical science to design the system and suggested that the costs would be much higher even if electricity eventually worked. Most of the complaints related to expense and the early inconsistencies with power supply. However, this was similar to other successful electric power ventures throughout the country such as the mines around Skipper's Creek, Auckland's electric lights, and electric transportation systems.[157]

Despite the occasional complaint, many in the town continued to adopt electric power and remained excited about the future prospects of electric power. James Stevenson and John Dawson both connected their hotels to the electrical system. One of "Dawson's Hotel" trademarks was being the first electrically lit hotel in the Southern hemisphere.[158] Even St. Stephen's Anglican Church, one of Reefton's many churches connected to the lighting network. William Hindmarsh, who happened to be the Electric Company's secretary, was a member of the

[156] "Not a Success," *Timaru Herald*, December 11, 1888, 4.
[157] Rennie, 38–39.
[158] *Inangahua Times*, September 17, 1888, 2.

church vestry. The church's minute book shows that the church received a custom rate, ten lights on Sunday for 30c a week, 3 lights for an any week night service for 10c a week, and anytime the choir practiced lights were free.[159] The supply of electric power for lighting was embedded in the town's basic functions.

As often happened with these early power stations, construction errors proved extremely problematic for the company. Prince came under pressure from the local press because the cables he had buried short-circuited due to poor insulation and inexpert installation.[160] At first Prince deflected the reports by criticizing delayed and faulty equipment. Before he was able to follow through on this plan, the *Inangahua Times* reported that he was, "closing his business affairs in Reefton," and sold his 2,000 shares in the company.[161] Prince did leave, but the reasons given for his departure vary. Some newspapers suggest he went to Auckland to develop an electric tram car system.[162] Other sources say he moved to Thames, another gold town with an active stock exchange and anxious investors. After that, Prince disappeared from the record, except for his death date and debt note in Dunedin.[163]

However inexpert Prince's effort and his sudden, and somewhat suspicious departure, this by no means dimmed enthusiasm for electricity, suggesting that there was more than Prince's showmanship to account for the local uptake of electricity. By October, Prince had been replaced by John Joshua Horton, an electrical engineer, who continued connecting parts of the town and repairing the system. The *Inangahua Times* reported:

Most of the business places in Broadway (one of the main streets) are now lighting by

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[159] Rosanowski, 17.
[160] "Not a Success," *Timaru Herald*, December 11, 1888, 4.
[161] *Inangahua Times*, 10 October 1888, 2.
[162] "Reefton Electric Light," *New Zealand Times*, October 15, 1888, 5.
[163] Prince, Walter- Dunedin- Electrical Engineer," Dunedin Bankruptcy Files, R19949228, Box 565, Folder 252, ANZ.

> electricity and, what with crowds of visitors, elegantly decorated windows, and the blaze of electric light, Reefton during the coming holiday evenings will make a considerable show.[164]

Horton served as the head engineer of the Reefton Electric Company for fifteen years but because of constant repairs, especially to the water race, the company lost money. In 1892, a new company was formed known as the Reefton Electric Light and Power Co. was formed. A wealthy London investor, Morris Levy, purchased the company. Levy and his partner, Phillip Salmon, had been among the original investors in Prince's system and Levy owned the Fiery Cross, the Energetic, and the Globe mines.[165] Even though the Reefton Electric Lighting Company ultimately collapsed and changed generation methods, it is the town's initial acceptance of Prince's proposal and the resonance the town had throughout the Empire that best demonstrates how this project worked to perform the imperial sociotechnical imaginary of figures like Vogel. On the surface Reefton's electrification provided lighting and attracted additional investors. However, these motivations did not see the project through. The project succeeded because it promised a form of economic self-sufficiency, productivity, and permanence.

Conclusion

Reefton gained international fame for its implementation of a public, electric lighting utility. The town's experience highlights how electric systems in New Zealand served both imperial and local interests in lighting and power. The boosters behind Reefton's electrification believed electric power would benefit their town as a mining settlement and as a part of the larger British Empire, even though many of Prince's promises were not kept and it is likely that

[164] *Inangahua Times*, December 16, 1888, 3.
[165] "Untitled," *Inangahua Times*, July 19, 1898, 2.

he was more concerned with making a profit than transitioning to electricity. Taken out of the context of the British Empire, Reefton's electrification appears only as a curious aside in the global transition to electric power; a token curiosity in the electricity craze of the nineteenth century. However, framing Reefton within the larger context of empire connects the transition to electric power with broader colonial aims. Reefton, and New Zealand itself, fit an imperial imaginary forged through decades of colonization and increased settlement. In order to succeed, New Zealand settlements needed to be prosperous, self-sufficient, and reflect Britishness, which in turn meant adopting modern technologies. Reefton's population growth, gold mining prospects, and investors created the correct climate for the introduction of electric power. Walter Prince's proposal to electrify Reefton using a "never-ending" supply of power to the light the town and run mining equipment coalesced with the visions of` an ideal colonial settlement.

Chapter 2:

Mining for Power: Electrifying the Phoenix Mine and the Creation of a Model Colony

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Introduction

> New discoveries of payable stone continue to be made in the Phoenix mine [sic], enhancing the value of the mine considerably. The electric apparatus has been working with the greatest ease and regularity.[166]

During the late 1880s, the potential for hydroelectric-power generation excited many Pākehā following the successful demonstration of the lighting scheme in Reefton. The ability to utilize electric power in New Zealand's frontier fulfilled many of the expectations for a "happy" colony.[167] However, lighting only partially demonstrated the colonial utility of electric power. In order for the transition to electric power to succeed, boosters needed to implement systems that aligned with British and settler plans for building a prosperous and self-sustaining colony. Introducing modern British technology to the frontier, as had happened in Reefton, was the first step. Next, Pākehā sought to apply electric power systems to the improvement of New Zealand's economic worth to the Empire, both for the profit of settlers and to cut the cost of maintaining the distant island-colony to Great Britain. Pākehā mine owners first explored the potential of electric power application beyond lighting. In 1886, the Phoenix Gold Mine implemented a hydroelectric scheme to power mining equipment. The mine's electrification promised to

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[166] "Mining Intelligence," *Lake Wakatip Mail*, April 30, 1886, 5.

[167] In 1854, Robert Pemberton (1788-1879) published a discourse on how Britain could establish an idyllic society in New Zealand founded by the laboring classes of Great Britain called the "Happy Colony." He lamented the endless quest and conflict that surrounded gold but suggested that workmen given land in New Zealand might more wisely use the land. Pemberton, *The Happy Colony: Dedicated to the Workmen of Great Britain* (London: Saunders and Otley, 1854), 48.

increase the mine's profits, conquer and utilize natural resources, and highlight British technological superiority – an energy transition aligned with larger aims of British colonialism.

> Production in New Zealand will, therefore, not be delayed as it was in South Australia; and the success of the experiment will be much earlier determined. The first colony at Port Nicholson [Wellington] will be a Model Colony; and will hereafter to be referred to as such.[168]

As demonstrated in the previous chapter, beginning in the 1830s Pākehā settlers, authors, and British politicians maintained idealistic visions for the future of New Zealand. The establishment of a model colony, a colony that exemplified how a settler colony should develop and operate, prevailed as a consistent theme between the various imaginings for New Zealand.[169] Hydroelectric power at the Phoenix Mine played a role in the transformation of New Zealand from a Pacific resource frontier, a materially exploitable region in the colonial periphery, into a model colony that did not financially burden the Colonial Office.[170]

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[168] *The New Zealand Journal* was printed and distributed in London and throughout New Zealand. The journal contained general colony news, New Zealand Company operations, and speculative pieces about the future of New Zealand. The term "model colony appear" in texts throughout the 1840s-1880s. "A Model Colony," *The New Zealand Journal*, October 24, 1840, 250; 192.

[169] Model colony was used in nineteenth-century speeches, fiction, and travel guides. For the remainder of this chapter, I will use "model colony" to describe this shared sentiment. It is important to distinguish the "model colony" of many investors, fiction authors, and politicians from the utopian visions many had for New Zealand because many of the utopian authors were less concerned with the practical use of New Zealand for the British Empire, as seen in the quote from the New Zealand journal. Instead, they preferred to craft New Zealand as space to foster a more just British society. Tamara S. Wagner ed., *Domestic Fiction in Colonial Australia and New Zealand* (London; Pickering and Chatto, 2014), 6–11.

[170] "New Zealand: Restructuring of the New Zealand Economy: Global-Local Links and Evidence From the West Coast and Southland Regions," from Greg Halseth, ed., *Transformation of Resource Towns and Peripheries: Political Economy Perspectives* (New York: Routledge, 2017.); Jim McAloon, "Resource Frontiers, Environment, and Settler Capitalism," from Eric Pawson and Tom Brooking, eds., *Making a New Land: Environmental Histories of New Zealand* (Dunedin: University of Otago Press, 2013), 52–53.

Although some contemporary New Zealanders see in hydroelectricity a prehistory of environmental consciousness, in fact the key connection between early electricity transitions and contemporary projects is really the notion of self-sufficiency. This connection helps us see the ways that colonial motivations and concerns have been materialized in New Zealand's electric grid. The Phoenix Mine is a cornerstone in the history of New Zealand's electrification and its many technological adaptations are celebrated for pioneering the hydroelectric systems that now generate 63% of New Zealand's electric power. Often the mine's electric system is heralded as the result of technological genius or as a foreshadowing of the country's hydroelectric potential.[171] Today, most New Zealanders, with the exception of disenfranchised Māori, farmers, and environmental activists, take pride in the country's hydroelectric systems. Generally, they see hydropower as a method for keeping New Zealand energy-independent and as an approach which is consistent with global green energy initiatives.[172] Yet it is crucial to avoid uncritically attaching the Phoenix Mine's hydroelectric history to the country's contemporary energy initiatives. Nineteenth-century electrification boosters were not concerned with green energy; environmental sustainability, if such a term can be applied at all, primarily concerned the utility of the land to the British Empire.

Some scholars provide more nuanced histories of the mine's transition to electric power and place it in the context of the global gold rush and international collaboration of electrical scientists and engineers.[173] Many argue that the electrification of the Phoenix Mine was

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[171] As I will discuss in Chapter 3, extensive surveys of New Zealand's hydroelectric potential did not happen until the 1900s.
[172] Helen Reilly, *Connecting the Country: New Zealand's National Grid, 1886-2007* (Wellington: Steele Roberts, 2008), 232-235.
[173] Ibid., 18-19; Peter Petchey, "New Zealand's Technological Participation in the International Goldfields: The Example of the Stamper Battery," *Technology and Culture* 60, no. 2 (2019): 494–522.

motivated primarily by the difficulty of transporting coal through the region, although in making this argument they often oversimplify the building of a dam in Otago. However, the coal argument does not stand because electricity was not the only choice. The mines could have continued to use or update their water-powered equipment as most mines did.[174] The system was experimental and sparked excitement among those working other industries who sought to apply electric power to more than lighting. Industrial archeologists, such as Peter Petchey, use the physical remnants of the Phoenix Mine to demonstrate the global circulation of electrical technologies and engineers, which is a useful claim given the lack of records kept at nineteenth-century gold rush operations. However, focusing only on the technological marvel devolves into debates about primacy and sidelines the Phoenix Mine's legacy in New Zealand's existing, primarily hydroelectric, electrical infrastructures. Instead, the integration of electric power at the Phoenix Mine should be seen as part of Britain's settler-colonialism in New Zealand – transforming colonial resource extraction into a self-sustaining industry that fits specifically with the ideals of New Zealand's as a model colony: one that transplants a British population to the frontier by displacing indigenous peoples, makes use of the land in service to the colony and the empire, and establishes the colony as financially self-sufficient.

[174] There were electrified gold mines in Australia, South Africa, and the United States, especially for lighting, pumping water, amalgamation, and explosive ignition, but they did not power the sizable equipment that was at Bullendale. They did not begin to use electric power until the mid-1890s. *Gold Mines and Mining in California: A New Gold Era Dawning on the State* (San Francisco: George Spaulding and Co., 1885); "Mysore Gold Mine," *The Mining Journal*, January 7, 1888: 20; Frederick H. Hatch and J. A. Chalmers, *The Gold Mines of the Rand* (London: Macmillan and Co., 1895).

The Final Resource Frontier

> For although this country be far remote, from the present trading part of the world, we can, by no means, tell what use future ages may make of the discoveries made in the present.[175]

From Cook's Voyages forward, New Zealand's bountiful land and resource potential defined its value to the British Empire. Settlement initiatives centered on Pākehā ability to work the land, purchase the land, and promote British culture as well as a desire to reduce Britain's overcrowding. Advocates for the electrification of the Phoenix Mine tapped into the rhetoric surrounding resource potential and promised that electrification would enhance miners' ability to profit and meet those colonial aims. By the 1790s, British Pākehā began officially settling in New Zealand. Usually, these trading posts hosted sealers, whalers, and traders circulating through British-controlled ports in the South Pacific; most of them came from Australia. [176] In 1788, after the founding of the penal colony of New South Wales, New Zealand's reported abundance of resources proved a vital asset for the justification of British settlement in the region.[177] Edward Gibbon Wakefield's (1796-1862) "Systematic Colonization", and by extension the New Zealand Company's plan for colonization hinged upon the settler's eventual

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[175] James Cook's crew, actually Nicholas Young, first sited New Zealand on October 6th, 1769. James Cook, *A Voyage Towards the South Pole and Around the World* (London: W. Strahan and T. Cadell, 1777), 92.

[176] The value of and right to obtain the resources in colonized land is a central tenant of the "Doctrine of Discovery", which is a set of ideas and laws that sought to establish European cultural, religious, and cultural superiority thus justifying their inheritance of indigenous lands. In New Zealand, this doctrine guided the installment of trading posts, the Treaty of Waitangi, and the subsequent exploitation of indigenous peoples, resources, and land. Robert J. Miller, Jacinta Ruru, Larissa Behrendt, and Tracy Lindberg, *Discovering Indigenous Lands: The Doctrine of Discovery in the English Colonies* (London: Oxford University Press, 2010), 208-209.

[177] Many writings from the early voyages from Tasman to Cook offered speculations that the vast green spaces and hospitable climate would yield a productive colony. Vincent O'Malley, *The Meeting Place: The Māori and Pākehā Encounter, 1642-1840* (Auckland: Auckland University Press, 2012), 39.

ability to purchase land or own businesses that used the land, like mining companies or farms.[178] Wakefield believed settlers from the laboring classes, who could not usually afford emigration on their own, would make the best candidates because they could become landowners, establish an honorable "British" work ethic, and avoid the ruin caused by class division.[179] Throughout the nineteenth century, social theorists like Wakefield, John Robert Godley (1814-1861), and Anthony Trollope (1815-1882) saw and wrote about New Zealand as a "resource or commodity frontier," one that would materially and socially enrich the British Empire, so long as settlers brought with them British culture, religion, and work ethic.[180]

Initially, European survival depended entirely on successful Māori trade relations but over time exchanges increasingly exploited Māori interests. Prior to the Treaty of Waitangi (1840), material trade and resource extraction by British settlers were facilitated by the Māori. Without Māori cooperation, and often exploitation, even on Cook's first voyage, it is likely that European and British settlements would have fared poorly. The Māori provided basic supplies, guided traders to resources, forged strategic alliances and became active participants in international commerce, especially in the timber, whaling, and flax industries.[181] This mutual cooperation, or *marae* (a term Vincent O'Malley borrowed from Māori meaning "meeting place"), helps us to understand that the Māori, along with the British, created a landscape

[178] Edward Gibbon Wakefield is a key figure in the colonization of South Australia and New Zealand. He is perhaps most famous for founding the New Zealand Company.
[179] Wakefield argued that other colonial efforts had been fruitless and horrible because settlers with capital came and brought with them an attitude of "master and servant" with those with less. This divide results in stagnation wherein the initial capital is wasted on pitiless labor and no one is afforded the opportunity to advance. Edward Gibbon Wakefield, "Report of the Select Committee on South Australia," *Parliamentary Papers Reports from Committees* (Wellington: George Didsbury Press, 1841), 332–339.
[180] John Robert Godley was one of the founders of Canterbury, the seat of the Anglican church in New Zealand.
[181] O'Malley, 110–111.

desirable to British colonial interests and settlers seeking fortune, land, or a new life. The Māori did not helplessly observe Pākehā colonization, nor were they just the resistant noble warriors of the New Zealand Wars.[182] Māori actively participated in colonization as victims and beneficiaries. Just as the British explored and attempted to understand how they might benefit from New Zealand, the Māori adjusted to the presence of the invaders and learned to navigate new economic and political structures. After the Treaty of Waitangi (1840), with the expansion of Pākehā settlement, resource extraction increasingly depended on the removal of Māori agency, either through duplicitous diplomacy or outright violence. Again, this is a key, and often overlooked, connection between hydroelectricity and colonialization. The transition to electric power took advantage of, and even depended on the displacement of Māori from the land and secured the transfer of land to Pākehā ownership in order to serve colonial goals of economic gain and manufacture.

Besides resources extraction, population growth encouraged interest in a transition to new sources of energy. Prior to European invasion, it is estimated that the Māori numbered around 100,000. During the first decades of the nineteenth century, the population shrank to an estimated 70,000-90,000 as a result of disease and warfare, especially the Musket Wars (1807-1842).[183] As the Māori population dwindled, the Pākehā numbers increased by the thousands,

[182] Many general histories of the British Empire point to the Māori has one of the most successful peoples to militarily halt the British military. And while it is true the Māori were formidable in combat, we risk missing the brilliance of Māori negotiation and evasion. O'Malley, 131.

[183] By 1858, that number dwindled further to approximately 60,000. Other estimates suggest much lower numbers, but historians generally use Fenton. F. D. Fenton, "Observations on the State of the Aboriginal Māori Inhabitants of New Zealand," *Journals of the Statistical Society* (1860): 508-541; James Belich, *Making Peoples: A History of New Zealanders from Polynesian Settlement to the End of the Nineteenth Century*, (Honolulu: University of Hawaii Press, 1996) 464.

particularly after speculative mining reports and the Colonial Office funded emigration to New Zealand. During the 1880s, hydropower continued to gain favor as Pākehā claimed previously occupied lands and water resources, especially as the Pākehā population drastically expanded. The treatment of New Zealand as a resource frontier altered Māori inter-iwi relations and the Pākehā population. By the 1830s, many Māori had traveled around the world, increasing Māori awareness of, and sometimes dependence on, European goods and imperial motivations. Beginning in the 1780s, Māori elected to travel back to Europe and learn more of the Pākehā world as sailors, missionaries, and artists.[184] Māori traders, already skilled in barter culture and becoming increasingly literate, entered into more complex negotiations with Europeans. Trade with Māori remained central to the colonial economy leading up to 1840, but Pākehā trade and exploitation of resources whittled away Māori title to their resources.

During the nineteenth century desirable resources, removal of Māori, and social circumstances in Britain compelled the movement of British settlers to New Zealand. In 1840, New Zealand became an official colony under the Treaty of Waitangi and British emigration increased dramatically.[185] The demand for more resources, primarily gold, wool, and meat, and increasing Pākehā population coincided with, and is a direct product of, the population boom during Great Britain's Industrial Revolution (1760-1840). This confluence of circumstances is

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[184] *Tangata Whenua*, 173.

[185] The New Zealand Company was founded in 1841 following the Treaty of Waitangi. It was set up to facilitate the creation of settlements based on the visions of Edward Gibbon Wakefield (1796-1862). The company lasted until 1858 after years of resistance from Parliament, the British Colonial Office, and missionary societies. While the company did establish many of New Zealand's most prominent cities, like Wellington, Nelson, Wanganui, and Dunedin and formed the basis of what would become the colony's government. Its operation was and is considered highly corrupt because of the company's poor treatment of Māori and laboring settlers. Patricia Burns, *Fatal Success: A History of the New Zealand Company* (Heinemann Reed, 1989); James Belich, *Making Peoples: A History of the New Zealanders from the Polynesians to the End of the Nineteenth Century* (Auckland: Allen Lane, 1996).

sometimes termed the "Settler Revolution."[186] The introduction of new technologies, expansion of the British economy, and population increase created as many problems in England as industrialization purportedly solved.[187] Between 1800 and 1860, England's population grew from approximately 7 million to 18.3 million, stretching Britain's available land and resources.[188] Increasingly, workers moved to growing urban spaces like London and Manchester to take factory work displacing farmers and sometimes skilled workers.[189] The demand for material resources, population control, and increased wealth stimulated British international initiatives to settle new territory, establish a global trading network, and compete with other European powers. During the 1830s, the goal had been to establish New Zealand as another regional trading post for existing and future Pacific territories. However, by the 1840s New Zealand offered an ideal place to redirect the ambitious British laboring class to settle, a new trading market, and a potentially resource-rich landscape. Furthermore, settler-colonialism offered some relief to the economic strains on Great Britain created by industrialization, such as population growth, competition for land with other empires, and the desire to establish global trading networks. By

[186] Population boom and industrialization were not unique to Britain, but Britain seems to have the most dramatic shift. P. K. Brien, "The Britishness of the first Industrial Revolution and the British Contribution to the Industrialization of follower countries on the mainland, 1756-1914," *Diplomacy and Statecraft* 8 (1997) 48-67; Belich is not the first to use "Setter Revolution" but his argument expands the extent of the phenomenon beyond individual countries, Belich, *Replenishing the Earth*, 9; Michael Andrew Žmolek, *Rethinking the Industrial Revolution: Five Centuries of Transition from Agrarian to Industrial Capitalism in England* (Boston: Brill, 2013).
[187] Nicholas Crafts, "Productivity Growth in the Industrial Revolution: A New Growth Accounting Perspective," *Journal of Economic History* 64, no. 2 (2003): 521-535; Peter Temin and Hans-Joachim Voth, "Credit Rationing and Crowding Out during the Industrial Revolution: Evidence from Hoare's Bank, 1702-1862" *Exploration in Economic History* 42, no. 3 (2005): 345.
[188] E. A. Wrigley and R. S. Schofield, *The Population History of England 1541-1871* 2nd edition (London: Arnold, 1981), 208–209.
[189] Charles Feinstein, "Pessimism Perpetuated: Real Wages and the Standard of Living in Britain before and after the Industrial Revolution," *Journal of Economic History* 58, no. 2 (1998): 625-658.

the time the Phoenix Mine switched on its electrical system New Zealand's Pākehā population numbered around 600,000.[190]

More than any other resource or incentive from the Colonial Office, gold encouraged mass settlement. Gold meant potential capital for settlers and the British Empire. A profitable resource venture meant the colonial government and Pākehā could establish a self-sufficient colony that could contribute to the high costs of maintaining a remote colony and "model" colony.[191] Even though Cook and others initially reported that New Zealand did not have valuable minerals, during the 1840s mentions of New Zealand's mineral wealth appeared in settler pamphlets, books, and newspapers such as *Latest Information from the Settlement of New Plymouth,* where a Mr. Cutfield claimed that, "From certain indication, iron, I apprehend, will be ultimately found in large quantities in this neighborhood."[192] One newspaper proclaimed that, "our mineral treasure as yet can only be guessed at."[193] As an author in the *Nelson Examiner* noted, valuable ore was just one of the many promising resources to be had in New Zealand.

> It seems to us that, with a good supply of hirable labour, in a country blessed with many productions of nature, possessing habours, a fertile soil, coal, limestone and other mineral productions… a colonial capitol will be speedily produced which will obviate the necessity for the influx of capital from Great Britain.[194]

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[190] "Population and Houses," *Census of the Colony of New Zealand* presented to the Colonial Secretary, March 28, 1886. Accessed via Statistics New Zealand, Last Access February 1, 2019, https://www3.stats.govt.nz/Historic_Publications/1886-census/Results-of-Census-1886/1886-results-census.html?_ga=2.86348508.511668155.1552436752-659471187.1552436752#d50e322

[191] Compared with many so-called failures in the "subject colonies," the gold rush in Australia, Canada, and New Zealand generated profit for the British via higher rates of taxation. Ewout Frankema, "Raising Revenue in the British Empire, 1870-1940" *Journal of Global History* 5, no.3 (2010): 469.

[192] Referring to what would become the Taranaki region, the west point of the northern island. *Latest Information from the Settlement of New Plymouth*, (1842) 19–20.

[193] "Correspondence," *New Zealand Colonist,* May 16, 1843: 2.

[194] "Untitled," *The Nelson Examiner*, March 12, 1842: 2.

Pākehā widely shared such sentiments, the prospect of mineral wealth remained mostly talk during the 1840s and 1850s, and the New Zealand Company began advocating for increased mining. In other colonies, especially Australia, gold had added to the imperial treasury. More importantly than wealth, gold brought an enthusiastic population of mostly British settlers to tame New Zealand's frontier.[195]

The Colonial Office employed writers to praise the colony's merits. Collectively they constructed imaginaries about New Zealand's mineral wealth. In these guides, authors pontificated over New Zealand's virtues. Its climate was better, it was a small island nation (a potential naval authority like Britain), it would not have the "convict stain" of Australia, and the settlers would come from the middle class or higher. Despite their inaccuracies and exaggeration, these books were widely read and went through numerous editions. They represented the imaginaries and visions constructed by and for New Zealand within the British Empire. Such texts promised prospective New Zealanders a country with untapped mineral potential, which appealed to those seeking to do the mining, build the towns, and invest in companies and relevant infrastructure.

Establishing the presence of gold accomplished part of the Colonial Office's agenda. Officials also hoped to encourage permanent settlement by highlighting the idea that one could succeed in New Zealand. Just as they had crafted a vision for New Zealand as a model colony, colonial boosters published more detailed and expository tracts pushing British citizens to move to New Zealand between the 1850s-1880s. Many of them used the potential for vast mineral wealth as an incentive. Charles Hursthouse's (1817-1876) *New Zealand" The Britain of the*

[195] James Belich places New Zealand's 1860 rush within the context of a much larger global gold rushes. Not because of the discovery of gold but because of the mass relocation of people in North America, Africa, Asia, and Australia. Belich, *Replenishing the Earth*, 306.

South (1857) and Arthur Clayden's (1829-1899) *England of the Pacific* (1879) show how the British thought about and advertised New Zealand's mineral wealth. For example, Hursthouse claimed that, "from the peculiar formation of the country, coal, copper, and gold and the precious metals will probably be found in abundance."[196] Writing on behalf of the New Zealand Company, Hursthouse advocated for mass settlement and charged a consultation fee for prospective settlers seeking to move to New Zealand.[197] Building on global gold fever, the promise of mineral wealth bolstered New Zealand's growing reputation as a model. The Colonial Office readily paid to send settlers to establish permanent industries. If British settlers came excited to buy land or work in profitable industries like goldmines, permanent communities and civic infrastructures could flourish.[198]

Until the 1890s, boosters and the Colonial Office continued to push settlement, so long as settlers came from the middle or laboring classes and worked to improve the profit of the colony. Writing two decades after Hursthouse and in more grandiose detail, Arthur Clayden exclaimed:

> The abiding impression left on their minds was that the country was pre-eminently a grand and glorious one, one which not New Zealanders only, but every citizen of the British Empire might be justly proud of. It had clearly all the elements of prosperity about it, and more nearly resembled the promised land of the Israelites than even Canaan itself did. It was indisputably "a good land, a land of hills and valleys; a land of brooks and rivers; a land of sunshine and of song; a land whose stones are iron;" its sand along the sea-shore at Taranaki being literally of iron, and out of whose hills you may' not only " dig brass " but gold, silver, copper, tin, marble, and " all precious minerals."[199]

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[196] Hursthouse, 144.
[197] Within in this text are many letters from Hursthouse demonstrate is interests in promoting the colony, and an offer for his services to those seeking to travel to New Zealand. Charles Hursthouse, *Letters on New Zealand Subjects* (London: Edward Stanford, 1865), 57.
[198] Besides aligning with aims to set up permanent communities, the British hoped to ward off other Europeans from placing a foothold on the islands, namely the French. In 1838, Jean Francois Langlois had purchased land from 12 Māori chiefs at Akaroa. The land was later purchased back as part of the Waitangi negotiations that left the land to the French owners. Peter Tremewan, *The French at Akaroa: An Attempt to Colonize Southern New Zealand* (Christchurch: Canterbury University Press, 2010), 98.
[199] Clayden, 55.

Like Hursthouse, the Colonial Office contracted Clayden to encourage emigration to New Zealand. During the early 1870s, Clayden became involved in some of Julius Vogel's (1835-1899) initiatives to draw agricultural workers to New Zealand.[200] Clayden wrote about his family's experience in his book; his brother Samuel had moved his entire family to Nelson and managed a successful farm. Arthur followed his brother and spent years in New Zealand. He returned to Britain in 1879, where he toured the country lecturing, culminating with the publication of this book. In addition to profiting from the success of migration to New Zealand, Clayden believed that the laboring classes, disenfranchised by the overcrowding of Great Britain, or facing job-loss due to the growth of factories, would succeed in New Zealand farming and extracting its mineral resources.[201]

Not all of the speculations about gold came from booster texts, many geological surveys promised great mineral finds. The scientific corroboration of gold in New Zealand legitimized continued investment.[202] Ferdinand Ritter von Hochstetter (1829-1884) conducted the most famous one between 1858-1863 as part of the Austrian *Novara* Expedition.[203] During his larger expedition around the globe, Hochstetter spent time in New Zealand exploring volcanoes and the geological features of the island. Julius Haast (1822-1887), another Austrian who became one of New Zealand's most prominent geologists, assisted in the survey. In his book about the trip, *New Zealand: Its Physical Geography, Geology, and Natural History* (1867), Hochstetter emphasized

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[200] Arthur Clayden, *The Revolt of the Field: A Sketch of the Rise and Progress of the Movement Among the Agricultural Labourers* (London: Hodder and Stoughton, 1874), 43.
[201] "Arthur Clayden," *Te Ara: The New Zealand Encyclopedia*, https://teara.govt.nz/en/biographies/2c19/clayden-arthur, Last Accessed March 28, 2018.
[202] L. Gillbank, " The Origins of the Acclimatisation Society of Victoria: Practical Science in the Wake of the Gold Rush," *Historical Records of Australian Science* 6, no.3 (1986): 359-374.
[203] "The Voyage of the "Novara," *The Spectator*, September 28, 1861: 21.

the production of geographic and geological knowledge rather than convincing settlers to move. Still, further proof of gold drove settlement.

> I was convinced, that if properly worked, the goldfields of the Aorere and Takaka Valleys near Golden Bay would prove very productive and that the discovery and working of those first goldfields of New Zealand would be followed by that of new goldfields extending all along the mountain-range of the Southern Island. The discovery of such fields, I was certain, would in the course of few years secure for New Zealand increasing importance amongst the gold-countries of the world.[204]

These travel and geographic speculations added to the hopes of settlers coming to New Zealand and promised that, provided the correct tools and work ethic, New Zealand would yield mineral wealth and support a self-sustaining colony.

Once news of gold deposits circulated in Great Britain, as well as in the United States, Australia, and China, settlers poured into New Zealand in a series of "gold rushes." The Otago Gold Rush catalyzed the invasion of a Pākehā population intent on claiming land, mineral wealth, and water resources for personal gain. As a result, the colony moved closer to achieving the aims of the Colonial Office by establishing a primarily British population and expanding its disenfranchisement of indigenous title and resources. Much like California, Australia, and South Africa, New Zealand witnessed a massive influx of settlers seeking to strike gold beginning in 1842 after whalers discovered a small quantity near Nelson on the Coromandel Peninsula. However, major mining operations did not begin until 1852.[205] The first significant "gold rush" to New Zealand, sometimes called the "Otago Rush," began in 1861 when Gabriel Reed struck

[204] Ferdinand Ritter von Hochstetter, *New Zealand: Its Physical Geography, Geology, and Natural History* (Stuttgart: J. G. Cotta, 1867), 25.
[205] During the 1850s-1870s, the North Island mines produced four and half million sterling, a much smaller yield than the gold mines on the South Island. Alfred George Warnford Lock, *Gold: Its Occurrence and Extraction* (London: E. &F. N. Spon., 1882), 517.

gold in Otago."[206] The initial settlement of the region was led by missionaries seeking to establish a community from the Otago Association, a subdivision of the Free Church of Scotland. Besides the Gold Rush, disputes within the Church of Scotland brought some 12,000 immigrants to Otago, especially in the city of Dunedin.[207] Between 1861-1863, Otago became the center of interest in gold. And between 1864-1867, the gold prospectors moved to the West Coast of the Southern island. During the first two years, miners set up small camps but as mining continued the established more permanent settlements. Altogether, it is estimated that some 195,000 gold seekers came to New Zealand during the 1860s, leaving a settler population of about 114,000 at the end of the decade, from a Pākehā population of 2,000 in the 1840s.[208]

Pākehā, and sometimes Māori, panned for gold throughout Otago and founded numerous towns.[209] Frequently, the natural manifestations of gold determined the type of town they established. Diggers worked for alluvial gold in the rivers, on the beach leads and coastal terraces that demanded sluicing and dug shaft mines for the gold locked in quartz reefs. The deeper shaft mines tended to leave more permanent towns because of the equipment and skilled

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[206] Otago was one of the provinces established in 1853, after the signing of the New Zealand Constitution (1852).

[207] In 1843, the Free Church of Scotland formed after a schism within the Church of Scotland because certain evangelical groups felt the state was interfering on the spiritual independence of the church. In addition to advocating for education and clerical reform, the church promoted active missionary work in the colonies that included New Zealand. During 1847, Thomas Burns and others established a settlement in Otago that would later become Dunedin. Tanja Bueltmann, *Scottish Ethnicity and the Making of New Zealand Society, 1850-1930* (Edinburgh: Edinburgh University Press, 2011), 28-29.

[208] Stevan Eldred-Grigg, *Diggers, Hatters, and Whores: The Story of the New Zealand Gold Rushes* (Auckland: Random House New Zealand, 2011); Jock Phillips, History of Immigration - Miners," *Te Ara: The Encyclopedia of New Zealand*, http://www.TeAra.govt.nz/en/history-of-immigration/page-7, Last Accessed January 10, 2019.

[209] Both Pākehā and Māori had participate in the California gold rush in the 1840s and brought many of the mining methods back to New Zealand. Llyod Carpenter, "A Rich Myth, Gold, and Narrative: Aspects of the Central Otago Gold Rush, 1862-2012," PhD Thesis, Canterbury University, 2013, 13.

workforce required to maintain a mine, whereas sluicing and dredging rivers meant more temporary or mobile establishments. Reefton typified later mining establishments constructed for a long-term mining operation because of its quartz reefs. Some other notable mining towns from this period include Waiuta, Denniston, Tangarakau, and Barrytown.

Despite British dreams of a New Zealand populated by a virtuous working-class of British descent, workers came from around the world to live in make-shift housing and perform extremely hard labor in the mines, with immigrants from different places living in separate neighborhoods. The majority of miners came from Britain and Australia, but many other Europeans, Māori, and Chinese immigrants also worked in Otago. Accurate census data for the population of mining towns is rare because of the fluid nature of the communities and colonial erasure of non-British settlers from the historical record. Many immigrants, particularly non-Europeans, avoided census takers to prevent deportation, taxation, and harassment. Historians mistakenly overlook Māori in studies of the New Zealand gold rush because of their smaller numbers, but they actively participated in the rush.

> …chances of a rush of Māories [sic] have also to be considered, as… they have a keen appreciation of the value of gold, and will soon be on the spot.[210]

Records produced by Māori miners during the Otago Rush remain scarce. Nonetheless, other miners and newspapers mentioned Māori mining exploits, such as a Māori from the 1860s, known as "Māori Jack."[211] Other Māori continued to appear in accounts and surveys of New Zealand's gold mines well into the twentieth century.

[210] "Mining Intelligence," *The Star*, August 24, 1861, 2.
[211] In his dissertation, Carpenter offers a chapter on the appearance of Māori in mining literature throughout the nineteenth century. Carpenter, 44-71.

Increasingly studies also highlight how the Chinese population may have been significantly higher in mining towns than previously suspected.[212] One Otago mining-town, in particular, Arrowtown, to the southeast of Bullendale, had a small Chinese settlement. Archeologists have found Chinese Daoist and Buddhist temples throughout Otago, most notably in Arrowtown. It is estimated that in 1866 about 200 Chinese immigrants lived in Otago but by 1871 their numbers increased to around 4,300.[213] Primarily, the miners came from the Guangdong Province in southeastern China seeking wages and stability.[214] That region of China had suffered particular hardships during the Taiping (1851-1864) and Nian (1851-1868) Rebellions. In New Zealand the Chinese miners faced harsh discrimination and by the 1880s were targeted by official Sino-phobic anti-immigration laws, such as the "Poll Tax" and Chinese Immigration Act of 1881.[215] Immigration continued to slow until after World War II.[216]

Efforts to establish a middle-class British workforce in New Zealand's new industries frequently clashed with the mixed race make-up of actual colonial mining operations. Given the

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[212] Jill Hamel, *The Archeology of Otago* (Wellington: Department of Conservation, 2001), 184-187; Keir Reeves, "Sojourners or a New Diaspora: Economic Implications of Chinese Miners to the South-Pacific Goldfields," *Australian Economic History Review* 50, no. 2 (2010): 178–192

[213] James Ng, "The Sojourner Experience: The Cantonese Goldseekers in New Zealand, 1865-1901," in Manying Ip, ed. *Unfolding History, Evolving Identity: The Chinese in New Zealand* (Auckland: Auckland University Press, 2003), 14; "Arrowtown Chinese Settlement," Department of Conservation, http://www.doc.govt.nz/Documents/about-doc/concessions-and-permits/conservation-revealed/arrowtown-chinese-settlement-lowres.pdf , Last Accessed March 15, 2018.

[214] Many of the Chinese migrated to New Zealand, as well as Australia, with extensive mining knowledge and technology. For instance, the miners introduced new ways to supply and recycle water using bamboo. Fei Sheng, "Techniques Used by Chinese Immigrants in the Australian Gold Rushes and Their Influence," *Chinese Southern Diaspora Studies* 6 (2013): 145-154

[215] "Chinese Immigration Act," *Parliamentary Papers* 47 (1881): 301-303.

[216] "1891 Census," *Stats NZ: Tatauranga Aotearoa*, https://www3.stats.govt.nz/historic_publications//1891-census/1891-results-census/1891-results-census.html?_ga=2.189753899.1628766456.1537472947-1334335624.1537472947#d50e162996, Last Accessed September 1, 2018.

troublesome reality of the mines, the promise of increased profit from the installation of modern electric technology allowed the press, owners, and investors to maintain a veneer of the utopian ideals of earlier settlement boosters. For instance, the generation of electric power by water meant miners could transmit power to resource rich quartz veins, use less water and be less dependent on consistent rain fall, and more efficiently use energy to process more material, even as the actual reality of what it took to make mining profitable was quite different.

Colonialism and the Phoenix Mine

As one of New Zealand's first electric power systems, the Phoenix Mine represents how Pākehā came to rely on hydroelectric power, often at the expense of the integrity of waterways, to generate power in the service of the Empire. In addition to its extensive quartz reefs and longevity, the Phoenix Mine contracted engineers to develop a hydroelectric motor to power some of its equipment.[217] Examining the decision to use electric power highlights how electric power coalesced with British plans for a model colony, especially in the extraction of resources. In 1886, when the mine introduced electric power, the owners could have continued using water power, but they elected to construct an entirely new and complicated system. According to the designers, hydroelectric power more efficiently harnessed the energy from the waters around the mine. They argued electric power could yield greater profit for the owners and miners, reaffirm the floundering gold rush, and establish a more permanent mine. The promise of electric power for mechanical movement, in addition to lighting, furthered British ideas about their own technological superiority and prerogative to conquer the frontier and exploit its natural resources.

[217] Some of the mines opened during the gold rushes often remained open for a year or less. The mine there remained in operation between 1862-1907. Petchey, *Gold and Electricity*, 5.

Gold mining in New Zealand is itself a colonial practice. The excitement of the miners and engineers around the electrification of Bullendale have obscured the fact that the existence and continued productivity of the mine depended on the removal of Māori from the land during the New Zealand Wars, not to mention the exploitation and mistreatment of non-Pākehā. Even though the British claim to have acquired the land through purchase and negotiation in the Treaty of Waitangi, not all Māori agreed to the terms. Major Thomas Bunbury (1791-1862) only gained the signatures of Ngāi Tahu leaders, only one of the *iwi* living in that region, others were pushed out or moved into Pākehā settlements.[218] Furthermore, even though the New Zealand gold rushes advertised the opportunity for settlement and individual wealth, the procurement of gold and the populating of New Zealand was done primarily to enrich the British Empire.

Miners first exploited the gold resources eventually controlled by the Phoenix Mine during the Otago Gold Rush.

> A sawyer, before leaving the district for the winter, dug a hole on the banks of the Creek [Quartz Creek], and found fine gold all down through it, the find became richer the further down he went… He expressed his opinion, that "Quartz Creek would turn out to be a paying gold field.[219]

In 1862, following a small rush in Otago, triggered by a rare find of 87 pounds of gold from Dunstan Gorge, near present-day Cromwell, hopeful diggers spread out around the region. Many moved to the area around Skipper's Creek, a tributary of the Shotover River. Miners quickly found numerous alluvial quartz reefs, the largest of which was named the Scandinavian

[218] Robert J. Miller, Jacinta Ruru, Larissa Behrendt, and Tracy Lindberg, *Discovering Indigenous Lands: The Doctrine of Discovery in the English Colonies* (Oxford: Oxford University Press, 2010), 212-213

[219] A miner extracted the 87 lbs. of gold from the Quartz Creek menti.oned in this survey. "Reconnaissance Survey," *Otago Witness*, July 26, 1862, 3.

Reef.[220] There miners erected a 4-stamp crushing battery powered by the right-hand branch of the creek. A "stamper" or crushing battery is a type of milling machine used to crush material by pounding rather than grinding.[221] The battery at Skipper's Creek was of the "Cornish" style, developed in Cornwall in the 1850s for tin mining. The "stampers" crushed ore into sand. After crushing, miners washed and screened the material to remove pyrite and unwanted sediment. Then they mixed the sand with mercury to create an amalgam which could be more easily separated into pure gold.[222]

During the mine's early years, the deep quartz veins established the likelihood of deep gold veins and the need for a permanent mine. In order to establish a long-term operation, miners needed sustainable methods of powering the equipment. In 1866, after little success with surface mining, the Scandinavian Mining Company ordered new equipment from an Australian company, A.K. Smith's Carlton Foundry, highlighting the transnational exchange of mining technology driven by the gold rush.[223] The new set up consisted of 30-stamps powered by an overshot water wheel.[224] According to George Henry Frederick Ulrich (1830-1900), "It was the largest in the Province, and its system of gold-saving appliances resembles most closely that of

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[220] *Appendix to the Journal of the New Zealand House of Representatives*, 1866 D14: 4.

[221] There are numerous types of stampers or batteries, many of which were invented in the United States during the California Gold Rushes. Much of the mining technology in New Zealand was adapted from U.S. and Australian mining equipment. Stephen Tuffnell, "Engineering Inter-Imperialism: American Miners and the Transformation of Global Mining, 1871-1910," *Journal of Global History* 10, no. 1 (2015): 53.

[222] J. C. F. Johnson, *A Practical Treatise for Prospectors, Miners, and Students* (London: Charles Griffin, 1896), 28–30.

[223] *Wright's Australian and American Commercial Directory and Gazetteer* (New York: George Wright, 1881), 397.

[224] The battery remained in service until 1907 and one of the largest systems in New Zealand Petchey, *Conservation Plan*, 13.

the Port Phillips Company, Clunes. The yield of sand by this latter process has varied from 3 to 12 oz. of gold per ton."[225] However, water shortages, which resulted from drought, and from sharing the river with other mining companies, kept the mine from operating at its full potential. Furthermore, the fumes produced from the crushing were hazardous to the men working around the battery.[226] The mine struggled to stay open until it was purchased by George F. Bullen (1832-1912) and his brother in 1874 and renamed the Phoenix Quartz Mining Company.[227]

For the next decade, water-power reliability proved troublesome for the mine, which led to a search for more economical and useful sources of power. The Bullen family established the mining settlement of Bullendale, sometimes called "the Reef" or "Skipper's" by miners or contemporary maps.[228] Spending nearly £15,000, Bullen expanded the mine and added several new implements, such as a Leffel Turbine, which harnessed falling water to power the battery.[229] Still, irregular waterfall plagued the mine's productivity. Beginning in 1884, Bullen and his mining manager, Fred Evans spiritedly pursued the electrification of the battery.[230] Bullen hired Walter Prince and the Dunedin firm, R. E. Fletcher and Co., to supply materials and install the

[225] Ulrich was a geologist with numerous publication and papers given to the Royal Society of New Zealand. He was a professor, Director of the School of Mines in New Zealand and Parliamentary Mine's Inspector. He corresponded with many of New Zealand's most noted geologists, such as Julian von Haast (1822-1887). The Port Phillip Company was the most success quartz reef in Victoria, Australia during the 1850s. "George H. F. Ulrich," Trove Database, National Library of Australia, Last Accessed March 27, 2018, https://trove.nla.gov.au/people/1238621?c=people

[226] These fumes are never again addressed in the sources I have found. (Currently communicating with Dr. Petchey and others)

[227] "Upper Shotover," *Evening Star*, July 16, 1874, 2 (Supplement)

[228] During this period, newspapers consistently reported progress and regional excitement about the prospects for the Phoenix Mine, especially after Bullen's takeover. By 1884, the mine was producing 145 ounces per week. "The Mines," *Otago Witness*, September 25, 1880, 9; "Mining Report," *The Colonist*, February 18, 1884, 3; "Mining Times," *Tuapeka Times*, October 29, 1884, 5.

[229] "Quartz Mining at Skipper's," *Cromwell Argus*, October 31, 1871: 6.

[230] "The Skipper's Reefs and Their History," *Lake Wakatip Mail*, December 3, 1884: 5.

electrical equipment. Company records and mine inspections credit Walter Prince as head advising engineering, but there were surely others involved although they remain unnamed. Still, whatever his inadequacies were as an engineer, Prince succeeded as a salesman and certainly played a role in winning R. E. Fletcher the contract.

By the time Bullen expressed interest in electric power systems, Robert Fletcher (1857-1935) and his partners in Dunedin represented part of a small group of a larger hub of electrical engineers in the city. Since the 1860s and through the rest of the nineteenth century, Dunedin played home to a number of electrical engineering firms.[231] The New Zealand Electric Light Company operated there too.[232] In addition to linking together the Empire via electrical communication, these sites of electrical knowledge production and invention connected many countries undergoing electrification.[233] For example, Dunedin and Cincinnati, Ohio were developing a similar type of electric tram during the 1890s and engineers encouraged

[231] Much of the telegraph industry in the South Island was based in Dunedin and run by the Colonial Telegraph Company, "Telegraphy in New Zealand," *Proceedings of the Institution of Electrical Engineers* 9 (1880): 29–30.
[232] Rob Aspden, "Electricity Supply in New Zealand," *Proceedings of the Electrical Engineering Advisory Committee* 14, no. 2 (1988): 187.
[233] Electrical and civil engineers, especially from Europe and the United States, traveled around the world consulting on electrical projects. For many, this was a means to jump-start a career outside of the over-saturated job market. Famous examples included British engineers like Richard Henry Brunton and William Ayrton in Japan who established electrical engineering colleges in Japan. The American Anthony Walton White Evans who developed railroads in Chile and New Zealand, his project in Chile was the first in South America. Graeme Gooday and Morris Low, "Technology Transfer and Cultural Exchange: Western Scientists and Engineers Encounter late Tokugawa and Meiji Japan," *Osiris* 13 (1998): 99–128; Ruth Barton, " 'Men of Science': Language, Identity, and Professionalization in the Mid-Victorian Scientific Community," *History of Science* 41 (2003): 73–119; Michael Bryan Schiffer, "The Electrical Lighthouse in the Nineteenth Century: Aid to Navigation and Political Technology," *Technology and Culture* 46, no. 2 (2005): 305.

cooperation.[234] Dr. Charles Lemon (1834-1901), one of early New Zealand electrification boosters mentioned previously, maintained that the city ought to adopt the "double trolley system," a system in which each rail uses two wires instead of one.[235] One author from the *Telegraphic Journal and Electrical Review* wrote that Lemon would benefit from the double system model built in Cincinnati. [236] In the late nineteenth century, most considered Brush equipment, particularly dynamos, state-of-the-art. In 1849, the Brush Electric Company was founded in Cleveland, Ohio. In 1880, The Anglo-American Brush Electric Light Company was founded and by 1882 they had offices and engineers circulating between America, Canada, Mexico, Chile, England, New Zealand, and Japan. The company trained its engineers and they circulated between projects where Brush components were being used, which instituted a global engineering network. [237]

In 1878, the Otago School of Mines was established in Dunedin as part of the University of Otago.[238] Electric and mining technologies, as well as expertise, flourished in the city and supplied regional projects, like the Phoenix Mine, with electrical expertise. Walter Prince was

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[234] Reefton, the Phoenix Mine, and Dunedin featured frequently in columns in electrical engineering journals naming the latest developments in electrical science and technology. "Applications of Power," *The Electrical World* 9-10, August 27, 1887, 121.

[235] Double-wire systems were rarely implemented. Cincinnati engineers argued for that design because it meant that rails did not have to be as carefully insulated, making it faster and cheaper to lay track. However, current is lost in the set up. Ultimately, Dunedin adopted a single wire model. *Appendix to the Journal of the House of Representatives of New Zealand* 3, I: 1a (Wellington: George Didsbury, 1893) 13.

[236] It should also be pointed out that Charles Brush, of the same Anglo-American Brush Company based in New Zealand, lived in Cincinnati during the 1890s and worked on a number of projects, including an electric power generating wind turbine. "Dunedin," *The Electrical Engineer*, August 25, 1893: 169–170.

[237] Harry James Eisenman, *Charles F. Brush: Pioneer in Electrical Technology*, Ph.D. Thesis, Case Institute of Technology, 1967, 110.

[238] J. G. Black, "Goldfields Classes and Schools of Mines," *Report on the Mining Industry of New Zealand* (Wellington: George Didsbury, 1887), 269–270.

one of the Brush engineers in New Zealand and was appointed to be the acting advisor to the mine.[239] Prince and the owner, Robert Fletcher, had been trained by the Anglo-American Brush Corporation based in London, and of course, used almost exclusively Brush components on all the mining equipment.[240] Fletcher and Co. also served as the local agent for Julius Vogel's Australasian Electric Light, Power, and Storage Company of Sydney and London, which had been responsible for the electrification of Sydney and Melbourne.[241] Besides Bullendale and Reefton, Fletcher installed many of the electric works in New Zealand.[242] Therefore, it logically follows the Bullen selected this company to install the system at the Phoenix Mine.

The Phoenix Company and Fletcher and Co. began constructing the powerhouse on a flat near the Left-Hand of Skipper's Creek. The mine operators knew that the left-hand branch, rather than the right-hand side where the mine works were currently located, had a steadier flow and electric power could be transmitted over a distance, which circumvented the problem of water shortages.[243] The area had once been used for a small farm, and a water race, called Aylmer's Race, ran above the flat for an older mine works. Builders repurposed the race for the hydroelectric scheme.[244] They constructed the powerhouse at the base of a ridge 182 feet below the race, brought water into the house via penstocks. The water turned two Pelton wheels, which

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[239] *Appendix to the Journal of the New Zealand House of Representatives* (1886) C-4: 19.
[240] "R.E. Fletcher obituary," *Journal of the Institute of Electrical Engineers*, 1936, pp 692-693; Grey River Argus, 2 October 1886, 2.
[241] "Untitled," *Otago Witness*, October 10, 1885, 8; Miles Pierce, "Early Electricity Supply in Melbourne," *Third Australasian Engineering Heritage Conference* IPENZ (2009): 1-10
[242] For instance, in 1901 they installed the hydroelectric works at Rotorua, the Okere Falls Power Station. It was the first plant that received funding from the state, rather than private enterprise. *Appendix to the Journal of the New Zealand House of Representatives* (1901) C-1: 125.
[243] In his review of the mine, a Mr. Patrick Galvin wrote about the problems Bullen had with water. Mining handbooks like this were published by Parliament every couple of years to report on mining profits and plans. "Phoenix Quartz Company, Skipper's," *The Handbook of New Zealand Mines* (Wellington: George Didsbury, 1887), 51–56.
[244] Petchey, *Report*, 15.

Fletcher had acquired from Price and Sons of Thames. Lester Allan Pelton (1829-1908), an American engineer, invented the wheel to drive gold mining equipment in California. Once again Pelton Wheels signal the global exchange of engineering knowledge during the late-nineteenth century made possible by the existence of colonial settlements and resource extraction opportunities, such as gold rushes.[245] After the water moved through the powerhouse, a downstream sawmill utilized the water to power its equipment. Once the powerhouse was constructed, Fletcher installed two 40-light arc dynamos, which turned the Pelton wheels and transmitted electric power to a 6-pole Mordley-Victoria Motor located at the battery, affectionately named "Victoria."[246]

In February 1886, the system trialed successfully and drove 20 of the stampers. At first, the installation was met with minimal excitement because it merely kept pace with the power output provided by water, but this was only temporary.[247] The Parliamentary Mines Inspector, George J. Binns, explained this away by saying, “Very little is yet really known about electricity.”[248] Even though Binns’ report did not show that electricity immediately raised profits,

[245] Johnson, 279; Pierre-Louis Viollet, “From the Water Wheel to Turbines and Hydroelectricity: Technological Evolution and Revolutions,” *Comptes Rendus-Mecanique* 345, no. 8 (2017): 576
[246] The dynamos and motor were linked by No. 8 B. W. G. Copper wire, which is 0.165-inch gauge wire, an industry standard at the time Archaeologists have pointed out that the particular “Victoria” motor used at Bullendale, was designed to be a dynamo, not a motor (Kapp 1891: 307). The Mosgiel Woolen Mill was equipped with a Victoria dynamo in 1885 to power electric lighting (Otago Witness, 10th October 1885: 8) Such technological adaption was common at mine works across New Zealand; Petchey, 15–16.
[247] “Wakatipu Mining Notes,” *Otago Witness*, January 23, 1886, 18.
[248] The inspector, a Mr. George J. Binns, a fellow of the Geological Society of New Zealand, also admits that he had no experience with electrical equipment. Not to be confused with George Binns (1815-1847), a well-known Chartist and poet. So, while operators at the mine may not have been well-versed in electrical science or engineering, it may also simply be that the inspector was just unfamiliar with the technologies. *Appendix to the Journal of the New Zealand House of Representatives* (1887) C5: 47. Binns would go on to write more on lighting in New Zealand mines, most famously in, “On Lighting in New Zealand Mines,” *Transactions of the North of England Institute of Mining and Mechanical Engineers* 41(1893): 123–125.

he hoped that as the electric system improved profits would increase. Hopes remained high that electricity would improve the mine's productivity, so much so that the Phoenix company added a new rock breaker and more stamps.[249] The success of the project sparked interest around the country. In 1887, Binns made an extremely detailed report of the mine's operation. He excitedly noted that the Brush dynamos were the, "largest size yet manufactured," and mentioned too that the powerhouse and battery had telephones, so the attendants could communicate.[250] By the end of 1888, the dynamos were capable of powering all 30 stamps.

The exact reasoning behind Bullen's pursuit of electric power for the mine is unknown; he never documented his thinking. However, there are several likely explanations as to why electricity appealed to Bullen and to other industrialists hoping to expand extractive industries in New Zealand. The hydroelectric system did not necessarily make the construction any easier than other systems Bullen could have used, which suggests that the commitment to electric power cannot be explained by appealing to practicality. Workers, using mostly mules, moved tons of unassembled parts and wire 200 miles to the mining site. Furthermore, electric power losses plagued the system. Engineers lacked the expertise needed to successfully install such a system. For example, reports show the mine had problems with eddy currents resulting in loss of power between the dynamo and stamper.[251]

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[249] There is some discrepancy here about the number of stampers at this mine that were powered by electricity. At one point there were 30 stamps, but the electric motor only ran 20 of them at first but eventually ran all 30. It is unclear whether or not the added 10 referred to here is part of the original system or if there was another set up somewhere on site. *Appendix to the Journal of the New Zealand House of Representatives* (1886) C4: 19.
[250] *Appendix to the Journal of the New Zealand House of Representatives* (1887) C5: 46.
[251] By the time this project began difficulties had been solved in 1864 by Antonio Pacinotti (1814-1912) This was known as the Pacinotti Dynamo and was a widely published experiment. Silvanus Thompson, *Dynamo-Electric Machinery: A Manual for Student of Electrotechnics*(London: E.& F. N. Spon., 1886) 113-115.Petchey, "The Industrial Archeology of Power," 207.

Explaining the mine's transition to electric power, both in its successes and failures, is only possible by contextualizing the project as part of British colonial aspirations for New Zealand. To be sure, there are some hints that Bullen's personal experience played a role. For instance, in 1885, he had successful had electric lights installed at the mine.[252] It is also likely that Bullen had heard of other successful electrification projects, specifically hydroelectric works around New Zealand, such as in Reefton. However, responses to the mine's electrification from newspapers and surveys, offer useful insight other factors that may have made them especially willing to pursue a new power system.

First, Bullen, like so many other Pākehā, would almost certainly have read claims that electric power would increase profits by providing more efficient and locally sourced power.

> The great want is capital. With that would come all the latest and best appliances for saving the gold, more systematic working, and the utilization of electricity and water-power on a large scale, similar to what has been done at Messrs. Bullen Bros.' mine [Phoenix Mine] at Skipper's. If English capitalists, who have invested millions of money [sic] in Indian, Californian, and South American mines, were to turn their attention towards the interior of Otago, they would get far better returns for their capital.[253]

Electricity appealed to investors, miners, and the colonial government because it promised increased efficiency, aligned with British ideas about technological progress, and made better use of the water sources near mines. Many mines were unable to turn a profit because the mines could not keep their stamping batteries open due to the variability of the water flow near the mines. In 1886, citing the Phoenix mine, one miner complained of the mines near Reefton saying:

> Let us take the Keep-it-Dark, Mountain Maid, Main Lode, Lady Fayre, Premier, and New All Nations. Here six companies have literally no crushing power, saving by the sparse amount of water supplied during the summer… A dynamo motor (like the one at

[252] *Appendix to the Journal of the New Zealand House of Representatives* (1885) C2: 11.
[253] *The Handbook of New Zealand Mines*, 48.

> Bullendale) could be driven by the Arrow River all year round…and keep their respective mines clear of debt.[254]

According to Fred Evans, at the end of 1886, the introduction of electric power not only increased the amount of material processed at the Phoenix Mine but also attracted more investors. Evans argued that:

> It may be well said that I have been well provided with funds for many years past in opening and prospecting the Phoenix Mine. I admit that, yet at the same time I can say that all of many drivings [sic] on lode or crosscut for so lengthened a period, there are none that are not of advantage now. But it cannot be said that I have copied anyone, either in mining or machinery, for I venture to think that in both we have left all others behind, and have shown the colony the immense value of its resources both in mining and power.[255]

During the 1880s, the majority of the remaining gold operations required substantial investment in equipment and labor; the days of panning were over. Mine owners wanted to produce enough to attract investors and laborers to dig deeper and process more quartz. National excitement about electrical power helped restore interest in mining. In addition to attracting regional attention, the Phoenix Mine's electrification, "attracted the attention of the Home Country."[256] Besides the newspapers in New Zealand that were littered with excitement and praise, international newspapers and journals took notice of the application of electricity to mining. An author in the *Telegraphic Journal and Electrical Review* said of the mine:

> The importance of this new application of electric power for the lighting and complete working of an extensive mine like that of the Phoenix opens up a new era in the economic development of the very valuable and inexhaustible mineral resources.[257]

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[254] "Transmission of Power by Electricity," *Otago Witness*, January 9, 1886, 11.
[255] This was written in October , eight months after the introduction of electric power at the mine. "Mining Intelligence," *Lake Wakatip Mail*, October 15, 1886, 5.
[256] "Transmission of Power by Electricity," *Otago Witness*, January 9, 1886, 11.
[257] "Electrical Transmission of Power in New Zealand," *Telegraphic Journal and Electrical Review* 19, August 6, 1886, 134

The article quoted above explains the technologies involved and offers praise for the inventiveness of the engineers, but later concludes by arguing that the true accomplishment of this project was, "the means of transmitting power hither and thither–up a hill or down dale–down the mountain top or in the ravine below."[258] In that way, the electrification of the Phoenix Mine improved New Zealand's viability as a model settler colony because modern power technologies could succeed across the colony, opening up the frontier for exploitation.

Of the many energy concerns at the end of the nineteenth century, the generation of electric power was of obsessive interest to engineers throughout the British Empire. During the 1880s, many questioned the longevity of steam as the motive power of the world. The British Empire needed to power their navy, their production, and maintain their economic growth. For many electricity offered superior power. In one prediction an author referred to New Zealand's "innumerable swift running torrents" saying that:

> New Zealand will make more use of electricity proportionally than any other country in the world…not because the lack of fuels prevents extensive use of steam, for I believe her enormous coal fields will be practically untouched. There is no other land of any importance that is so well adapted for the production of electricity."[259]

New Zealand has a total of 70 major river systems, some 110,000 miles of river.[260] Electricity could be transmitted from these water sources to light cities, power factories, and power

[258] Ibid., 135
[259] "Electric Power in Mining," *The Press*, July 12, 1888, 3.
[260] The number of rivers in New Zealand has served as a foundation for most of the country's history of hydroelectric projects. At the same time, the number of rivers and their dependent ecosystems has recently worked to undermine the expansion of hydroelectric systems. Most new systems, like the Amethyst River Dam, mentioned in the last chapter, must meet strict environmental guidelines. "Overview of New Zealand's Rivers," Last Accessed February 22, 2018, http://www.doc.govt.nz/about-us/statutory-and-advisory-bodies/nz-conservation-

transportation systems. Frequently, engineers and journalists cited the success of the Phoenix Mine to encourage the installation of electric works in other spaces.

> With regards to the prospects of the Phoenix Mine, we are happy to learn that they are exceedingly good–better than usual. The battery is turning out from 60 to 70 ounces of gold per day.[261]

Unlike the water-powered or steam-powered mining batteries, in New Zealand and elsewhere, hydroelectric systems took full advantage of the water running through mine works. On one side of the creek, water entered penstocks to turn the turbine. The other branch of the creek collected water to clean crushed material for faster processing. For many owners and investors, hydroelectrically-generated electricity promised to avert the waste of energy, as well as replace steam-generated electric power. By waste, these miners were not referring to the efficiency of steam engines vs. hydroelectric turbines. Instead, this was about maximizing the utilization of resources present. For instance, one author wrote in the *Thames Advisor*:

> The subjoined account of the application of electricity to gold mining purposes at the Phoenix Co. mine**,** upper Shotover, Otago, will be read with interest. It shows how the vast water power that annually runs to waste in, say a place like the Thames, might be made available for industrial purposes.[262]

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authority/publications/protecting-new-zealands-rivers/02-state-of-our-rivers/overview-of-new-zealand-rivers/

[261] In 1875, the mine reported much lower weights in gold, 497 ounces for the entire year. "Untitled," *The Grey River Argus*, April 21, 1875, 2; "Upper Shotover: The Success of the Electric Machinery at the Phoenix Mine," *Lake Wakatip Mail*, February 15, 1886, 2.

[262] Concerns about wasted energy for dredging, sluicing, drilling, and crushing happened at Mines around the world. And, by the 1890s as hydropower systems became popular other mineworks weighed taking further advantage of the water supply for electric power. "Transmission of Electric Power for Gold Mining," *Thames Adviser*, June 14, 1886, 2; Joseph W. Buell, "The Coming Motive Power: Is Compressed Air to Become the Rival of Electricity," *California Journal of Mines and Geology* 12-13 (1893): 721–725; "South Africa Again," *Engineering and Mining Journal* 60, December 7, 1895, 535–536

Such sentiments connect these mines to commonplace imperial ideologies in Great Britain, expressed in the writings of Benjamin Kidd and Peter Lund Simmons, who believed the control/transformation of nature legitimized colonialism and capitalistic expansion.[263]

Engineers and subsequent historians have noted the risk of investing in such an experimental and therefore potentially financially disastrous technology as electricity. Nonetheless, the rhetoric around electricity speaks to an atmosphere of excitement about its promise that may have nudged investors like Bullen to use it in the hopes of increasing the productivity and value of New Zealand's frontier. Even though the Phoenix Mine was isolated and far from the urban centers of New Zealand, and indeed the British Empire, miners, and owners were still connected to conversations about electricity. Although it was the first mine in New Zealand to adopt electric power, the implementation of electricity did not make it an outlier or ahead of its time. Instead, electric power boosters used existing systems of resource extraction and colonial plans to build a model colony using modern British technology.

Conclusion

> The enterprise displayed by the owner Mr. G. F. Bullen of the Phoenix mine**,** Queenstown, New Zealand, is an example deserving of imitation… Of course, Mr. Bullen and his manager were looked upon as misguided enthusiasts…but now that the scheme is an accomplished fact, they will receive, no doubt, the congratulations they deserve.[264]

Written about a year after the electrification of the mine, this author captures most of what has been written about the Phoenix Mine. It was a technological marvel that improved the mine's productivity and output. As I have explained, this misses the mine's significance. It is true that the mine represents a definitive energy transition in New Zealand because electricity

[263] Timothy Cooper, "Peter Lund Simmonds and the Political Economy of Waste Utilization in Victorian Britain," *Technology and Culture* 52, no. 1 (2011): 21-44.
[264] "Mining Enterprise in Otago," *Inangahua Times*, August 13, 1886, 2.

was used as a source of industrial power, not just for lighting or entertainment. Electricity was not utilized by happenstance or because it was easier. Instead, electric power systems increased New Zealand's potential as a resource frontier and redefined the boundaries of that frontier by utilizing New Zealand's rivers and bringing technologies of the metropole into what had previously been non-Pākehā spaces. The application of electric power to the exploitative practice of mining demonstrates the colonial utility of electric power. Electric technologies, like the stamper, highlight the British commitment to their mantra of technological superiority and the creation of a model colony. A self-sustaining colony with a strong British settler population that works to profit the British Empire. Furthermore, this mine establishes the beginning of New Zealand's commitment to hydroelectricity. Hydroelectric power did not make more sense geographically or financially. Rather it appealed to those people vested in making New Zealand a more profitable, model colony.

Chapter 3:

The Dam at World's End: Reimagining Imperialism in through the Lake Coleridge Dam

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Introduction

> May the new Dominion flourish
> With the progress time will bring,
> And a knot of heroes nourish
> For the Empire and the King.[265]

Between 1867-1948, the British Empire and certain settler colonies deployed the category of Dominion to define a new sort of imperial relationship, that of self-governing colonies loyal, but not subordinate to the Crown.[266] The title elevated settler-colonies above subject colonies and prevented the adoption of more rebellious titles like "kingdom."[267] This political transition offered greater political autonomy to settler colonies in return for a significant savings in imperial defense expenditures. On September 26th, 1907, the Colony of New Zealand became the Dominion of New Zealand. Celebrations happened around the islands, but none were as energetic as the events around the parliament buildings in Wellington. The festivities at the new Dominion's capital lasted throughout the day and included speeches, bands, and military demonstrations. One of the most visible and well-attended attractions was the lighting of the Parliamentary Library. Bright electric lights covered the building and formed the words, "Advance New Zealand," "Colony 1840," and "Dominion 1907." The use of electric lights at

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[265] This is the final stanza of a poem, written by an anonymous citizen from Auckland, read in the New Zealand Parliament follow deliberations over the establishment of the Dominion. Anon., "The New Dominion," *Parliamentary Debates* 139, July 12, 1907, 387–388.
[266] Dominion status was granted to the following colonies: Canada (1867), Australia (1901), New Zealand (1907), Newfoundland (1907), South Africa (1910), Irish Free State (1922), India (1947), Pakistan (1947), and Ceylon (1948). Kenneth O. Morgan, ed., "Chronology," in *The Oxford History of Britain* (Oxford: Oxford University Press, 2010), 760-765.
[267] G. A. Wood, "The Former Dominion of New Zealand," *Political Science* 26, no. 1 (1974): 2–10.

public exhibitions was typical of many turn-of-the-century celebrations around the world.[268] Electric lights symbolized technological capability and modernity; however, for New Zealand, the relationship between progress and electricity had for decades been associated with New Zealand's settler-colonial mission to create a model colony.[269] Electric power had bolstered New Zealand's seemingly contradictory plans for self-sufficiency on the one hand and economic productivity in service to the Empire on the other. At the same time, the creation of the Dominion of New Zealand highlights this paradox as New Zealand government officials sought to maintain the authority they had enjoyed while under the control of the Colonial Office. In the early years of the country's transition to electric power, hydroelectricity proved the most effective means of both achieving economic gain and establishing imperial infrastructures, such as lighting frontier outposts, mining gold in the frontier, and building long-distance telegraphic communication. Across the Empire, the British enacted water regulations to control settler populations and marginalize indigenous peoples.[270] The colony's government introduced new infrastructures, like state-run hydroelectric dams, to more efficiently enforce control over water,

[268] David. E. Nye, "Electrifying Exhibitions: 1880-1939," in *Fair Representations: World Fairs and the Modern World*, Robert Rydell and Nancy Gwinn, eds. (Amsterdam: Free University Press, 1994), 140–156.
[269] Graeme Gooday, *Domesticating Electricity: Technology, Uncertainty, and Gender 1880-1914* (London: Pickering and Chatto, 2008): 121–122.
[270] The following articles review the ways the British Empire used water (supply, irrigation, and transport) in their subject and settler colonies during the nineteenth and twentieth centuries, particularly in Africa. H. Hoag, "Turning Water into Power: Debates Over the Development of Tanzania's Rufiji River Basin," *Technology and* Culture 49, no. 3 (2008): 624-651; T. Tvedt, "Hydrology and Empire: The Nile, Water Imperialism and the Partition of Africa," *Journal of Imperial and Commonwealth* History 39, no. 2 (2011): 173–94; H. Hungerford and S. Smiley, "Comparing Colonial Water Provision in British and French Africa," *Journal of Historical Geography* 52 (2016): 74–83; L. Bruce Railsback, "Rain, Riches, and Empire: The Relationship between Nations Ruling Distant Lands, Nations of Great Wealth, and Regions of Regular Moderate Atmospheric Precipitation," *Weather, Climate, and Society* 9, no. 3 (2017): 455–469.

land, and peoples. Historians and sociologists, classify this type of technopoltics as *hydro-imperialism*, or the usage and control of water resources in a colonial setting.[271]

Even though the signage and rhetoric of Dominion Day touted independence and separation from British colonialism, New Zealand remained part of the British Empire. The continued protection provided by the British navy, even after the regular British Army was withdrawn, and high tax rate alone demonstrates this relationship.[272] However, the Parliament and the Public Works department also adopted colonial rhetoric and practices to advocate for and produce state-run electric power. The transition to electric power systems had fulfilled visions of a self-reliant colony; the expansion and demand for electric power gave officials a means to facilitate a more centralized government that would continue to pursue a colonial agenda in New Zealand. Electric power boosters' insistence that electric power was part of a natural progression to other energy infrastructures artificially created a need for a strong national government. The establishment of the first national grid, which began with the Lake Coleridge Power Station in Canterbury, exercised New Zealand's rebranded colonial authority under the auspices of Dominion. The proto-Dominion and Dominion government engaged in hydro-imperialist practices by repurposing indigenous land, establishing national electric-power regulations, and

[271] Sometimes written as hydraulic imperialism, especially when studying numerous water infrastructures, such as irrigation, sewage, transportation, etc. Hydro-imperialism typically refers exclusively to hydroelectric infrastructures. Sara Pritchard, "From Hydroimperialism to Hydrocapitalism: 'French' Hydraulics in France, North Africa, and Beyond," *Social Studies of Science* 42, no. 4 (2012): 591–615; Mason Gaffney is generally credited with first using the term, Mason Gaffney, "What Price Water Marketing?" California's New Frontier," *American Journal of Economics and Sociology* 56, no. 4 (1997): 475–520.

[272] As I will discuss later in the chapter the presence of the British Army in New Zealand was a major issue after the New Zealand Wars because the Colonial Office wanted to reduce military expenditures in New Zealand for conflicts with the Māori. However, the British Navy continued to protect the colony even during this conflict. Avner Offer, "The British Empire, 1870–1914: A Waste of Money?," *Economic History Review* 46, no. 2 (1993): 215-238.

supporting the creation of a centralized Public Works Department with the authority and resources to create hydroelectric infrastructures.

An Electric State

> More favourably than any other water supply… the Christchurch and tributary districts could be very effectively supplied, that the installation would be simple and that the initial installation would not be enormously costly, as the plant could be enlarged as needed.[273]

This statement from the *Evening Post* is one of many excited reports touting the potential of a Christchurch-based hydroelectric power station on the Rakaia River watershed, which included Lake Coleridge, in the early twentieth century. Construction on the dam and power station commenced in 1911 and began supplying power in 1914. Over the next few decades, the dam added more generators and expanded its supply network. Later in the twentieth century, new rivers were fed into the lake to increase output, generators were replaced, and it linked up to other power boards. Today the dam remains an important power station in the TrustPower network on the South Island.[274] Corporate histories credit the dam as the origin and earliest example of New Zealand's hydroelectric capabilities. Even though many earlier electric projects relied on hydropower, the Lake Coleridge scheme harnessed hydropower on a larger scale and at a higher cost. In order to understand the lasting impact of the dam on New Zealand's energy infrastructure, the dam is best understood as a part of the larger colonial project in New Zealand. The transition to Dominion represents the completion of the initial push for settlement because the colony achieved local self-government, one of the supposedly cherished aims of British

[273] "Electrical Transmission of Power," *Evening Post*, October 31, 1904, 2.
[274] TrustPower, for more see, https://www.trustpower.co.nz/Getting-To-Know-Us/Our-History

colonialism. Nationalized electrification demonstrates the duplication of imperial infrastructures within New Zealand's new national government.

Understanding Lake Coleridge's role in local enactments of imperial power, the ways in which New Zealand's government adhered to the Colonial Office's emphasis on centralized governance, is aided by placing the project in the context of the larger global transition to hydroelectric power, especially in British colonies and territories. Hydroelectric infrastructures and the accompanying political institutions, (like the Public Works Department in New Zealand), expanded rapidly in the British Empire, especially in Canada, at the turn of the twentieth century.[275] In studies of hydroelectric systems, dams, such as the Lake Coleridge Power Station, existed within an imperialist dynamic, in which Pākehā reimagined the river as an industrial resource. Across the Empire, the British enacted water regulations to control settler populations, marginalize indigenous peoples, and justify the introduction of new infrastructures.[276] Even though the dam was designed and built after Dominion, the construction of Lake Coleridge still depended on imperial power dynamics and exploitation. As the Victorian scholar John Miller Dow Meiklejohn (1836-1902) argued in one of his geography textbooks:

> Divine Providence, brought it about that the people of Great Britain are now the traders and news carriers for the whole world. These functions have given us another office, have forced upon us another mission. This is to keep the Water-ways of the world– the water-

[275] Dorotea Gucciardo, "The Powered Generation: Canadians, Electricity, and Everyday Life," Dissertation, University of Western Ontario, 2011, 49–50.
[276] Water rights were used to expand colonial influence in numerous British colonies such as Africa, India, and Canada for drinking water and hydroelectric power. Ute Hasenöhrl (2018) "Rural Electrification in the British Empire," *History of Retailing and Consumption* 4, no. 1: 10–27; Lewis, M. (2007). "The Personal Equation: Political Economy and Social Technology on India's Canals, 1850-1930. *Modern Asian Studies, 41*(5), 967–994; Daniel Macfarlane and Peter Kitay, "Hydraulic Imperialism: Hydroelectric Development and Treaty 9 in the Abitibi Region," *American Review of Canadian Studies* 46, no. 3: 380–397.

> ways in ocean, sea, lake, river, and canal. Great Britain is, therefore, the Guardian of Water-ways.[277]

In colonial spaces, water manipulation and regulation reveal and reproduce unequal power regimes. Beginning in the 1840s, in order to revitalize urban spaces, Britain undertook sweeping water supply and drainage reforms and these changes were emulated across the empire. The construction of new colonial water supplies increasingly transformed previously decentralized systems into centralized systems with new restrictions on how to use them. British officials and engineers hoped that new water systems would support the productivity and modernization of the colonies. Besides hydroelectric systems, many colonial cities, like Bombay, Colombo, Hong Kong, and Singapore installed massive water schemes to solve labor, health, and environmental problems.[278] As we have already seen in New Zealand, Pākehā altered the environment around the Inangahua River in Reefton and Skipper's Creek at the Phoenix Mine to create a sustainable settlement and enhance economic productivity in the service of colonial interests. And while the power boards operated locally, water rights had to be obtained from the colonial government. Placing the construction of Lake Coleridge in the context of hydro-imperialism situates New Zealand's transition to electric power, within the broader frame of imperial utilization of water as means of centralizing national government control over indigenous and settler populations to assert control over colonized places.

Becoming a Dominion

> The freer we become, the closer we draw together; the more our constitutional bonds are relaxed, the more closely we are held in bonds of friendship.[279]

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[277] J. M. D. Meiklejohn, *The British Empire: Its Geography, Resources, Commerce, Land-ways, and Water*-ways, 6th ed. (London: Alfred M. Holden, 1899), 16.
[278] John Broich, "Engineering the Empire: British Water Supply Systems and Colonial Societies, 1850-1900," *Journal of British Studies* 46 (2007): 346–365.
[279] In this speech, the New Zealand Prime Minister, Peter Fraser, was appealing to the United States for increased support in the Pacific theater of World War II. He hoped to convince the

Just as Pākehā politicians and writers celebrated the status of New Zealand as a model colony during the nineteenth century, so too did they portray the transition to Dominion as the ideal conclusion of the settler-colonial mission. The Dominion of New Zealand formally existed between 1907-1946 and was part of the movement to form the British Commonwealth of Nations.[280] Dominions, such as New Zealand, Canada, and Australia, existed at the intersection of unity and independence. The use of the term "dominion" has a long history in Great Britain; colonies were the monarch's, "dominions beyond the sea," whose governments were subordinate to the Crown.[281] The first major alteration to a British settler colony's status happened within the Canadian Confederation, when Nova Scotia, New Brunswick, and Canada rewrote their constitutions intending to become the "Kingdom of Canada." Some feared that title might evoke rebellious intent, so the new state was named the Dominion of Canada.[282] Canada became the model for the other "self-governing" colonies, like New Zealand. Unlike Canada, the

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U.S. that Great Britain's interests were New Zealand's interests. Despite its later date, this attitude encapsulates the paradoxical relationship of New Zealand to the British Empire well into the twentieth century. Peter Fraser, "Prime Minister's Conference," *New Zealand Parliamentary Debates* 265 (1944): 185.

[280] The Commonwealth of Nations, often known as the Commonwealth, is an organization of 53-member states that are mostly former territories of the British Empire. The movement officially began after the Balfour Declaration (1926) and later it was altered by the London Declaration (1949). Philip Murphy, *Monarchy and the End of Empire: The House of Windsor, the British Government, and the Postwar Commonwealth* (Oxford: Oxford University Press, 2013), 17

[281] "Dominion" first appeared in Oliver Cromwell's title over the Protectorate Government, which was "Lord Protector of the Commonwealth of England, Scotland, and Ireland, and the dominions thereto belonging" Kenneth O. Morgan, ed., *The Oxford History of Britain* (Oxford: Oxford University Press, 2010), 375.

[282] Samuel Leonard Tilley (1818-1896) of New Brunswick proposed the title of Dominion as part of the British North America Act (1867). William Parr Greswell, *History of the Dominion of Canada* (Oxford: Clarendon Press, 1890): 212.

development of New Zealand's self-government accelerated at an unprecedented rate in the history of the British Empire.[283]

Even before the declaration of dominion, the New Zealand government made rapid constitutional alterations which fostered policies that granted Parliament increasing power, while maintaining loyalty to the Crown. The legislative changes reflected colonial aspiration for the colony as an ideal England, first articulated by Edward Gibbon Wakefield, who said, "English society with its various gradations in due proportions, carrying out our laws, customs, associations, habits, manner, feelings –everything of England, in short, but the soil."[284] This idea was maintained and expanded by subsequent settlers, thinkers, and politicians.[285] Furthermore, two 1839 revolts in Canada concerning representation, coincidently the year that the British Parliament officially annexed New Zealand, encouraged the establishment of increased self-government and representation in some parts of the empire.[286] In order to maintain its empire, the Crown needed to grant its colonies– at least its settler colonies– a representative body in which the country had confidence. The Colonial Office recognized that settler-colony rebellion would result in expensive military and trade costs that neither the colonies nor the Crown could afford.

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[283] New Zealand maintained spectacular population growth (and decline) from 2,000 Europeans to 100,000 Māori in 1840 to almost one million Europeans in 1907 and approximately 40,000 Māori. The 1901 census divided the population into Māori (43,112) and non-Māori (772,719), including Europeans, Chinese, and others. "A Census of the Colony of New Zealand," March 31, 1901. James Belich, *Paradise Reforged: A History of the New Zealanders from the 1880s to the Year 2000* (Honolulu: University of Hawaii Press, 2001): 16–17.

[284] Edward Gibbon Wakefield, *Twenty-Third Report of the Court of Directors of the New Zealand* Company (London: New Zealand House, 1847), 2. William David McIntyre and W. J. Gardener, eds. *Speeches and Documents on New Zealand's History* (Oxford: Clarendon Press, 1971), 21.

[285] See Chapter 1

[286] For more see, John George Lambton, *Report on the Affairs of British North America* (London: J. W. Southgate, 1839). This work often referred to as *Durham's Report*, Lambton was the 1st Earl of Durham, reshaped arguments for self-governance in British settler colonies.

Besides fiscal concerns, locally elected representatives proved to be more effective administrators than earlier leader appointed by the Colonial Office.[287]

Throughout the mid-nineteenth century, amendments to the colony's Constitution increasingly granted Pākehā politicians authority to govern the island, which led to debates about how much self-rule the Colonial Office ought to allow. The first colonial constitution, the Charter of 1840, established rule under a lieutenant-governor and an executive council. Together this group formed a Legislative Council and met to enact new laws in the colony. By 1846, municipal politicians and settlers had so frequently critiqued the Council's effectiveness, that interest in establishing a new government arose around the colony.[288] After years of debate, in 1852, Governor George Grey introduced a new legislative structure to Westminster and the Colonial Office accepted the following year.[289] The General Assembly first met in 1854 to establish ministerial responsibilities of the new body, sometimes referred to as a responsible government.[290] Responsible government refers to a system of government that embodies the principle of parliamentary responsibility, the British Parliament being a primary example. In 1855 the Colonial Office approved this transition to a responsible government and appointed a new governor. Governor Thomas Gore Brown (1807-1887) granted the General Assembly

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[287] Lorenzo Veracini, *Settler Colonialism: A Theoretical Overview* (London: Palgrave, 2010), 66–67.

[288] "Lord Stanley's Speech," *New Zealand Colonist and Port Nicholson Advertiser*, August 9, 1842, 4; "Untitled," *The Nelson Examiner*, September 10, 1842, 106.

[289] The governorship of New Zealand was first established in 1841 after New Zealand separated from New South Wales. The governor was appointed by the colonial office to represent the monarch's interests in New Zealand.

[290] In New Zealand, the General Assembly consisted of a Legislative Council and a House of Representatives elected every five years by males aged over 21 who owned property of a certain value – and elected superintendents and from each of the six provincial councils. "Political participation and electoral change in nineteenth-century New Zealand," Official Website of the New Zealand Parliament https://www.parliament.nz/en/visit-and-learn/how-parliament-works/fact-sheets/participation/, Last Accessed June 4, 2018.

additional power but differed with them, primarily premier Edward Stafford (1819-1901), on matters of "Imperial interests generally," referring to land and Māori affairs.[291] This agreement marked the beginning of responsible government in New Zealand under a dyarchy or "double government."[292] Some critics, like Charles Hursthouse, labeled the new parliamentary government as "double government" because Colonial Officers in London and Pākehā politicians ineffectively shared power. Fraught communication between these figures frequently hampered decision making. It was a delicate balancing act that ultimately proved ineffective and served as an argument for increased self-government for the remainder of the century.

Ultimately, the so-called "Māori Problem" defined the limits of self-government because the New Zealand government lacked the means to support their own military garrison.[293] In 1857, the constitution was amended granting basic administration of laws and domestic affairs to New Zealand's General Assembly, allowing it some semblance of self-governance, but contentions remained over colonial and imperial authority in matters of colonial defense. During the early 1860s, conflict with the Māori peaked and forced the transfer of security to internal ministers because the Colonial Office decided that such matters were better handled locally,

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[291] "Governor T. Gore Browne to Sir George Grey," March 12, 1856, published in *Accounts and Papers of the House of Commons* 46 (London: George Edward Eyre and Spottiswoode, 1860), 193

[292] Hursthouse, and others, strongly criticized what they considered an unbalanced and efficient distribution of power between the General Assembly, the Crown, and Colonial Office. Sometimes referred to as the "Treble Government." They wanted to remove the "quills" of Downing Street and give increased legislative authority to practice leaders in New Zealand. Charles Hursthouse, "Double Government," in *Letters on New Zealand Subjects* (London: Edward Stanford, 1865): 63–64.

[293] From the 1860s forward, journalists and politicians frequently referred to the Māori problem. During the 1860s especially this referred to what we now call the New Zealand Wars. After that, some authors evoked the phrase to refer to potential violence from Māori, Māori socio-economic problems, and difficulties integrating Māori in New Zealand society. For example, see, "Letter to the Editor," *New Zealander*, May 8, 1861, 3; C. W. Burnell, "The Māori and the Moa," *Ashburton Herald*, March 5, 1880, 5; "City Māori Problem," *Gisborne Herald,* April 13, 1950, 4.

especially land redistribution.[294] In 1861, Māori affairs became part of the ordinary business of New Zealand's Parliament.[295] Increasingly, settler colonies were expected to protect their settlers in domestic conflicts. The intensity of the New Zealand Wars (1845-1872) proved an exception to this hands-off approach by the British Army. By 1864, the army's garrison in New Zealand had risen to 18,000 but the troops began to be redeployed, especially to Ireland to quit rebellion and South Africa to protect mining operations.[296] The Colonial Office agreed to leave a battalion and £50,000 a year for "Māori purposes."[297] Any further military action would require the funds to be raised by the colony, which proved extremely difficult for the young administration.[298] Although the "garrison controversy" concerned warfare, the debate proved formative to the Pākehā push for self-rule and the local centralization of political authority. It remained a point of strain in the otherwise good relations between the colony and England for the remainder of the nineteenth century as many in the colony felt abandoned. As Henry Sewell (1807-1879), the first premier and third colonial secretary of New Zealand, argued, "it was not the treatment which a child would expect from its parent."[299]

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[294] Alan Ward, *An Unsettled History: Treaty Claims in New Zealand Today* (Wellington: Bridget Williams Books, 2015), 162.

[295] As a result of military difficulties in the Crimean War and the Indian Rebellion of 1857, the Liberal government of the 1860s sought to change the size, organization, and expenditure of the British military. Under the direction of William Gladstone, Edward Cardwell (1813-1886) the Secretary of War led this movement which is often labeled the Cardwell Reforms. These were followed up by the Childers Reforms in the 1870s and 1880s, led by Secretary of War Hugh Childers (1827-1896). Harold E. Raugh Jr., ed. *The Victorians at War, 1815-1914: An Encyclopedia of British Military History* (Oxford: ABC-Clio, 2004): 82.

[296] Morgan, *The Oxford History of* Britain, 561-563.

[297] Belich, *The Victorian Interpretation of Racial Conflict*, 23–24.

[298] This happened after the supposed "massacres" at Poverty Bay and White Cliff, Taranaki. Both of which were tragic and frustrating defeats for the British military and settlers, as well as many Māori. For more see, James Belich, *The Victorian Interpretation of Racial Conflict*, 216–218.

[299] Henry Sewell, David McIntyre, ed. *The Journal of Henry Sewell*, vol. 2 (Christchurch: Whitcoulls Publishers, 1980) 320.

The Gladstone government pushed for home-rule, but this by no means meant an end to empire.[300] Instead, he redefined what the character of the empire should be. Between 1869-1870, Grey and Sewell led conferences of the self-governing colonies with the hopes of revitalizing trade and emigration.[301] The meetings did not alter any major Colonial Office policies toward the self-governing colonies. However, they played a crucial role in the new label of "imperialism" in the British Empire, which at his point meant forging a sense of unity across the Empire. This thinking was best captured by one of Gladstone's speeches.

> Let them flourish to the uttermost; and, if their highest welfare requires their severance, we prefer their amicable independence to their constrained subordination. The substance of the relationship lies, not in dispatches from Downing Street, but in the mutual affection, and the moral and social sympathies, which can only flourish between adult communities when they are on both sides free.[302]

Although they only applied to settler colonies' white-male population, Gladstone's ideas about mutual cooperation guided imperial policy well into the early 1900s. Even as the Colonial Office granted New Zealand more independence in terms of self-government, the country remained culturally and financially tied to Britain.[303]

Even with the Colonial Office and Westminster advocating for home rule, this new view of empire was certainly contested in New Zealand. The Britain of the Pacific, they suggested,

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[300] See Chapter 1

[301] Politicians from Canada, Australia, and New Zealand met in the Cannon-Street Hotel to consider the relations between England and the Colonies. "Home News," *Pall Mall Budget*, November 26, 1869, 30–32; "News of the Week," *The Spectator*, December 4, 1869, 1414–1415.

[302] In a later speech, Gladstone reflected on this period as a turning point for England's responsibility to its colonies. William Gladstone, "England's Mission," *The Nineteenth* Century, August 25, 1878, 560–585. C. C. Eldridge, *England's Mission: The Imperial Idea in the Age of Gladstone and Disraeli 1868-1880* (London: Macmillan, 1973) 98–119.

[303] Eqout Frankema, "Raising Revenue in the British Empire, 1870-1940: How 'extractive" were colonial taxes," *Journal of Global History* 5, no. 3 (2010): 447–477; Felicity Barnes, *New Zealand's London: A Colony and Its Metropolis* (Auckland: Auckland University Press, 2012), 17.

deserved better protection. Some talked of increasing trade with the United States and there were motions of censure in the General Assembly.[304] During the censure debate, Sewell brought up the idea of total independence. In a speech laden with overtures of patriotism, Sewell exclaimed:

> I should, under existing circumstances, prefer assuming the risks and responsibilities – the privileges and immunities – of a free state, to continuing in our present precarious position of semi-dependence.[305]

Despite the intensity of some arguments the "independence option" had a short life. By the turn of the twentieth century New Zealanders still maintained strong cultural and familial connections in Great Britain.[306] With booms in economic and population growth, projects for improvement and expansion of infrastructure for the settler population drove national political agendas. Then Colonial Treasurer Julius Vogel's (1835-1899) "Great Public Works" scheme which borrowed some 10 million pounds to fund road, railway, and communication infrastructure, drove this shift.[307] Prior to this expenditure, New Zealand's infrastructure depended on provincial interest and short-term booms from extractive industries, such as gold, flax, and wool. New technological infrastructure projects provided a reason for increased central government in the colony as more political power devolved to local authorities, a pattern that would reemerge when the Dominion government was formed. Ultimately, in 1876, the success of Vogel's action led to the dissolution of the provinces and a much stronger reliance on the national government.

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[304] "The Honorable Julius Vogel on the Policy of Government," *Nelson Examiner and New Zealand Chronicle*, November 19, 1870, 3.
[305] Henry Sewell, "Conduct of Imperial Government, July 18, 1870" *New Zealand Parliamentary Debates vol. 7*, (Wellington: G. Didsbury, 1870,) 371.
[306] The connection became increasingly concrete as electric communication and faster naval transport shortened the gap between New Zealand and Great Britain. Barnes, 9.
[307] Ultimately, the scheme would borrow a great deal more money, by 1889 the amount rose to 37 million. "Property Assessment Bill," *Parliamentary Debates* (Wellington: G. Didsbury, 1889): 239–240.

Despite increased economic success, many politicians, such as Premier William Fox (1812-1893), feared the colony would be vulnerable without imperial management of foreign affairs and defense. In response, politicians, like Vogel, pushed for New Zealand to act as an agent for British imperialism in the southern Pacific by extending his public works policies to consolidate the Polynesian islands as one Dominion.[308] As this idea met with little approval, Vogel opted for linking New Zealand with other colonies through federalization, a Pacific Federation. In 1883, the Confederation and Annexation Bill gave the government the power to link up with any Pacific island group, not under another power.[309] Besides a small movement to annex Fiji spearheaded by Richard Seddon (1845-1906), New Zealand's "sub-imperialism" only resulted in the establishment of a protectorate of the Cook Islands and Niue.[310] However, arguments for federalization with another Pacific island, Australia, were much more contentious. The colonies shared settler populations, trade, communication networks, and many common interests but New Zealand did not join in the group that in 1901 became the Commonwealth of Australia. In addition to these more locally-concerned federalization initiatives, many New Zealanders were interested in an imperial federation, or the creation of a single state among the colonies of the British Empire. This movement, led by the Imperial Federation League (1884-1893), never solidified and ultimately fell apart.[311]

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[308] He promoted the creation of a joint-stock company, known as the New Zealand and Polynesian Company. Julius Vogel, *Appendix to the House of Representatives* (Wellington: George Didsbury, 1874) A-3, 9–10.

[309] "Confederation and Annexation Act," *New Zealand Herald*, October 8, 1883, 11 (Supplement).

[310] Raewyn Dalziel, "Southern Islands: New Zealand and Polynesia," in Andrew Porter, ed. *The Oxford History of the British Empire: The Nineteenth Century* (London: Oxford University Press, 1999): 591.

[311] When the League first met in 1884 some of the most prominent politicians in Great Britain were in attendance. The organization embodied the hope many British Imperialists had for the future of the Empire. However, conflicting initiatives from each of the colonies only ever made

> The Premier was convinced that New Zealand's only hope lay in being designated in the World's Metropolis by some high-sounding, mouth-filling term. So today, with the gracious consent of the King and his Ministers, our land has become a Dominion, and our people dominionites.[312]

Considering the political and cultural ties the country maintained with Great Britain before and after Dominion Day, New Zealand's transition should not be considered an act of independence or separation from the British Empire but rather a new manifestation of British colonialism. As Canada and Australia adopted their Dominion status, New Zealand politicians, especially Premier Joseph Ward (1856-1930), hoped New Zealand might achieve such as status. Ward wrote to the Colonial Office and proclaimed to the General Assembly that New Zealand had passed the "embryo stage."[313] For many New Zealanders, the change was largely ceremonial and meant little for their daily life. One author in the *Evening Post* argued that "the man in the street has not quite realized the greatness thrust upon him but he is enjoying the excitement."[314] Although many did not see much immediate change, increasingly centralized infrastructure would have real effects on New Zealanders.

Public Works Department

The transition to Dominion represents the political reproduction of British settler colonialism, namely that the ideal New Zealand can only be achieved through the guidance of Pākehā government, industry, and technology. During that transition, the infrastructures

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the organization an exchange for ideas rather than actually enacting political ideas. M. D. Burgess, "Lord Rosebery and the Imperial Federation League, 1884-1893," *New Zealand Journal of History* 13 (1979): 165–181.

[312] "Dominion of New Zealand," *The Feilding Star,* September 26, 1907, 2.

[313] Joseph Ward, "Address in Reply," *Parliamentary Debates* 139 (1907): 305.

[314] "Dominion Day Celebrations in New Zealand: The Proclamation, Festivities in the City, Sights, and Sounds, Message from the King," *Evening Post,* September 26, 1907, 7.

established by the Public Works Department, especially electric power and communication networks, provided the physical framework that facilitated more centralized authority within New Zealand. The idea for a national grid began in the country's earliest public works legislation. As New Zealand continued to favor self-rule policies, the Public Works Department and its antecedents played a critical role in upholding New Zealand's ideas about self-sufficiency and demonstrated its ability to independently operate. In addition to the political alteration of New Zealand's relationship with Great Britain, the three decades after the Treaty of Waitangi saw tumultuous changes on the islands. The country's diverse geography, New Zealand Wars, and poorly run provincial system virtually created two separate countries on the North and South islands.[315] The North Island was ravaged by war due to Māori relocation and the New Zealand Wars, whereas the South Island prospered from increased settlement, gold mining, and pastoral farming. However, in 1870, the gold boom slowed and left room for only long-term mining efforts rather than mass waves of panning. The country's agricultural industry peaked.[316] Despite calls for a separation of the two islands into different states, most agreed that establishing a unified New Zealand was essential for the survival of the colony. In June 1870, Julius Vogel, Colonial Treasurer at the time, pushed the Immigration and Public Works Act of 1870 through

[315] The inequality is perhaps best described by Victorian historian James Anthony Froude's (1818-1894) tour of New Zealand published in *Oceana or England and Her Colonies* (London: Longmans, Green, and Co., 1886): 230–335. The divide has been thoroughly discussed in more recent histories such as James Belich's, *Making Peoples* (Honolulu: University of Hawaii Press, 2001): 437.

[316] Agriculture would again expand rapidly in the 1890s after refrigeration. Peter Holland, Kevin O'Connor, and Alexander Wearing, "Remaking the Grasslands of the Open Country," in Eric Pawson and Tom Brooking, eds. *Environmental Histories of New Zealand* (Oxford: Oxford University Press, 2002): 69.

the General Assembly.[317] Over time the bill set up a system by which the New Zealand government would borrow large sums of money from Britain. The money provided government-subsidized immigration and money for infrastructures such as railroads, telegraph lines, roads, public buildings, and port facilities. This act and the subsequent amendment rejuvenated a war-weary colony. In the context of New Zealand's long history of electrification, the legislation and practices concerning the telegraph provided the foundation for a national grid.

During the mid-nineteenth century, Colonial Office and Public Work's policies signed to regulate the introduction of electric communication and power increasingly granted authority to local political bodies. New Zealand's first piece of legislation concerning electricity was the Electric Telegraph Act of 1865, which gave the colony's General and Provincial governments control over telegraphic communication. The act formed the basis of New Zealand's laws concerning electrification and made the regulation, construction, and maintenance of electric communication equipment a function of the central government. After Vogel's Public Works Act (1870), telegraphic legislation and construction remained under the control of the government. Advocates proposals for electric power, such as mine owners or urban industrialists, gained traction in New Zealand because electric power promised to modernize the country's cities and manufacturing potential. Thus Parliament saw a need for new legislation.[318] In response, Parliament passed the Electric Lines Act of 1884. This law consolidated the preceding laws relating to telegraph and telephone lines and created restrictions involving the use of electric lighting for public places. The next and most important amendments to this law were the

[317] The act was written so that the agreements would conclude the following June. Many of the acts, did not take effect until much later in 1870. "Immigration and Public Works Act," September 12, 1870.
[318] See Chap 1

Municipal Corporations Act of 1886 and its 1887 revisions. This act granted local authorities the right to use water resources to generate electricity and sell it for lighting and motive power. Local authorities, such as town councils like the one in Reefton or mining companies like the Phoenix Mine were given the ability to harness water for electric power production and to sell it. Under the Public Works Department, these legislative actions guided New Zealand's national transition to electric power.

As with many other industrial nations, during the 1890s demand for electric power grew in New Zealand. Lighting accounted for the majority of that demand, but the utility of electric power applied also to public transportation, department store elevators, and factory machinery. The success of the Phoenix Mine and Reefton inspired the development of numerous hydroelectric schemes in New Zealand, such as the Wellington City Corporation (1888), Stratford (1898), and Parihaka Pa (1899).[319] And like the two earlier projects, these schemes relied on municipal or provincial funding. Hydropower proved to be the most successful and widespread of the available options. As discussed in the previous chapter, the success of hydroelectric schemes had to do with geographic availability, but the manipulation of water also lived up to hydroimperialistic ideas about making the country's natural resources profitable. Still, some cities located far from water sources adopted steam or suction gas systems.[320]

While the demand for electric power grew, the national government increasingly found regulation an effective means of maintaining and expanding its influence. As many have noted,

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[319] The Wellington City Corporation Offices were first lit on November 30th, 1888, "Electric Light," *Star,* December 1, 1888, 3; The Stratford Electric Company formed in May 1898 to carry out the town's electrification by water power, "The Electric Light Proposals," *Northern Advocate*, May 21, 1898, 3; After the success of Stratford's electrification, the trustees of Parihaka Pa decided to install public electric lighting. John Martin, *People, Politics, and Power Stations* (Wellington: Electricity Corporation of New Zealand, 1991): 31–32.
[320] Helen Reilly, *Connecting the Country*, 24–25.

governments distance themselves from infrastructures, in an effort to control and organize populations through technological domains that seem separate.[321] By managing infrastructures like electric power systems in New Zealand, Parliament played an active role in the organization of municipal boundaries and regional industries.[322] In 1896, with the passage of the Electrical-Motive-Power Act, the pattern of electrification shifted toward national over regional or municipal power boards. The act stipulated that private enterprises could no longer gain control over of any New Zealand waterway for the production of hydroelectric power, nor could any local body grant permission to generate electric power without government consent, which allowed for the Public Works Department to ultimately decide how to begin developing a large-scale hydroelectric power station.[323]

Lake Coleridge

The construction of the Lake Coleridge power station highlights how the New Zealand government effectively utilized decades of increasing authority for self-government, and capitalized on local desires to be productive and modern to begin building a national grid. In 1883, a passenger train carried 200 passengers from Christchurch to the electric lighting display at Kaiapoi Woollen Mills, which was illuminated by two arcs and sixty incandescent lamps.[324] The spectacle captivated many members of the Christchurch City Council. Over the next decade, the City Council pushed for public electric lighting and power supply, especially with the highly

[321] Technological infrastructures allow for an "apparatus of governmentality." Michel Foucault, *The Birth of Biopolitics: Lectures at the Collége de France, 1978-1979* (New York: Picador, 2010), 70; Brian Larkin, "The Politic and Poetics of Infrastructure," *Annual Review of Anthropology* 42 (2013): 328.
[322] Reilly, 25.
[323] "Electric Motive Power Act," 17th October 1896, 60, no. 47, 149.
[324] "Electric Lighting in the Colonies," *New Zealand Herald*, June 13, 1885, 1 (Supplement); Rosemary Britten, *Lake Coleridge: The Power, the People, The Land* (Christchurch: Hazard Press, 2000): 100–101.

successful reports of electric systems in Reefton and the Phoenix Mine.[325] In addition to the general interest in electric power, they advocated for hydropower which had proven to be an effective solution for increasing settlement and attracting investors around New Zealand. And since the Electro-Motive Power Acts had not been passed, the city remained responsible for the power station. Numerous suitable water sources, such as the Waimakariri River, Rakaia River, Lake Coleridge, and Opihi River, surrounded Christchurch. However, comprehensive surveys of the area for a hydroelectric scheme did not begin until 1899 when the city council contracted Arthur Dudley Dobson (1841-1934), the city surveyor and engineer, to study the potential of the Waimakariri River.[326] This survey marks the beginning of the planning that resulted in the construction of the Lake Coleridge Power Station.

Even before the decision to build a dam in the region was made, excitement among local politicians and residents mounted because the project represented progress for the city of Christchurch and New Zealand itself. Dobson's first survey concluded that the river's width and shingle bed was not suitable for a dam.[327] It was, "Out of the question," with the exception of a single gorge. As was true for many other rivers, including the Inangahua River, Dobson preferred to divert water from higher up the river through channels to a power station at a lower

[325] "Untitled," *Cromwell Argus*, June 29, 1886, 2; "New Zealand Industrial Exhibition," *New Zealand Times*, August 14, 1889, 5.
[326] After moving to New Zealand from London in 1850, on one of the "First Four Ships" to Canterbury. Dobson worked as a surveyor with his father Edward Dobson. During the 1860s and 1870s, Dobson was a provincial engineer and surveyor charting paths to the west coast and exploring the gold fields. He inherited his father's business and moved to Christchurch where he began his work on surveying for hydroelectric schemes. Dobson held a certificate of membership from the Institute of Civil Engineers, London. "The New City Surveyor," *The Press*, December 12, 1900, 2.
[327] Due to the pattern of glacial shifts during the Pleistocene, the river beds of this region formed shingles, deposits of flattened or disk-shaped stones, making the ground extremely unstable. D. M. Calder, "Plant Ecology of Subalpine Shingle River-Beds in Canterbury, New Zealand," *Journal of Ecology* 49, no. 3 (1961): 581–594.

elevation. The report convinced members of the Christchurch City Council to gather information and cost estimates for such a power station. The Swiss firm Escher Wyss of Zurich, who later played a role in supplying material for the dam at Lake Coleridge, offered to supply materials for £3500 with additional expense for the engineers and foremen. [328] Many on the council were keen to begin construction on the scheme and hoped to do so beginning in October 1900, Canterbury's Jubilee year, because it was, "naturally an occasion for erecting some tangible central memorial commemorative of the solid progress accomplished by Canterbury."[329] The construction of a large-scale public work accomplished as much as the power supply because it meant the New Zealand was becoming a modern, self-sufficient state.

Regional politicians stressed that electric power could reshape Christchurch, and New Zealand itself, into a modern manufacturing center, a prospect they hoped would excite, and gain the support of, the local population. One of the most pronounced advocates for such a dam was Thomas Edward Taylor (1862-1911) who claimed the river could make Christchurch the manufacturing capital of New Zealand. For politicians like Taylor, the introduction of electric power highlighted a half-century of "almost magical development" of the city of Christchurch, and indeed New Zealand itself.[330] Later in his article, Taylor titled an entire section, "The Colonies are All Behind," in which he claimed, "New Zealanders are sometimes rash enough to boast of their reforming zeal and general progressiveness in comparison with the Old Country."[331] Despite the introduction of electric power systems in New Zealand, Taylor felt the country was lagging behind Great Britain, the United States, and other European countries in

[328] "A Big Scheme," *Lyttleton Times*, June 11, 1900, 3.
[329] T. E. Taylor, "Harness the Waimakariri," *The Press*, October 27, 1900, 3.
[330] Taylor is more well-known for his opposition to the wars in South Africa, which cost him his seat in Parliament, and prohibitionist politics. Ibid.
[331] Ibid.

constructing electric power infrastructures.[332] He admitted that Christchurch had, "no Niagara" but had, according to Dobson, enough power to replace its current fossil-fueled infrastructure. At this point, advocates like Taylor and Dobson believed that hydroelectric power could be produced more cheaply than natural gas or other sources.[333] In 1900, wrapped up in the excitement of the prospect of the introduction of electric power, Taylor and a group of businessmen founded the New Zealand Electrical Construction Company.[334]

As had happened frequently with the provincial regional governments, the Christchurch City Council could not effectively administer plans to build a large hydroelectric facility. In 1901, Robert Hay (d. 1928) a civil engineer from Dunedin was contracted to further investigate the river.[335] Generally, he agreed with the earlier survey completed by Dobson. Despite the promise of this site, the proposed scheme would cause a significant violation of water rights in Selwyn County, where the proposed gorge for the scheme was located.[336] The construction would lead to blockages and washouts that could potentially devastate the region's agricultural

[332] This is only partially true, especially among the British settler colonies. Complains of falling technologically behind was common almost everywhere in the late-nineteenth century. South Africa did not begin major hydroelectric projects until 1905. Renfrew Christie, *Electricity, Industry, and Class in South Africa* (Albany: State University of New York Press, 1984), 5; Great Britain, Germany, and the United States had completed large-scale hydro projects like Niagara Falls or the Schiffbauerdamm Station by the mid-1890s. However, such projects were not widespread and the small-scale industrial stations common in New Zealand during the 1890s were on the level with most other states. Hughes, *Networks of Power*, 262–264; Rennie, *Power to the People*, 233–234.
[333] "Electricity as a Motive Power," *Timaru Herald*, October 23, 1900, 4.
[334] The company was intended to supply the city with equipment for an electric tramway system but ultimately failed to meet financial and legal requirements. For more, see "Town and Country," *Lyttleton Times*, January 18, 1904, 4.
[335] "The Waimakariri Scheme," *Lyttleton Times*, May 14, 1901, 2; "Loss to Dunedin," *New Zealand Herald*, November 29, 1928, 8.
[336] Selwyn County existed between 1867-1910 when it was divided up into ten smaller counties. The county bordered on the north and west of the Christchurch city limits. "County Merger?" *The Press*, June 11, 1927, 14.

productivity. Ultimately, Hay recommended against the construction of the scheme. The Christchurch City Council and the Selwyn County Council were unable to reach an agreement regarding the project. The frustrations generated by these localized land and water disputes increasingly catalyzed the movement to centralize the implementation of electric power projects, giving responsibility solely to the Public Works Department. Although many remained convinced of the utility of the Waimakariri River, some were willing to seek alternative options. In 1901, Taylor put together another survey of the region, with input from including Dobson, city council members, and journalists, of Lake Coleridge and the Rakaia Gorge.[337] Electric power proponents, like Taylor, thought that Lake Coleridge would still prove just as difficult to build but that the outcome would pay for the hardship and continued to advocate for the Waimakariri River scheme.

Taylor's excitement continued to keep the scheme alive despite the hesitation of the Christchurch City Council. After traveling through Europe touring power stations, he proposed that the city hire a Swiss engineer, Colonel Théodore Turretini (1845-1916), but the city council ignored his proposal.[338] The debate continued into 1902, especially in the aftermath of the proposition of the City of Christchurch Electric Power and Loan Empowering Bill. William Whitehouse Collins (1853-1923) introduced the bill into Parliament in order to grant the city the ability to control and seek out financial assistance with electric light and electric power.[339] The bill sparked debates over financial responsibility for the Waimakariri scheme. Taxpayers in

[337] (The letter is signed "progressive." This likely means it was written by Taylor), "Waimakariri Power Scheme," *Lyttleton Times*, August 1901, 7.
[338] Turretini briefly worked for Edison in the 1880s but returned to Geneva to work on the hydroelectric power stations there. Paquier, Serge, "Turrettini, Théodore", in *Dictionnaire Historique de la Suisse*
[339] This was necessary because of the regulations set forth by the Electro-Motive Power Act (1986)

Christchurch worried that they would pay for everything while the entire region benefitted. Additionally, Selwyn County and the Waimakariri-Ashley Water Supply Board feared a loss of irrigation supply. Eventually, a clause was added to the bill assuring that water would not be taken from the river within a certain distance of the gorge.[340] On November 17th, 1902 the bill successfully passed through Parliament authorizing the city to raise a loan of no more than £250,000 to contract, construct, and maintain a power station on the Waimakariri River.[341] However, there were many who protested the scheme, especially when many engineers had reported the Lake Coleridge proposal was less dangerous.[342] The city council continued to hesitate on finalizing plans for the dam, when the passage of the Water Power Act (1903) complicated their decision further.

Parliament's passage of legislation to control the country's vast water resources represents one of the strongest links between colonialism and hydro-electrification in New Zealand. By controlling water usage for electric power, politicians assured the national government's power over Pākehā and Māori energy interests.[343] The Water Power Act stated, "The sole right to use water in lakes, falls, and rivers or streams for the purpose of generating or

[340] "City of Christchurch Electric Power and Loan Empowering Bill," in *Parliamentary Debates: House of Representatives* (Wellington: John Mackay, 1902), 250.
[341] "Christchurch City Council," *Lyttleton Times,* 22 November 1902, 9.
[342] "Harnessing the Waimakariri," *Lyttleton Times*, August 29, 1902, 5; "Interview with Mr. T. E. Taylor," *The Press*, September 18,1902, 5; "River Eyre Protective Works," *The Press*, November 13, 1902, 5.
[343] While the Water Power Act proved an inconvenience for many Pākehā and Māori farmers dependent on rivers for irrigation. The removal of water rights from the Māori was especially harsh because of the central role of water to Māori cosmogony and community life. Yet another Pākehā tool for trying to create an ideal New Zealand, that does not include Māori culture. This remains a contested Māori rights issue today more in Chapter 4, see also D. Williams, "Ko Aotearoa Tenei: Law and Policy Affecting Māori Culture and Identity," *International Journal of Cultural Property, 20* (2013): 311–331.

storing electricity or other power shall vest in His Majesty."[344] By making water, the primary source of New Zealand's electric power production, a resource exclusively controlled by the national government, this act effectively placed electric power under their control too. For the first time, almost all electric power facilities were controlled by the national government. Even though the city was permitted to construct the Waimakariri power station, the council held back because of the national government's new authority over water resources. Seeking to maximize the country's hydroelectric potential, the New Zealand Government contracted L. M. Hancock, an American electrical engineer, and P.S. Hay, a civil engineering superintendent from the Public Works Department, to report on potential sites. They surveyed the entire country. In Canterbury, Hancock reported, much to the dismay of citizens of Christchurch, that the Waimakariri, "was best left to its own sweet will."[345] Council members and advocates for the scheme, like Taylor, complained that Hancock was an expensive foreigner who could not give the region fair treatment. However, Hannock did suggest that Lake Coleridge showed promise, even though Taylor said Hancock's report, "was not worth the paper it was written on."[346] In 1904, the "Hancock Report" made it clear that Lake Coleridge, not the Waimakariri River, ought to be the national government's priority and begrudgingly the city council relented. Hancock calculated that Lake Coleridge would yield 94,677 horsepower, whereas Waimakariri only promised 20,440. Furthermore, he argued that the area around Lake Coleridge had room for expansion and more favorable terrain. [347]

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[344] Later in the document, the bill declared that the law made an exception for any prior Parliamentary actions granting sovereignty to a province or municipality, such as the Empowerment Act. Water-power Act 1903 (3 EDW VII 1903 No 26).
[345] "Mr. Hancock's Report on Water Power," *New Zealand Herald*, November 1, 1904, 5.
[346] "Christchurch Monopolies," *Lyttleton Times*, May 19, 1905, 3.
[347] "Electrical Energy: New Zealand's Wonderful Possibilities," *The Press*, October 31, 1904, 10.

Despite intense enthusiasm for electricity, the Public Works Department had other priorities that made it necessary for boosters to fight for their projects. Public Works Department funding in the first years of the twentieth century focused primarily on transportation, connecting the islands by increasing the flow of people and materials. Electric power did not receive as much attention because of the previous commitment to connecting the islands by road and rail. Many public works officials believed that trade and transportation would produce unity among the island's citizens and municipalities, particularly the completion of the North Island Main Trunk (1908).[348] The proposed water diversions and scale of a dam at Lake Coleridge, which was projected to cost some £1,200,000, discouraged the Public Works Department from seriously considering the plan, still preferring transportation investment. [349] Ultimately boosters succeeded by promoting the manufacturing potential of electric power.

Christchurch citizens and politicians believed that increased electric supply would help the town, and New Zealand more broadly, to become a model state.

> If the Government installed its power schemes, the profits would go into the consolidated revenue, and would be used to the advantage of the whole dominion… The proper use of water-power would prove to be a source of enormous profit in the near future, and that it would probably rival the railways in regard to the production of wealth.[350]

With expansion to serve Christchurch's manufacturing sector and rising electric power usage for lighting, the City Council argued that either the town or the national government ought to fund a major hydroelectric facility to keep New Zealand's (or Christchurch's) economy expanding. In 1909, the Christchurch City Council decided that expanding demand for electric power could not

[348] Work officially began in 1888 and was completed in 1908. The line is 680 kilometers long and was a feat of engineering for New Zealand at the turn of the century. Bill Pierre, *The North Island Main* Trunk (Wellington: Reed, 1981), 289–290.
[349] The Clarence and Rakaia were the two major rivers considered.
[350] "Power for Christchurch," *Star*, January 13, 1910, 1.

be met by the town's existing steam plants. The New Zealand Government had not broadened its regulation of electric power since 1903 when the Water Power Act had been signed. The Waimakariri River scheme was reconsidered and quickly dismissed because of the same water rights concerns as were raised earlier.[351] Considering all possible alternatives, they even unsuccessfully petitioned to build a city-run power station on Lake Coleridge. After the petition failed the mayor Charles Allison (1846-1920) began urging the government, specifically the Minister of Public Works, Roderick McKenzie (1852-1934), to fund a power station at Lake Coleridge. He claimed that "without electricity, Christchurch will lose its status as a manufacturing city."[352] The Canterbury region, with Christchurch as a center for distribution, had long been the South Island's major agricultural producer of seed, wheat, wool, and meat. Since the introduction of refrigeration technology, companies such as the Canterbury Frozen Meat and Dairy Produce Export Company were major components of the Christchurch economy.[353] Additionally, the town hosted numerous port-related businesses, metal processing factories, and engineering firms. At the turn of the century, Christchurch politicians competed with other cities, such as Wellington and Auckland to expand its importance and attract a large labor pool.[354] Increasingly, electricity was needed to keep and attract businesses to Christchurch. In response to Allison, McKenzie felt that the government was obligated to supply electric power to the city but believed the expense prohibitive.

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[351] "Water Power," *Lyttleton Times*, February 4, 1909, 9.
[352] "State Water Power," *Lyttleton Times*, August 24, 1910, 7.
[353] Belich, *Paradise Reforged*, 61.
[354] In 1901, Wellington had 141,354 and Auckland had 175,938. "Population and Dwellings in Provincial Districts," Statistics New Zealand Digitized Collection. Last Accessed June 11, 2018, https://www3.stats.govt.nz/historic_publications/1901-census/1901-results-census/1901-results-census.html?_ga=2.17981695.776511255.1528752484-1760458550.1528752484#d50e6396

Profit and the potential of manufacture continued to drive Christchurch's and Parliament's interest in constructing a state-funded and regulated power station. Finally, in 1910, Lawrence Birks (1874-1924), an Australian electrical engineer, and lead engineer of the Tourist Department in Rotorua submitted a report on the hydroelectric potential of the Lake Coleridge and Hutt River schemes to the New Zealand government.[355] Another report written by R. W. Holmes, chief engineer of the Public Works Department, supported Birks' and came to similar conclusions as to the benefits of Lake Coleridge, much as Hancock's report had done. After years of resisting, Taylor agreed to drop his promotion of the Waimakariri River scheme in favor of Lake Coleridge.[356] Even though they initially feared the excessive cost, the Government passed the Aid to Water Power Works Act (1910) so that money could be raised to credit the Public Works Fund for hydroelectric power and irrigation.[357] Mackenzie did not offer an explicit explanation for the change in Public Works policy. However, local papers argued that the success of other major hydro projects in America, Canada and Switzerland had supported impressive industrial results, and suggested the same would be true for New Zealand.[358] Thus Christchurch became the primary focus in New Zealand for implementing state-funded electrification.

Despite the implementation of policies that removed legislative barriers to large-scale construction, building the power station continued to challenge the commitment to electrification. The Public Works Act (1908) made it possible for the New Zealand Government

[355] John E. Martin, "Birks, Lawrence," *Te Ara: Encyclopedia of New Zealand* Last Accessed June 11, 2018, https://teara.govt.nz/en/biographies/3b34/birks-lawrence
[356] "The Lake Coleridge Hydroelectric Scheme," *The Press*, December 3, 1910, 10.
[357] "Aid to Water Power Works Act," November 21, 1910.
[358] "Water Power," *Bush Advocate* November 19, 1910, 4.

to purchase the land needed for the Lake Coleridge Power Station.[359] On November 4, 1910, the official Public Works survey began, and construction projects followed with major building beginning the following year. Prior to this venture, the Lake Coleridge region had been open farmland with little activity. After 1910, the area played home to more settlers, machinery, and construction than ever. Before building could begin, the ground had to be tested for strength and waterproofing, a holding tank, or surge chamber was needed to reroute water. Builders constructed two tram lines to transport water up the Rakaia River and remove soil. In continuing with the Public Works Department's transportation mission, F.W. Furkert (1876-1949) surveyed and build roads between the station and Coalgate, the nearest railway head, so that tractors, "Furkert's Motor Cars," could easily move material to the station.[360] Tractors, traction engines, and horse-drawn wagons moved material between 1910-1914.

Throughout the dam's construction, the project required more funding and political maneuvering than expected. Although earlier portrayals of the area as perfect for a large power station excited the city council and Public Works Department, the miserable working conditions, unknown geological barriers, and discontented workers proved otherwise.[361] Despite these difficulties, the Public Works Department maintained that such a work could only be handled by a central governing body, so the department became increasingly involved in the dam's construction. The supervising engineer, F. T. M. Kissel, began constructing a "town" for the

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[359] The Act was an amendment to the first Public Works Act (1864). The 1908 amendment has proven extremely problematic throughout the 20th and 21st century because it has granted the government ill-defined powers in land acquisition which has disproportionately chosen to take Māori land as they had to be compensated at a lower rate.

[360] Frederick William Furkert CMG was a New Zealand engineer. He joined the Public Works Department in 1894 and was engineer-in-chief of the PWD for twelve years from 1920 until he retired in 1933. (IPENZ)
Windmill at Coalgate for cooling tractor engines with water pumped from a pond.

[361] "Strike at Lake Coleridge," *West Coast Times,* September 24, 1912, 3.

laborers and future workers for the power station, even moving his own family there.[362] The town first consisted of eight cottages built to manage the tough conditions, namely fierce wind and rain, in tents. Kissel replaced G. S. Bogel who had been one of the first engineers on the 1910 survey.[363] Throughout the construction process, Kissel and his crew were frequently stalled by miscommunication and delay in material delivery on the part of the Public Works Office in Christchurch. Word spread that work was available and laborers flocked to Lake Coleridge. Besides the prospect of a new manufacturing center in Christchurch, the scale of the dam brought a sizable population to the region, some 4,000 between 1906-1911, to the region and boosted the economy.[364] Even as they made progress on the tunnels, buildings, and pipelines work frequently stalled due to harsh weather and miserable work conditions. One of the workers, James Ryan, claimed that "these were the worst conditions he had ever known."[365] In addition to these personal grievances, other workers took issue with the safety of the equipment and speed of

[362] Eventually, the town was called Kisselton. "Lake Coleridge," *Star*, November 4, 1912, 4; Some locals did not appreciate the name being suggested by outsiders. One of the inhabitants thought the locals especially the Murchison's ought to have a say. Mountain Lily "Letter the Editor: Lake Coleridge Township," *The Press*, June 1, 1912, 14.
[363] "Electric Power," *Lyttleton Times*, November 15, 1910, 9; "Hydroelectricity," *Lyttleton Times*, January 17, 1911, 7.
[364] I could not find exact census data for the workers at Kisselton. Instead, I used census data for the Canterbury region at the beginning of the Lake Coleridge project. Other major regions such as Wellington and Auckland only grew by 1,000-2,000 before 1911, whereas Canterbury grew much more rapidly. This likely due to both the expansion of Christchurch and the influx of labors for the dam. New Zealand Census, Statistics New Zealand, Last Accessed March 18, 2019, https://www3.stats.govt.nz/historic_publications/1911-census/1911-results-census.html?_ga=2.89543891.939482789.1552937376-659471187.1552436752
[365] Besides the working conditions, Ryan and other worker interviewed for this article express their discontent with the living conditions as well. Part of this discontent stemmed from the unequal treatment of laborers and other Public Works Department members who got to live more comfortably. According to them, the rate for food and board was outrageously high. "Miners Complain," *New Zealand Times*, July 12, 1912, 8.

construction. As a result, the Canterbury General Laborers' Union formed to renegotiate wages and contracts between contracted companies and the Public Works Department.

As had been the case with many colonial projects before, New Zealand's terrain proved troublesome, so electric power boosters argued that centralized authority and modern technology would fix the problems. In 1913, under the direction of Lawrence Birks, the Public Works Department had to take over the work to make regulation easier. After the takeover many supporters believed construction would stop halting, saying things like all work, " is likely to go better now."[366] The power station was the first to be constructed on a glacial moraine.[367] This loose gravel made construction difficult because of the deep foundation that had to be concrete, a temporary solution that plagued the power station throughout the twentieth century.[368]

In early 1914 as construction neared completion, negotiations concerning the cost of electricity demonstrated that the Public Works office and city council were willing to forgive prior difficulties because of the economic potential of hydropower.[369] All that remained was to finish the tunnel and pipelines, construct the powerhouse, and connect the switchboard. Posts and wires had already been erected through most of the 85-mile distance to Christchurch, where

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366 "Lake Coleridge Notes," *Press*, February 21, 1913, 9.

367 A glacial moraine is the accumulation of settlement formed by the movement of glaciers. The "glacial debris" left behind is usually rounded gravel ranging in size from boulder to small silt particles.

368 Coincidentally, the construction and experimentation on the area around Lake Coleridge provided many geologists with the opportunity to observe the effects of glaciation on the land and resulted in a number of studies over the next few decades as construction continued. "Glaciation at Lake Coleridge," *Star*, September 4, 1913, 1; R. Speight, "Ice Wasting and Glacier Retreat," *Journal of Geomorphology* 3 (1940): 131–141.

369 "Lake Coleridge Explored," *Sun*, April 4, 1914, 14 The Citizens' Association, was a right-leaning local body electoral ticket in Wellington, New Zealand. It was formed in 1911 by merging the selection process of council candidates of several civic interest groups and business lobby groups. They were one of the first groups to tour the facility. Peter Frank and Jim McAloon, *Labour: The New Zealand Labour Party 1916–2016* (Wellington: Victoria University Press, 2016).

citizens eagerly awaited increased access to lighting and manufacturing jobs. By July, the six major sections of the dam – the tunnel, the pipeline, the powerhouse, the transmission lines, the Addington substation, and the Christchurch City Council's plant – had been completed.[370] The power station generated 66,000 volts which were transformed at Addington to 11,400 volts for distribution. Earlier in 1914, the Public Works Department and the City Council negotiated and agreed that the city would take a minimum of 500kW, and the city agreed to supply 4500 kW. Escher Wyss, the Swiss firm mentioned earlier supplied the three 1500 kW generators. The council agreed to pay £8 per kilowatt for the first 300kW and £5 for every kilowatt in excess of 300kW in quarterly installments.[371] Years later, Birks used this cost comparison as an example of the virtue of hydroelectricity when he classified it as "poor man's light."[372]

> Under the present rates electricity in the house has been found decidedly cheap, and when the Lake Coleridge scheme comes into force the expense will be much less.[373]

For consumers and the politicians that advocated for the dam affordability drove interest in the completion of the Lake Coleridge dam. They believed that the cheaper energy promised by the council and engineers would turn Christchurch into a modern manufacturing city. In almost every positive article about the Lake Coleridge Power Station, authors emphasized the cost benefits of electric power, namely that it would be cheaper than natural gas, and get cheaper as more subscribers took advantage. Even though the city council eventually agreed to these rates, they feared that local companies might circumvent the city and purchase power directly from the Government. In order to address these concerns, the City Council and the Minister of Public

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[370] "The City's Electricity, Progress of the Great Scheme from the Lake to the Citizen's Home," *Lyttleton Times*, July 14, 1914, 15.
[371] "Lake Coleridge Current," *Press*, October 21, 1914, 2.
[372] "The White Coal: A Visit to Lake Coleridge," *Manawatu Times*, November 29, 1917, 6.
[373] "Cheap Current: The Lake Coleridge Power," *Press*, July 10, 1913, 5.

Works, William Fraser (1840-1923), arranged a meeting. On March 5th, 1914, at the meeting Fraser stated:

> The Government had sunk a lot of money in the Lake Coleridge Scheme and was anxious to it a commercial success, but it would not make both a wholesale and retail profit.[374]

However, he also acknowledged that while he did not wish to compete with the City Council, local bodies could not control the Government if in the future they elected to negotiate other parties. World War I and the resulting material shortages marred the early years of the dam's operation and reminded New Zealander's of their military connection to a much larger Empire. One paper even claimed, "Wars and rumors of wars have interfered with the progress of the Lake Coleridge Scheme."[375] Still, the opening of the station excited Pākehā about the potential economic growth and visions of self-sufficiency attached to the introduction of electric power.

> The City of Christchurch has never been repaid the preliminary expenses which were incurred; and seeing that that body really inaugurated the idea of hydro-electric power in New Zealand, and as the scheme has proved a blessing and a gold-producer, I think the National Government should, at any rate, repay the City Council of Christchurch.[376]

Despite the remaining tensions over the initial investments in surveying and material between the City of Christchurch and the Public Works Department, Lake Coleridge proved the effectiveness of the Public Works Department and national government in the construction and operation of a hydroelectric scheme. At the time, such a success was necessary given increasing frustration across the island over increasing national-government incursion on regional water rights, especially at the Waihi Gold Mine which was having difficulty building their own

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[374] "Lake Coleridge: The Supply of Power is the Government a Competitor," *Lyttleton Times*, March 5, 1914, 3.
[375] "Light and Power: Lake Coleridge Scheme," *Sun*, September 11, 1914, 8.
[376] Henry Thomas Joynt Thacker (1820-1939) member of Parliament and Mayor of Christchurch, "State Supply of Electrical Energy Bill," *Parliamentary Debates* 181, October 24 (1917): 408.

hydroelectric dam.[377] Soon after Christchurch, Lake Coleridge began supplying power to nearby Lyttleton Harbor and Tai Tapu. Excitement swept the region as more people waited, sometimes impatiently, to be connected to the grid.

Conclusion

> The important fact is that with the practical completion of the Lake Coleridge installation New Zealand is fairly entered upon an undertaking that is going to benefit Canterbury enormously in the immediate future, and that may revolutionise the industries of the Dominion with the next quarter century.[378]

After the completion of the dam, Pākehā politicians and consumers, heralded the power station as a turning point for the Dominion, echoing the rhetoric of self-sufficiency used to bolster support for Reefton and the Phoenix Mine. In a speech during the opening ceremony, Prime Minister Rhodes (1861-1956), referenced new hydroelectric projects, the Waihi and Whangarei schemes, proclaimed, “that in time to come the whole of the power required in the Dominion would be generated by the current generated in the streams and rivers of the country."[379] Furthermore, they celebrated New Zealand's "endless supply," which had, thanks to the political maneuvering a decade earlier, come under the control of the State.

> The late Mr. Seddon, with his far-seeing statesmanship made the abundant water power of New Zealand a State monopoly, and when the turbines begin to spin at Lake Coleridge the people of this country will appreciate the significance of that step to a land that possesses practically unlimited supplies of the “white coal.”[380]

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[377] Reilly, 35.
[378] “Lake Coleridge,” *Lyttleton Times*, November 26, 1914, 6.
[379] “City’s Electricity,” *Star*, November 26, 1914, 8.
[380] This is an excerpt from the same article quoted earlier. During the nineteenth and early twentieth century, hydropower advocates frequently referred to waterways with the potential of hydroelectric generation as "white coal," not to be confused with the white coal that refers to charcoal made by the drying of wood also referred to as white coal. "Lake Coleridge," *Lyttleton Times*, November 26, 1914, 6; Thomas Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Baltimore: John Hopkins University Press, 1983), 292.

The Dominion movement, the formation of the Public Works Department, and the orchestration of the hydroelectric works at Lake Coleridge reinforced British settler colonialism and underlines the imperial practices embedded in New Zealand's national grid. Much like other late-nineteenth-century technological infrastructures such as the telegraphs and railroads, electric power systems justified the increasing number of calls for local governance. New Zealand, perhaps most among the settler colonies, strived to achieve self-sufficiency at the end of the nineteenth century. A large-scale nationally funded electric grid promised to increase the productive capabilities of Christchurch and subsidiary communities. Furthermore, it demonstrated to New Zealanders and Great Britain that the young Dominion's ability to complete national-scale projects. However, Lake Coleridge was not an outcome of New Zealand's newly gained independence, rather it is the product of more than half-century of colonial policies aimed at creating a self-sustaining and productive British population in the Pacific.

Chapter 4:

Another World is Possible: Geothermal Power and Decolonization

Introduction

"Another World is Possible"

–World Social Forum (2001)[381]

Currently, hydroelectricity contributes to 61% of New Zealand's electric power production. The remainder is 12% natural gas, 6% wind power, 3% biomass, and 17% geothermal.[382] Beginning in the 1950s, New Zealand expanded its geothermal sector and became a global leader in developing the associated technologies. The Taupo Volcanic Zone (TVZ) is one of the most active geothermal sites in the world. Today, New Zealander's cite the recent success of the country's geothermal energy to promote climate change awareness, environmental preservation, and sustainability. Unlike the electrical enterprises at Reefton, the Phoenix Mine, or Lake Coleridge, many of the country's geothermal power stations are rooted in ethical energy practices based in Māori culture. Māori investment, persistence, and environmental world view in reclaiming Aotearoa's resources, such as those at the Mokai Geothermal Fields, have worked to decolonize New Zealand's electric power infrastructure.[383] The Tuaropaki Power Company's investment in geothermal energy, sustainable farming, and social justice represent an active refutation of the colonial practices of early electric power systems in New Zealand, namely that

[381] The World Social Forum is a collection of civil society organizations, NGO's, and activists first held in Brazil in 2001. Their primary function is to promote international solidarity on social justice issues, disincentivize neoliberal agendas, and counter hegemonic global systems.
[382] New Zealand maintains one of the largest geothermal power infrastructures in the world. Adele Manzella, Agnes Allansdottir, and Anna Pellizzone eds., *Geothermal Energy and Society* (Cham, Switzerland: Springer, 2019), 194.
[383] Aotearoa is the Māori term for the islands of New Zealand. At first, the term referred only to the northern island. The exact origin of the term remains unknown.

electric power be controlled by the central government and used to extract New Zealand's resources without environmental consideration.

Histories of British colonialism and electrification in New Zealand are guilty of highlighting electrification as primarily a Pākehā success.[384] The majority of electrical history, in New Zealand and elsewhere, presents electrical technologies and the requisite knowledge to electrify as primarily Western technological diffusion.[385] Such perspectives on electrification privilege the success and dominance of colonizers while also in some cases implying the necessity of colonialism for making it happen. For Pākehā settlers, miners, and politicians electric power provided the means to exploit the frontier, efficiently distribute resources, and facilitate the creation of a modern state – in other words, meet the promises of British colonialism. What has been less studied is how, in the latter half of the twentieth century, Māori built electric power production facilities and used that power as a way to decolonize New Zealand, reclaim land, and protect their heritage, environment, and future.[386] Because of the lack of documentation, Māori rarely if ever appear in the history of New Zealand's electrification. However, when they do appear, it is often as passive victims of Pākehā colonization. Even though Māori narratives in Reefton, Bullendale, and Lake Coleridge convey tales of removal,

[384] In an effort to highlight Māori culture, Māori language terms will be used throughout this chapter when appropriate. See Māori lexicon in the introduction.
[385] Neil Rennie, *Power to the People: 100 Years of Public Electricity Supply in New Zealand* (Wellington: Electricity Supply Association of New Zealand, 1987); John Martin, *People, Politics and Power Stations: Electric Power Generation in New Zealand, 1880-1990* (Wellington: Bridget Williams Books and the Electricity Corporation of New Zealand, 1991); Helen Reilly, *Connecting the Country: New Zealand's National Grid, 1887-2007* (Wellington: Steele Roberts, 2008).
[386] Decolonization research must be broadly defined and read from the perspective of the colonized in order to see how they see themselves as active in decolonization. Linda Tuhiwai Smith, *Decolonizing Methodologies: Research and Indigenous People* (New York: Palgrave, 2013), 124.

absence, and conformity to Anglo-settler requirements, Māori played a far from passive role in the colonial projects that built Reefton and the Phoenix Mine through trade and land negotiations.[387] At the same time, both in the nineteenth and twentieth centuries, Māori facilitated New Zealand's decolonization. As recent historians have emphasized, Māori and Pākehā Māori built New Zealand together.[388] They both participated in the World Wars, defined New Zealander culture, and design, build and use New Zealand's electric power systems.[389] At Lake Coleridge, Māori set up the agricultural industries and trading posts that helped establish Christchurch as an urban center.[390] Unfortunately, the historical record obscures Māori contributions to New Zealand's growth during the late nineteenth century, such as their role in the first state-run power system. Despite this, Māori were users and designers that participated in the electrification of New Zealand. To decolonize the history of New Zealand's electrification requires giving due attention to Māori actors and highlighting their narratives whenever possible.

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[387] Many of the larger histories of electrification in New Zealand spend little time addressing the Māori role in the country's electrification. Many Māori took out mining licenses and panned for gold during the rushes and lived in mining communities. Atholl Anderson, Judith Binney, Aroha Harris, *Tangata Whenua: A History* (Wellington: Bridget Williams Books, 2015), 226.
[388] Vincent O'Malley, *The Meeting Place: Māori and Pākehā Encounters, 1642-1840* (Auckland: Auckland University Press, 2012), 227.

[389] This is not meant to oversimplify the long and tragic history of cultural erasure by Pākehā and Māori bicultural movements. Many Māori continue to resent and resist the invasion of Aotearoa. At the same time, many Māori identified and continue to identify as New Zealanders. Both World Wars resulted in a greater sense of belonging for some Māori because the government returned and granted them new lands. M. Durie, "*Te Hoe Nuku Roa* Framework: A Māori Identity Measure," *Journal of the Polynesian Society* 104 (1995): 461-470; Alistair Te Ariki Campbell, *Māori Battalion: A Poetic Sequence* (Wellington: Wai-te-ata Press, 2001); Gould, A., "From Taiaha to Ko: Repatriation and Land Settlement for Māori Soldiers in New Zealand after the First World War," *War and Society* 45, no. 2 (2009), 49–84; Houkamau, C. A., Sibley, C. G., Overall, N., Pomare, P., Rickard, S., & Wolfgramm, R. "The Multi-Dimensional Model of Māori Identity and Cultural Engagement," *New Zealand Journal of Psychology* 39, no. 1 (2010): 8-21.

[390]O'Malley, 288.

Pākehā used electrical infrastructures to facilitate their settlement of the frontier, expand their extractive industries, and legitimize a national government. How then do we rewrite the history to understand their role beyond victimization? The answer is to pay attention to the ways that Māori themselves have used electricity in the service of decolonization.

Māori utilization of Land Trusts and their environmentally-conscious production of electric power provides a space to explore the role of electrification in decolonization and to explore the legacy of colonialism in New Zealand's infrastructures. From the beginning of New Zealand's transition to electric power, Pākehā designed and used electric power systems in service to their colonial mission to build the model British colony. They integrated electrification into colonial processes, such as communication, transportation, and resource extraction. Although such operations were designed to enhance New Zealand's self-sufficiency, they were also clearly intended to establish the dominance of British settlers over the Māori. If we look at the early stages of electrification in New Zealand according to newspapers and Parliamentary records, only Pākehā successes like lighting, mining, power supply, and trams, are visible to readers because each of those projects was established in service to the colonial mission. Following the success of Lake Coleridge, New Zealand's electric grid expanded across *Te Waipounamu* (Southern Island) and *Te Ika-a-Māui* (Northern Island).[391] For the most part, hydroelectric dams remained the favorite method of electric power production. During the 1970s, natural gas-fired power stations, namely those at New Plymouth and Huntly, marked an increase in the country's dependence on an expansive electric grid that could meet the country's growing

[391] The Māori names for the Southern Island and northern island respectively.

energy needs.[392] The government, and eventually the corporatized Electricity Corporation of New Zealand (ECNZ), continued to market electricity as a means of expanding New Zealand's economy, enlarging urban spaces, and maintaining its Pākehā population. In reaction to this pattern of electrification, particularly after the expansion of natural gas-fired stations, Māori Trusts engaged in technopolitical legislation to create an energy policy that served Māori peoples and accords with their sense of proper land use. Even as Pākehā used electricity to construct colonialism, it was also used as a powerful tool to deconstruct colonial power. Māori leaders and business owners, particularly the Tuaropaki Trust, used, and continues to expand, geothermal electric power production to reclaim *Tino rangatiratanga* (absolute sovereignty), establish a diverse Māori economy, and develop a sustainable energy future for New Zealand.[393] Thus the full story of New Zealand's energy transition is one with an inescapable colonial legacy, although electricity itself is by no means intrinsically hegemonic.

Methodology and Historiography

[392] In 1974, the 600 MW New Plymouth Power Station began generating power. At first, the station was designed to be powered by coal from the West Coast but the discovery of the Maui gas field, near Taranaki, encouraged the designers to build a heavy oil/natural gas-powered system. It was the country's first oil-fired station and while it has received criticism for environmental degradation, the plant helped bolster the country's power supply during dry years. The Huntly Power Station was built following the success of the New Plymouth station. It remains the country's largest natural gas power plant. Rennie, 77, 194; Reilly, 310, 319.

[393] A Māori language term that, after the signing of the Treaty of Waitangi (1840) has come to refer to "absolute sovereignty." Literally, *tino* is an intensifier that means highest or great, whereas *ranhatira* means chief. *Tanga* is attached to words to denote the abstract and qualities of the term. The term is used in Article 1 of the Treaty and promises that the chiefs ceding *kawanatanga* (governorship). My use of diverse economy here borrows from economists Gibson-Graham and argues that the local economies of the Māori geothermal works are not mere emulations of traditional capitalism, but a more powerful expression of Māori power.

The sources and material used to complete this chapter rely largely on non-Māori sources and authors, although I consult Māori scholars and oral histories, as well as research in indigenous studies.[394] By exploring the significance of the Tuaropaki Power Company, I intend to critique the absence and active removal of Māori from the history of electrification and encourage others to grant Māori a place in energy history. This research must be approached using *Kaupapa Māori*, an ontological base that asserts an understanding of New Zealand's history as a partnership between the Pākehā and Māori.[395] In order to navigate this tenuous partnership, my scholarship emulates the practices of Linda Tuhiwai Smith and Graham Smith by adopting a model of culturally appropriate research, the "Empowering Outcomes Model" aimed at producing research that serves the Māori people. Specifically, this encourages research practices to be structured in a way that allows indigenous peoples' concerns to guide the process and works to make the study bicultural.[396]

To more fairly and accurately report on the ways indigenous peoples understand the natural world, social scientists have often looked to indigenous language. In this way they hope to avoid using Western categories (like "resource management") which may be inappropriate or

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[394] Merata Kawharu, "Kaitiakitanga: A Māori Anthropological Perspective of the Māori Socio-Environmental Ethic of Resource Management," *The Journal of the Polynesian Society* 109, no. 4 (2000): 349-370; David Christopher Young and Grid Heritage, *Māori Linemen Oral History Project,* 2007-2008; Linda Tuhiwai Smith (Ngati Awa and Ngati Porou), *Decolonizing Methodologies: Research and Indigenous Peoples 2nd edition* (London: Zed Books, 2012).
[395] Most Kaupapa Māori scholars have incorporated interviews into their work. As this work expands, I hope to conduct interviews and expand the number of voices in this narrative. While initially developed using Western research models Kaupapa Māori has come to be the most widely practiced research concept in Māori history and sociology. Bishop, R. (1994), 'Initiating Empowering Research?', *New Zealand Journal of Educational Studies*, Vol. 29, No. 1, pp. 175–88; Pihama, L. (2001). Tihei mauriora, Honouring our voices, Manawahine as a Kaupapa Māori theoretical framework. Unpublished doctoral dissertation. The University of Auckland, New Zealand; Jo Mane, "Kaupapa Māori: A Community Approach," *MAI Review* 3 (2009): 1-9.
[396] *Decolonizing Methodologies*, 292.

fail to capture the complexity of indigenous belief systems. In New Zealand's environmental legislation and energy policy many have adopted the Māori term of *kaitiakitanga,* which has come to mean "guardianship" in New Zealand's legislation and energy policy. Currently, politicians, energy policymakers, and activists, both Pākehā and Māori, use the term in environmental discourse aimed at conservation and sustainability. Yet, I will not adopt the term, because of the difficulties of translation involved, even though the Tuaropaki Power Company has adopted a mission to protect the country's resources and the Māori people. The use of the term may cause more problems than it solves. Merata Kawhuru and others argue that the term should not be literally translated as guardianship nor be limited in scope to the preservation of the environment.[397] As part of Waitangi Tribunal and growing recognition of Māori culture by the state in the 1970s and 1980s, the term entered public discourse as a means of promoting intercultural cooperation. On the one hand, the term has played a positive role in the country's environmental legislation, especially the Resource Management Act (1991), which effectively brought all of New Zealand's resource-use regimes under one administration that operated under the principle of sustainability.[398] On the other hand, this usage does not represent the breadth of meaning of the term within Māori cosmogony. Māori interpretations of kaitiakitanga weave through the relationship between human, material, and non-material elements, not just ideas about resource management or production.[399] In addition, different iwi don't necessarily share a

[397] Merata Kawharu, "Kaitiakitanga: A Māori Anthropological Perspective of the Māori Socio-Environmental Ethic of Resource Management," *The Journal of the Polynesian Society* 109, no. 4: 349.
[398] Ian A. Thain, "Impact of the Resource Management Act on Future Geothermal Development in New Zealand," *Geothermics* 21, no. 5-6 (1992): 991-1000.
[399] Mere Roberts, Waerete Norman, Nganeko Minhinnick, Del Wihongi, and Carmen Kirkwood, "Kaitiakitanga: Māori Perspectives on Conservation," *Pacific Conservation Biology* 2, no. 1 (1995): 7-20.

clear definition; using it further disenfranchises some of the many cultures that make up the Māori. It is beyond the scope of this chapter to explore the expansive and changing meanings of the term. Rather than add to the uncritical usage which threatens to over-simplify how Māori understand and improve the world, I will work to explain as clearly as possible in conventional language what the Māori respect and aim for in their geothermal project.

Inquiring seriously into Māori role in history requires careful treatment of the limited historical sources, and recognition of the ways that Māori have at times been left of the historical record. Much of the textual post-invasion Māori history covered in this chapter comes from legal documentation concerning land. Some information about recent Māori history is unavailable because of the Māori decision to keep it private. There are very few sources on the Māori and electrification prior to 1900. One of the most insightful histories of the Māori and electrification is an oral history project. In 2008, David Christopher Young conducted interviews with Māori linemen with financial support from Grid Heritage, a historical society dedicated to preserving the history of New Zealand's electric power grid. During the 1940s and 1950s, Māori men were among the many New Zealander's recruited to build and update the electric grid on *Te Waipounamu* (Southern Island) and *Te Ika-a-Māui* (Northern Island). The interviewees, such as Pat Toi and Bill Hiku, fondly remember the camaraderie between the workers, which include Māori and immigrants from the Netherlands, Poland, and Ireland. They were among the 5,000 workers that built *Te Ika-a-Māui's* first 220 kV transmission line and connected the islands creating a true national grid.[400] Much as with early Pākehā and Māori exchange, the electric grid

[400] I was unable to contact Grid Heritage to obtain permission to use direct quotes from the interviews and they are only accessible at the National Library in Wellington. Furthermore, many of the interviews are no longer alive and obtain permission from them directly was not possible. However, I hope to return and connect more directly with Grid Heritage and other

was a middle ground where both met to establish a system of exchange. Before moving to the history of the Tuaropaki Power Company, it is worth considering the colonial policies that ostracized Māori following the Treaty of Waitangi in 1840.

The Māori and Colonialism

In order to understand the role the Tuaropaki Power Company played (and continues to play) in Māori efforts to decolonize New Zealand, further detail about the longer history of the relationship between Māori and Pākehā is useful. Following the signing of the Treaty of Waitangi (1840), many Māori lost control of the land they owned through purchase, unfair land deals, and outright seizure in the aftermath of the New Zealand Wars (1845-1872).[401] Much of the acquisition took place through the enactment and amending of the Native Lands Act (1862), which also established the Native Land Court.[402] These laws were passed as a measure to individualize Māori land tenure in keeping with English Common Law. Traditionally, Māori land tenure was communal, therefore such legislation fragmented Māori authority as much as it fragmented their land ownership. In many land acquisition cases, the New Zealand Government

agencies, so that I may use the full interviews. Still, I am able to summarize the interviews because each had an accurate transcription. Reilly,119-120; David Christopher Young and Grid Heritage, "Interviews Abstracts," *Māori Linemen Oral History Project,* 2007-2008.

[401] Atholl Anderson, Judith Binney, and Aroha Harris, *Tangata Whenua: A History* (Wellington: Bridget Williams Books, 2015), 262.

[402] The Native Land Court is now known as the Māori Land Court, the name was changed in 1954. In 1993, as part of larger Waitangi Tribunal reforms, the Te Ture Whenua Māori Act granted the body authority permission to hear and resolve matters pertaining to Māori land. The Native Lands Act, while still manipulative of Māori practices of land tenure, did represent an experiment in land tenure in the British Empire and was unique to New Zealand. Richard Boast, *Buying the Land, Selling the Land: Government and Māori Land in the North Island 1865-1921* (Wellington: Victoria University Press, 2008), 41-42.

spurned the Treaty.[403] In 1877, for instance, during *Wi Parata v Bishop of Wellington* Chief Justice Sir James Prendergast (1826-1921) ruled that land claims made by the Ngāti Toa against the Anglican Church were a, "simple nullity."[404] Though some Māori political and social movements gained power during the late nineteenth and early twentieth centuries, the New Zealand Parliament and Colonial Office did little to negotiate meaningfully with them. Despite Māori efforts to participate in New Zealand politics, such as the inclusion of Māori representatives in Parliament, the Pākehā government continued to inhibit their political influence. For instance, they forced Māori to deal directly with the Crown through appeals and petitions, rather than being able to directly purchase land or negotiate with local offices or amongst themselves. In spite of such barriers, Māori found ways to increase their involvement in New Zealand politics.[405]

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[403] In this case, the New Zealand Government refers to the colonial office in London, the General Assembly in New Zealand, and the courts in New Zealand. As demonstrated in the previous chapter, the New Zealand General Assembly and provincial governments were given a great deal of authority during this period, but the Crown still had a hand in much of the day-to-day operation of the colonial. André Brett, *Acknowledge No Frontier: The Creation and Demise of New Zealand's Provinces, 1853*-1876 (Dunedin: Otago University Press, 2016),14-15.

[404] This short quote is representative of a general attitude toward Māori sovereignty during the late-nineteenth century, not a condemnation of Prendergast. In Waitangi legal scholarship, critical, and much more detailed, evaluation of this case worked to establish the necessity for Waitangi Tribunal Reform, in particular, the extension of claims dating back to the 1840s. Grant Morris, "James Prendergast and the Treaty of Waitangi: Judicial Attitudes to the Treat During the Latter Half of the Nineteenth Century," *Victoria University of Wellington Law Review* 35, no. 1 (2004): http://www.austlii.edu.au/nz/journals/VUWLawRw/2004/4.html

[405] One of the most prominent of these movements was the Kīngitanga Movement or the Māori King Movement. In the 1850s, many *iwi* gathered on the North Island, after being forced to gather for the increasing warfare, and chose a representative to appeal to the Queen. Also significant in this period was the formation of the Kauhanganui, Māori Parliament, and Waikato Tainui Parliament. Rangunui Walker, *Ka whawhai tonu mātou: Struggle without End* (Auckland: Penguin, 1990), 112-113.

As they continued to lose land during the nineteenth century, many Māori fought for ways to retain their lands and create infrastructures that could bind Māori land interests behind a single administration. For instance, during the 1850s in response to unfair land losses on the North Island many Māori iwi formed the *Kīngitanga*, or Māori King Movement, so that they had a representative like a European monarch to advocate for their interests and negotiate with the Crown.[406] During the 1860s, Māori and Pākehā alike sought political means to ease relations during the New Zealand War. In 1867 Parliament passed the Māori Representation Act and added Māori seats to the legislative body, although the number of Māori seats did not give them equal representation to Pākehā. In 1868 during their first meeting, the Māori MP to speak, Tāreha Te Moananui, said, "It has been laid down in the Scripture and also by your own law, that there should be one law for both of us."[407] Days later, another Māori MP, John Patterson, seeming disillusioned to the promises of Pākehā legislation, said:

> It is my desire that I shall have a voice in matters introduced into this House, for appearance of us whole are called Māoris sitting here is this, we hear merely the words that are spoken, but we don't know the meaning; we are like a post standing, having neither voice nor ears.[408]

Despite underrepresentation, Māori politicians and community leaders continued to advocate for changes to oppressive Pākehā policies, including unsuccessful movements to redraw the electorate based on tribal regions and create a Māori Parliament, the Kotahitanga Movement.[409]

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[406] Alan Ward, "A 'Savage War of Peace'? Motives for Government Policies Towards the Kingitanga, 1857–1863," in *Raupatu: The Confiscation of Māori Land*, Richard Boast and Richard S. Hill eds. (Wellington: Victoria University Press, 2010), ?
[407] *New Zealand Parliamentary Debates*, vol. 2 (Wellington: George Didsbury, 1868), 271
[408] Ibid., 372.
[409] Lindsay Cox, *Kotahitanga: The Search for Māori Political Unity* (Auckland: Oxford University Press, 1993).

During the 1950s-1960s, in what is sometimes called the "Māori renaissance", Māori, frustrated with unexamined land claims, vied for a new legal mechanism to address these issues.[410] After decades of controversy, protests, marches, and the establishment of the Māori Affairs Amendment Act (1974) by the Honorable Matie Rata (1934-1997), in 1975, New Zealand established the Waitangi Tribunal, *Te Rōpū Whakamana I te Tiriti o Waitangi*.[411] The Tribunal is charged with investigating claims by Māori of Crown and by extension the New Zealand Government, breaches of the Treaty of Waitangi.[412] Initially, the court only heard cases from 1975 forward. By 1980, only seven claims had been investigated. The Labour Party then expanded the Tribunal's timeline back to 1840.[413] Still, the Tribunal could only make recommendations to the government; they did not have any real judicial authority. Although flawed the Tribunal's attempts at reconciliation are meant to encourage decolonization. Some argue that it was and remains an essential milestone in correcting grave injustices against indigenous peoples.[414]

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[410] Increasing Māori demands for recognition of rangatiratanga in the 1950s and 1960s, earlier according to some historians, had led to an awareness of the falsity of the supposed paradisal race relations in New Zealand. Many Māori youths used their access to urban spaces and education to garner political support and establish a coherent campaign for Māori rights, which some have called the "Māori Renaissance." *Tangata Whenua,* 321-322; Mark Williams, "The Long Māori Renaissance," in *Other Renaissance: A New Approach to World Literature* (New York: Palgrave Macmillan, 2006), 219–220.

[411] Matiu Rata Māori Affairs Amendment 1974.

[412] Waitangi scholars, such as Andrew Sharp and Bill Oliver, have argued the initial institution of the Tribunal was the "tame option" because it was merely avoiding Māori protest rather than confronting the issues at hand. W. H. Oliver, *Claims to the Waitangi Tribunal* (Wellington: Department of Justice, 1991), 10; Andrew Sharp, *Justice and the Māori, 2nd ed* (Auckland: Oxford University Press, 1997), 74.

[413] Nicola R. Wheen and Janine Hayward, "The Meaning of Treaty Settlements," in Nicola R. Wheen and Janine Hayward, eds. *Treaty of Waitangi* Settlements (Wellington: Bridget Williams Books, 2012), 17.

[414] Michael Belgrave, *Historical Frictions: Māori Claims and Reinvented Histories* (Auckland: Auckland University Press, 2005) 1-2.

Besides the Waitangi Tribunal, the establishment of Land Trusts in the early twentieth century represents one of the most effective and longstanding Māori methods of regaining cultural and political authority. During the early twentieth century, Māori established businesses that reclaimed Māori land and began creating business models to serve Māori workers, farmers, and education. The first major achievement in reclaiming land happened under the Māori Land Development Scheme created by Paratene Ngata (1849-1924) and Sir Āpirana Ngata (1874-1950) because they established businesses that provided work, financing, and materials for the Māori community.[415] Even though this new structure continued to operate on Pākehā terms of land ownership, it did provide government funding to Māori landowners to develop land, effectively creating Land Trusts and the formation of Māori agricultural incorporations. Ngata strongly supported the expansion of sheep and dairy farming, popular trades among the Ngāti Porou.[416] They formed incorporations such as the Ngāti Orou Dairy Company and Ruatōria Factory to generate Māori employment and income.[417] From 1925 until the 1950s, the Ruatōria based dairy and factory gained fame for the Nāti-branded butter it produced. Māori ran the venture and the financing, which included buying herds and working the facilities. According to a 1952 review of the company, the dairy was, "Staffed and managed entirely by Māoris, and 90

[415] Boast, 82-83; Steven Oliver. 'Ngata, Paratene', Dictionary of New Zealand Biography, first published in 1990. Te Ara - the Encyclopedia of New Zealand, https://teara.govt.nz/en/biographies/1n7/ngata-paratene (accessed 15 November 2018); M. P. K. Sorrenson. 'Ngata, Apirana Turupa', Dictionary of New Zealand Biography, first published in 1996. Te Ara - the Encyclopedia of New Zealand, https://teara.govt.nz/en/biographies/3n5/ngata-apirana-turupa (accessed 15 November 2018).
[416] Ngāti Porou is a Māori iwi, to which Ngata belonged, located in on the northeastern coast of the Te Ika-a-Māui. After the 1890s, the iwi played a role in Māori revitalization.
[417] "Exploratory Report," *Ngati Porua Treaty Claims* (Wellington: Waitangi Tribunal, 1993), 38

percent of its cream supply comes from farms under Māori ownership or management."[418] Such practices became a standard model for other Māori Land Trusts. Even though some details of the Trusts' operations, such as the Ngāti Orou Dairy, are open to researchers, many Trusts maintain strict control of their business plans and records. Therefore data on the success of the early Trusts is limited. Nevertheless, we can take note of the ones that promoted decolonization by establishing Māori-sourced industries built to circumvent Pākehā dominance in New Zealand.

Electric Power Transitions after Lake Coleridge

The physical expansion and bureaucratic restructuring of New Zealand's electric power grid between 1914 and the opening of Tuaropaki Geothermal Scheme resulted in a cheap nationwide power source, especially for Pākehā consumers. The Crown and New Zealand government had long used the ambiguity surrounding Māori freehold land, or land returned to or granted to Māori by the Crown, back to the to develop land for public works, especially after the major reforms of the 1870s but certainly earlier too.[419] Despite the cessation of large scale government acquisition of land and the success of land trusts, public works authorities sought Māori lands because the land could only be sold through the government which artificially lowered the valued.[420] Even as Māori regained control of land through the trusts, it remained difficult for individuals to hold property. The rapid expansion of the electric power grid during

[418] *Weekly News*, May 26, 1952. Retrieved from Monty Soutar, 'East Coast places - Waiapu River valley', *Te Ara* - the Encyclopedia of New Zealand, http://www.TeAra.govt.nz/en/east-coast-places/page-2 (accessed 20 March 2019).
[419] Cathy Marr published an extraordinary history of public works projects on Māori land. She points to the difficulty of tracing all accounts of Māori land invasions since so much of it was never documented. Cathy Marr, *Public Works Takings of Māori Land, 1840-1981* (Wellington: Waitangi Tribunal, 1997), 4-5; "What is Māori Land," *Te Kooti Whenua Māori: Māori Land Court*, Last Accessed April 3, 2019, https://www.Māorilandcourt.govt.nz/your-Māori-land/
[420] Boast, 191-192.

the mid-century was one of the many public works initiatives that took advantage of smaller Māori properties. Beginning with Lake Coleridge, the Public Works Department continued to argue for the centralization of electric power production, enlarging the country's power production capabilities, and use of electric power to fuel New Zealand's productivity and expand the government's control over the country's energy infrastructure. Yet with few exceptions, Māori communities would not receive electric power themselves until the 1950s.[421]

Before exploring the development of Māori geothermal electric power production, it is helpful to explore the context which informs geothermal efforts, especially the expansion of hydroelectric dams, the search for alternative sources of energy, and the subdivisions of the public works department that ended in the creation of the Electric Corporation of New Zealand (ECNZ). From the installation of the Reefton system forward, some Māori and Pākehā recognized that hydroelectric systems ruined water sources for agriculture, drinking, and culturally significant purposes. However, for most Pākehā these problems were a necessary evil which was outweighed by the progress achieved through electric power. During the 1950s, however, Pākehā environmental activists began to seriously protest the damage inflicted by these dams, namely at the Manapouri and Huntly facilities, a movement which in the 1970s resulted in conservationist legislation.[422] Despite successes like this, overall, the expansion of New Zealand's electric power grid led to an electric power system that increasingly abused New

[421] Reilly, 123-126.
[422] Jacques Boubée, Don Jellyman, and Colin Sinclair, "Eel Protection within the Manapouri hydro-electric power scheme, South Island New Zealand," *Hydrobiologia* 609 (2008): 71–82; Jo Whittle, "Into the Backyard: Huntly Power Station and the History of Environmentalism in New Zealand," *Australian and New Zealand Environmental History Network* 8, no. 1 (2013), last accessed March 26, 2019, http://www.environmentalhistory-au-nz.org/2013/11/into-the-backyard-huntly-power-station-and-the-history-of-environmentalism-in-new-zealand/

Zealand's environment reinforced colonial visions about New Zealand's productivity and enforced a stronger centralized Pākehā government.

Between 1886 and 1920, Pākehā designed electric power technologies, like other public works infrastructures, to create a Pākehā space based on British visions of an ideal colony, one which did not include Māori. After the 1914 opening, the Hydroelectric Branch of the Public Works Department declared the Lake Coleridge Power Station a success. There was even a weekly meeting in Christchurch where Mr. Lawrence Birks, the electrical engineer in charge of the project, explained how the dam would supply power to people but, "not in the usual technical way."[423] For instance, he explained how powerlines distributed electric power to power trams, illuminate the streets, and light up shops using illustrations and non-technical language. Christchurch began receiving power 24-hours a day in March of 1915 and the surrounding region followed suit, namely Lyttleton Harbour and Tai Tapu District. These areas were primarily inhabited by Pākehā. As of 1916, of the 49,776 Māori in New Zealand, 1,900 lived on the *Te Waipounamu*. According to the census, these Māori lived almost exclusively in Pākehā cities or nearby settlements. The implementation of electric power in the Canterbury Region almost certainly impacted Māori lands by the redirection of waters, construction of power lines, and lighting of shared spaces. However, it is impossible to determine whether or not these Māori had access to domestic power because there is no census data on Māori dwellings.[424] Furthermore, many Māori were categorized or identified as "half-caste" some of whom, according to the

[423] "Local and General," *Sun*, May 31, 1915, 10.
[424] "Census of the Population of the Dominion of New Zealand, October 15, 2016," *Statistics New Zealand*, Digitized Collection, Last Accessed December 21, 2018, https://www3.stats.govt.nz/historic_publications/1916-census/Report%20on%20Results%20of%20Census%201916/1916-report-results-census%20.html?_ga=2.219019793.985914877.1546529967-789407428.1546529967

census, lived as Europeans.[425] Māori wanted to engage in colonial society on their own terms and many saw European assimilation as a means of maintaining *mana motuhake,* a term used in the Treaty of Waitangi meaning political authority, so many did move into urban spaces during the early-twentieth century.[426] For instance in 1916 census, 142 Māori were identified as "European-living" half-castes in the Canterbury Region, many presumably living in urban areas (Christchurch and Dunedin) supplied with electric power. Whereas on *Te Ika-a-Māui*'s, many half-castes lived in higher numbers in urban spaces which had access to electric power.[427] Larger Māori movement into urban spaces did not occur until the 1940s.

Even though the Lake Coleridge Power Station and the expanding grid experienced problems with porcelain insulators and harsh weather, the project launched New Zealand into an era of hydroelectric expansion, especially after WWI. Between 1914 and 1929, demand for electric power grew in the Canterbury Region and the dam continued to generate revenue. In 1918, Evan Parry prepared plans for the country's electric grid and used the electric grids of Canada, Sweden, and Australia, where electric power systems were controlled by a central government agency, to facilitate the state's responsibility to manage public hydroelectric supply, rather than adopt the private enterprise system like that of Great Britain or the United States.[428]

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[425] Half-caste was first used as a derogatory classification in the 1830s to describe the illegitimate children of Māori and Pākehā but has in some instances been appropriated to empower. Here it is only used because those were the terms used in the New Zealand Census. Paul Meredith, "A Half-Caste on the Half-Caste in the Cultural Politics in New Zealand," in *Māori und Gesellschaft: Wissenschaftliché und literarishe* edited by Hartmut Jäcksch and Alan Duff (Mana: Auflage, 2000), 1-2.
[426] Richard Hill, *Māori and the State: Crown-Māori Relation in New Zealand/Aotearoa, 1950-2000* (Wellington: Victoria University Press, 2009), cxvi
[427] For instance 1,962 Māori lived in Auckland and 386 lived in Wellington.
[428] James Lowe and Evan Parry, "Hydroelectric Schemes Compared with the Gas Industry," *Appendix to the Journals of the House of Representatives,* D-01b (Wellington: Marcus F. Marks, 1918), 9–16.

Just as had been argued with Lake Coleridge, only the government had the means to build the necessary infrastructures, at least infrastructures suited for industrialization and Pākehā plans for New Zealand.[429] In 1924, the Public Works Department completed the Mangahoa Power Station, which provided hydroelectricity to *Te Ika-a-Māui's* cities like Wellington and other counties owned primarily by Pākehā. The dam also encouraged interest in electric power across in cities like Auckland and Wellington. Even though electricity was being provided to the *Te Ika-a-Māui*'s major cities, it was not built for Māori use, except for the *hāwhekaihe*, or people of mixed Māori and non-Māori ancestry, living in the cities.[430] There were exceptions such as Parihaka, which was the largest Māori settlement in *Te Ika-a-Māui* Other major hydroelectric facilities like the Arapuni Power Station (1929), which would supply much of the power for Auckland, were built during this period.

During the mid-century, due to rising Māori population numbers and a shortage of Pākehā workers, the Public Works Department employed Māori laborers to update and expand the country's electric power system. Many of these projects formed the basis of the grid that would connect the country during the 1950s. As mentioned earlier, Māori, along with laborers from around the world built the major power lines that connected New Zealand's power boards together. Even though Māori did not write the legislation or draft the engineering plans, their

[429] Aaron Fox, "The Power Game: The Development of the Manapouri-Tiwai Point Electro-Industrial Complex 1904-1969," Dissertation University of Otago, Dunedin (2001): 14.
[430] In census date well into the 1950s, these people are referred to as "half-castes." Lachy Paterson and ??? effectively argue that often these people frustrated British and New Zealand authorities hoping to neatly define the contours of the country by clearly distinguishing between the colonizer and colonized. Lachy Paterson, "Hāwhekaihe: Māori Voices on the Position of "Half-Castes" within Māori Society," *Journal of New Zealand Studies* 9 (2010): 135–155; Paul Callister, "The Construction of Ethnicity and 'Belonging' in New Zealand: Where We Have Come from and Where We Might be Going," *Journal of New Zealand* Studies 10 (2011): 115–138.

labor helped to build the grid.[431] In doing so they created their own ideas about what it meant to build electric power structures. Bill Hiku, one of the Māori linemen, fondly remembers Māori workers racing up pylons and hanging from wires unsecured as a show of masculinity and physical prowess.[432] Other linemen also celebrated their role in state building by arguing that working on the linemen gangs gave them a sense of belonging to the nation because they worked alongside Pākehā to build public works.[433]

As the grid grew larger and increasingly interconnected, Pākehā engineers and politicians maintained that only centralized state governance could effectively manage electric power supply. Between 1930-1949, the electric grid enjoyed rapid expansion and ultimately became a separate state-run entity, the Hydro-Electric Department.[434] Between 1920 and 1930, New Zealand's total population grew from 1.2 to 1.5 million and the Māori population grew from 53,000 to 67,000. Beginning in the 1890s, Pākehā increasingly moved to cities reaching, so much that by 1930 60% of the Pākehā population lived in the four main urban centers, Auckland, Wellington, Christchurch, and Dunedin, whereas 90% of the Māori continued to live in rural areas in 1930. Some Māori remained in rural and secluded communities by personal choice,

[431] Reilly, David Christopher Young and Grid Heritage, "Interviews Abstracts," *Māori Linemen Oral History Project,* 2007-2008.
[432] Rennie, 93.
[433] D. Morrow and M. Brookes, "The Politics of Knowledge: Anthropology and Māori Modernity in Mid-Twentieth Century New Zealand," *History and Anthropology* 24, no. 4 (2013): 453–471; R. Scott Sheffield and Noah Riseman, "Rehabilitating Assimilation," in *Indigenous Peoples and the Second World War: The Politics, Experiences and Legacies of War in the US, Canada, Australia, and New Zealand* (Cambridge: Cambridge University Press, 2018), 271-300.
[434] Rennie, 229.

while others were unable to transition due to income, education, and discriminatory practices. [435] Throughout the 1920s, demand in electric power had grown dramatically, increasing by upward of 25% in electric sales per year both in residential and industrial spaces. During the Depression Years (1928-1935), the growth of the grid slowed which left thousands of New Zealanders, who relied on Public Works expansions, without employment. Despite the slowdown in expansion, many Public Works electric power projects were aimed at connecting the country, such as the Mangahao-Waikaremoana and Waitaki Schemes. In addition to the success of many of the hydroelectric schemes, this period also brought about some harsh realizations about New Zealand's power security.

A series of natural disasters and grid failures, led politicians and engineers to decide that any expansions required a stronger regulatory hand and to consider alternatives to hydroelectric systems, which tended to prioritize Pākehā. First, the Napier Earthquake (1931) decimated much of *Te Ika-a-Māui's* grid causing insecurities about reliance on hydropower and the ability of regional power boards to handle massive failure. Earthquakes, or *rū whenua*, had plagued both Māori and Pākehā buildings for centuries.[436] Some Māori stories recorded by T. W. Downes notes massive events in 1843 at Taupō and Rotorua that swallowed a pā, Māori earthen fortification, and formed Lake Rotorua.[437] Urban Pākehā architecture shifted back and forth from wood to brick for much of the nineteenth and early twentieth century. Architects eventually began to use art deco and ferro-concrete but large structures, like power station foundations were

[435] Ian Poole and Natali Jackson, "Population Change-Māori Population Change," *Te Ara: The Encyclopedia of New Zealand* http://www.TeAra.govt.nz/en/population-change/page-6 (accessed 8 January 2019).
[436] Rū whenua is roughly translated as the "shaking of the earth."
[437] Thomas William Downes, *Old Whanganui* (Hawera: W. A. Parkinson, 1915), 222.

still susceptible to damage.[438] Following the destruction at Napier, electrical engineers and public works officials sought to diversify the means of electric power production and construct additional transmission lines to connect the country's isolated grids, so that New Zealand could maintain its electric system and not rely exclusively on one method of power production. The passage of the Electric Power Boards and Supply Authorities Act (1930) gave legal status to the supply authorities to distribute power within the National Grid.[439] This meant the urban areas and well-to-do rural farms received more and cheaper electric power. More significantly in rural, and Māori towns, electrification did not happen until after World War II. By 1939, many of the connection projects had succeeded in bringing 91.7% of the country electric power and, as the Depression ended, plans were made for expansion and celebration at the Grand Centennial Exhibition.[440] However, New Zealand's plans for expansion were halted by the country's entrance into World War II on September 3, 1939. Parliament quickly passed the Emergency Regulations Act (1939), effectively limiting the production and sale of electricity.

Well into the mid-twentieth century, Pākehā politicians echoed early colonial electrification efforts by continuing to insist that the increased centralization of electric power yielded a more productive and modern New Zealand. As one journalist wrote in a commentary on the country's electric history.

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[438] Peter Reed, Kate Schoonees and Jeremy Salmond, *Historic Concrete Structures in New Zealand: Overview, Maintenance, and Management* (Wellington: Science and Technology Publishing, 2008), 14.
[439] "Electric-Power Board and Supply Authorities Association Act, 1930," *GEO* 5, no. 42 (1930): 242-247.
[440] There were over 37,000 lights, using over a million watts at the exhibition site. 'The Centennial Exhibition', URL: https://nzhistory.govt.nz/culture/centennial/centennial-exhibition, (Ministry for Culture and Heritage), updated 27-Jun-2018

> The Great Development– the completion of the main State Hydro Stations…Probably nowhere else in the world is the purely rural reticulation so fully developed or better organised than in New Zealand.[441]

By 1942, the war began to severely impact materials, labor, and finances for transmission lines and new facilities. The Hydroelectric Branch encouraged the public to save power, reduced public lighting hours and restricted the sale of electric appliances.[442] War, much like the Depression, impressed upon everyone the need for increasingly secure and reliable electric power, which ultimately led to the creation of the State Hydro-Electric Department as part of the Electricity Act (1945).[443] Furthermore, the government hoped to expand electric power networks to New Zealand's more rural, and resource producing, areas by forming the Rural Electricity Reticulation Council.[444] In connection with this new push for rural electricity, new tactics were adopted for distributing power in extremely isolated places. One of the systems developed was the Single Wire Earth Return (SWER).[445] Lloyd Mandeon (1888-1973), an electrical engineer, presented a paper to the New Zealand Institution of Electrical Engineers detailing the success of

[441] Rural reticulation refers to mechanisms employed, usually sponsored by the government, to physically link rural electric power systems with urban grids or larger power stations. Many pieces of Rural Electrification legislation, in New Zealand and elsewhere, were labelled "reticulation acts." "Two Inventions," *Auckland Star*, April 27, 1940, 4; The Archives New Zealand has uploaded pieces of a documentary about New Zealand in 1938. Many of the scenes and comments concern its modern electric systems. The video can be access at the Archives or YouTube, last accessed March 26, 2019, https://www.youtube.com/watch?v=5kbiCoylMfA

[442] Reilly, 108.

[443] "The Electricity Act," *Parliamentary Proceedings* (1945): 287-296.

[444] The council was comprised of five members, representing a generation, bulk transmission, and distribution sides of industry. The organized the levy for the 95 electric supply authorities in rural areas.

[445] Unlike regular distribution systems, SWER uses a single-wire to supply single phase electric power. The distinguishing feature is the use of the Earth, or sometimes water, as the return path to avoid the need for a second or neutral wire. Even though many questioned the safety and utility of widespread usage of SWER during the 1950s, it has become a mainstay for rural electric power distribution around the world.

the design in work for the Tauranga Electric Power Board in the 1920s.[446] The system was successfully implemented in many areas and helped revive electric power usage in the sheep industry. During the 1950s, the system was implemented by power boards in the Bay of Islands, King Country, Wairere, Banks Peninsula, and Otago.[447]

After recovering from the Depression and World War II, the new State Hydro Electric Department continued to expand the grid and its authority over the country's electric power. In addition, they began to explore the possibility of using methods of generation other than hydropower. There was an unsuccessful attempt to incorporate the coal and natural gas industry into electric supply authorities in the Electricity and Gas Co-Ordination Act (1956). More promising was the effort to harness geothermal energy for power production. In 1958, the State Hydroelectric Department became the New Zealand Electricity Department (NZED) reflecting the diversification of New Zealand's energy supply.

Geothermal Energy in New Zealand

Geothermal energy is deeply rooted in New Zealand's history long before the invasion of Pākehā. Māori, especially the Te Arawa, have incorporated geothermal resources into their cosmogony and daily life. For instance, Ngatoroirangi, a prominent *tohunga*, priest, from Māori legend known for being on the voyage from *Hawaiki*, the homeland of Māori ancestors, is known to have used geothermal energy.[448] During his exploration of *Te Ika-a-Māui*,

[446] Lloyd Mandeno, "Rural Power Supply Especially in Back Country Areas," *Proceedings of the New Zealand Institution of Electrical Engineers* 33 (1947): 234.
[447] Reilly, 111.
[448] Hawaikia appears in other Polynesian mythologies. The name also appears as Rangiatea, Havai'i, and Tawhiti. Alexander Wyclif Reed. *Raupō Book of Māori Mythology* (Auckland: Penguin, 2008).

Ngatoroirangi became trapped on Mount Tongariro dying of cold. He called out to his sisters, Kuiwai and Haungaroa, to bring him heat. Upon hearing his cries, they sent their spiritual being, in form of fire, from Hawaiki through the Earth to warm Ngatoroirangi leaving behind geysers, hot pools, and volcanoes throughout *Maketū* (Bay of Plenty), especially around Lake Taupo.

For centuries, Te Arawa, a confederation of Māori iwi and hapu descended from the first explorers of Te Ika-a-Māui, settled and thrived in much of the area around the Taupo Volcanic Zone, including Lake Taupo and Lake Rotorua. Geothermal steam and water were used for cooking and heating.[449] In 1800, the European invasion of Maketū began. Trade, settlement, and resource exploitation increased, especially after the signing of the Treaty of Waitangi (1840). One of the ways the colonial government and the Crown hoped to develop Te Ika-a-Māui and encourage settlement of the region, particularly after the conclusion of the New Zealand Wars was through tourism.

During the nineteenth century, Pākehā capitalized on Māori geothermal resources in the tourist and health industry. Beginning in 1845, Robert Graham (1820-1885) founded the first Pākehā geothermal enterprise in New Zealand, a sanatorium at the Waiwera geothermal fields near Auckland.[450] By the 1870s, newspapers were filled with advertisements for the Hot Springs at Waiwera which promised that the springs, "border on the miraculous."[451] In 1878, Graham, fluent in Māori, helped to solve a land dispute in the Taupo Volcanic Zone at Makutu. Te Arawa leaders granted him some land during this exchange. There is some debate about how he

[449] Melissa Climo, Sarah D. Milicich, and Brian White, "A History of Geothermal Direct Use Development in the Taupo Volcanic Zone, New Zealand," *Geothermics* 59 (2016): 215-224.
[450] "Death of Mr. Robert Graham," *New Zealand Herald*, May 27, 1885, 5.
[451] "Waiwera Hot Springs," *Auckland Star,* June 5, 1875, 6.

obtained so much land, and whether the chiefs truly granted him ownership. Nonetheless, he became the sole proprietor of the Ohinemutu Hotel, the Terrace Hotel at Wairoa, and 1700 ha between Huka Falls and the Wairakei Geyser Valley.[452] Besides jumpstarting the geothermal tourism industry, Graham's acquisition of the land led to the creation of a dialogue between Pākehā and Te Arawa, who had traditionally resisted land sale.[453] Eventually, the government and Te Arawa agreed to establish a township to facilitate the building and working of a large sanatorium. In parallel with these land acquisitions, the Government passed the Thermal Spring Districts Act of 1881, which formally placed all thermal springs under government control, so that the land would have to be purchased. Even though these exchanges led to a booming tourist industry that in many ways celebrated Māori culture and promoted cooperation, it continued colonial patterns of land acquisition that ultimately disenfranchised Māori and meant that the land had to be repurchased or acquired by Land Trusts.

Following the successes of hydroelectric expansion during the 1930s and 1940s, the Public Works Department saw geothermal energy as one way to supplement New Zealand's growing demand for electricity, particularly for industrial manufacture and export industries.[454] They were further encouraged by the success of the Lardello geothermal works in Italy.[455] New

[452] Niramona Pini, "The Ohinemutu Hotel," *Bay of Plenty Times* August 17, 1880, 3; "Police Court Ohinemutu," *Bay of Plenty Times,* October 7, 1880, 2; "A Trip on Wheels to the Lakes and Back," *Hawkes Bay Herald,* October 27, 1881, 3.
[453] Te Arawa established a "Great Committee" to deal with land issues. White, B. R., & Chambefort, I. (2016). Geothermal development history of the Taupo Volcanic Zone. *Geothermics, 59*(B), 149.
[454] Electric power rationing during World War II led to increasing awareness in the country's power supply security. Reilly, 115-119.
[455] "Harnessing Thermal Regions: Dispensing with the Need for Coal," *Bay of Plenty Times*, September 24, 1946, 5; Lardello's Valle del Diavolo (Devil's Valley) became the first recording geothermal power station in the world when it produced enough electricity in 1904. The plant grew and was the largest geothermal works in the world until the Waikeiri Sation was built in

Zealand's geothermal wells were one of the sources of energy they pursued. Much of this had to do with maintaining energy security in the face of changing environmental conditions that affected hydroelectric production, New Zealand's rain can be temperamental depending on the region, particularly on the Te Ika-a-Māui.[456] Besides the production of electric power, many in New Zealand had already incorporated geothermal wells into heating systems and the British government proposed using wells in the production of heavy water.[457]

Throughout the late-twentieth century, New Zealand's governing electric power authorities built a number of geothermal power stations to supplement their hydroelectric systems. Even though the system used a different method of power production, they relied on the central government's ability to use the land to expand the country modernization and productivity. The country's first four geothermal stations were built at Wairakei (1958), Kawerau (1989 and 1996), and Ohaaki (1989), where Māori-owned land was either sold or leased to the Government under compulsory land acquisition for "public works."[458] The Wairakei and Ohaaki power stations caused the extinction and depletion of geothermal geysers and springs highly valued by Māori peoples. During this period, geothermal power production relied on the production of "dry steam" facilities.[459] Wells had to produce steam at 150 °C or higher so that

1958. R. Parri and F., "Larderello: 100 Years of Geothermal Power Plant Evolution in Italy," in Ronald DiPippo ed., *Geothermal Power Generation* (London: Woodhead Publishing, 2016), 537-590.

[456] New Zealand has a wide range of annual regional rainfalls. Most regions have an annual rainfall of 600–1,600 millimeters per year. Terry Heiler, 'Irrigation and drainage - Regional characteristics', *Te Ara - the Encyclopedia of New Zealand*, http://www.TeAra.govt.nz/en/map/19595/new-zealand-annual-rainfall (Accessed 27 November 2018).

[457] Rebecca Priestley, *Mad on Radium: New Zealand in the Atomic Age* (Auckland: Auckland University Press, 2012), 69.

[458] Katherine Luketina and Phoebe Parson, in *Geothermal Energy and Society*, 193

[459] DiPippo, 309.

steam could be transferred directly up a shaft to turn turbines, collected in a condenser, and sent back in the wells to be cooled. While it is one of the most efficient methods of geothermal power production, this method caused subsidence or the downward setting of land due to the removal of underground liquids.[460] Although the process can be reversed in some cases, the vast majority of wells, such as those at Wairakei, will disappear. More sustainable methods have been developed since the 1950s, such as the binary cycle, which utilize much lower temperatures. Today, geothermal energy is classified as renewable energy, and while it can be operated in a sustainable, environmentally conscious manner many of these early systems were built using exploitative frameworks of electric power production.

Reckless Pākehā exploitation of the Māori geothermal sites for tourism and energy echoed the practices of earlier colonization because Pākehā utilized them for profit and without consideration for Māori. Even though there have been reparations for some of the losses, many of the sites suffered irreparable damage. At Wairakei the historically adverse effects on valued geothermal features by the Wairakei Power Station, originally owned by the New Zealand Electricity Department, are now addressed through cooperation between Contact Energy Ltd and Te Kupenga Charitable Trust which was set up by members of the Ngāti Tuwharetoa tribe in 1996. The Trust has established a Māori tourism operation, Wairakei Terraces, using bore water supplied by Contact Energy to create and maintain artificial geothermal features and bathing pools. The Trust has also set up Nectar, a Māori training organization with three training

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[460] Bromley, C. J., Currie, S., Jolly, S., & Mannington, W. "Subsidence: An Update on New Zealand Geothermal Deformation Observations and Mechanisms," *World Geothermal Congress, 1* (2015): 19–25.

facilities.[461] Its key focus in relation to education and training has been to create opportunities and employment for Māori in education health, and tourism.

The Orakeikorako geothermal system in the Waikato Region was also compulsorily acquired by the government for the development of the Waikato River's Ohauri Dam in 1961. Approximately three-quarters of the area's geysers, sinter springs, and other geothermal features were submerged underwater, as was the site of the Ngāti Tahu's primary *marae*, meeting place.[462] Since then, groups within the iwi have either brought back or had land returned, although the hydroelectric dam remains and still covers the geothermal features. The tribal landowners leased the main area of geothermal features to a tourism concessionaire. Of the many projects, there is one Māori-geothermal development venture that did not need any Waitangi Tribunal intervention at Mokai (Waikato Region), where the Tuaropaki Trust, formed the Tuaropaki Power Company Ltd.

The Tuaropaki Trust and the Mokai Fields

After decades of increasing national authority in the generation of New Zealand's electric power, the Tuaropaki Power Company's commitment to sustainable power production by and for its community disrupts and decolonizes the electric power production practices that had dominated since the 1880s. The Tuaropaki Trust is a collection of multiple-owned lands that can be traced to the descendants of seven Mokai hapu, the Ngāti Parekaawa, Ngāti Kohera, Ngāti

[461] *Geothermal Energy and Society*, 201.
[462] *Marae*, a word common to many Polynesian cultures, is best understood as, "a place where culture can be celebrated," in New Zealand. It generally refers to a central location that benefits the needs of *iwi* (tribes), *hapū* (clans), or *whanau* (families). It may refer to a building or a ceremonial open space.

Wairangi, Ngāti Whaita, Ngati Moekino, Ngāti Haa, and Ngāti Tarakaiahi.[463] Initially, the Trust served to further Māori agricultural interests but grew to incorporate electric power production, education services, and telecommunications. Beginning in 1951, landowners amalgamated to develop a single pastoral farm. The collective received financing from the Department of Māori Affairs, which would regulate the farms until the loan was repaid. During the 1960s, the trust coordinated a comprehensive development program under the department to expand farms known as the Tuaropaki Land Development Scheme.[464] By 1982, the loans and interest were repaid in full and all of the lands were returned to a board of trustees, formally establishing the Trust. Initially, operations included cattle and sheep farms but they gradually diversified the stock. In 1993, the Trust was recognized as an Ahu Whenua Trust acting under the provisions of the Te Ture Whenua Māori Act. As part of larger Waitangi Tribunal reforms, this act reaffirms the Treaty of Waitangi and stipulates that, "that land is *taonga tuku iho* of special significance to Māori people," and "they [Māori] facilitate the occupation, development, and utilization of that

[463] Even though the focus here is on the Tuaropaki Trust, the success of the industries involved is the result of collaboration between a number of Māori trusts, companies, and individuals. Robert Joseph et al argue that this style of collaboration is the result of centuries of resistance of Pākehā governance. Te Puni Kokiri and the Federation of Māori Authorities. 2005. *Māori Business Innovation and Venture Partnerships: Hei Whakatinana I te Turua Po*. Wellington, NZ: Ministry of Māori Development and Federation of Māori Authorities. Robert Joseph Te Mata Hautū Taketake, Arapeta Tahana, Jonathan Kilgour, and Jason Mika, Mylene Rakena, and Te Puritanga Jefferies, *Te Pai Tawhiti: Exploring the Horizons of Māori Economic Performance through Effective Collaboration* (Ngā Pae o Te Māramatanga, 2016), 13.

[464] As noted above about other Trusts, the Tuaropaki Trust does not share provide public access to their records. In accordance with their wishes, I did not pursue additional information from the Trust. The primary documentation I use in the analysis below comes from their website, the Waitangi Tribunal financial records, and other historians who have been given access. While the trust does specifically prohibit discussion of past developments of the Mokai Power Station, they do not actively support publications on current developments. Brian White and Isabelle Chambefort, "Geothermal Development History of the Taupo Volcanic Zone," *Geothermics* 59 (2016): 162.

land for the benefit of its owners, their *whānau*, and their hapu."[465] This act, along with decades of negotiating and resisting colonial regimes, provided the foundation for and catalyzed the mission of the Tuaropaki Power Company.

From the method of power production, the design of the facility, and the distribution of income the Tuaropaki Power Company works to decolonize New Zealand's grid. Like many of the electric power production milestones seen in previous chapters, the Tuaropaki Power Company completed a number of firsts in the electrification of New Zealand. However, like other Māori Land Trusts before them, it is their commitment to Māori led sustainable electric power production and industry that worked most effectively toward decolonization. In 1983, the Electricity Corporation of New Zealand estimated that the entire field could generate 150 MWe, or about 25 MWe per well.[466] To date the wells are some of the hottest in New Zealand, regularly reaching temperatures of 325ºC, whereas the majority operate between 140ºC and 220ºC.[467] After the Department of Māori Affairs secured Tuaropaki's interests, the Trust began to develop the fields in 1996. They agreed that the Tuaropaki's goals were achieved when they, not the government, acted as owner and developer. After exploring a number of options, they determined Geothermal Combined Cycle Technology (GCC) was the most appropriate method

[465] *Taonga Tuku Iho* can be roughly translated as cultural heritage or birthright. *Whanau* essentially means extended family but can also refer to all Māori. "Te Ture Whenau Māori Act," 1993 http://www.legislation.govt.nz/act/public/1993/0004/latest/DLM289882.html (Accessed November 29, 2018).

[466] MWe or Megawatts Electric is a value assigned to a power plant and refers to the electric output capabilities of the facility. Generally, MWe is listed alongside MWt, Megawatts thermal, or the amount of energy required to generate electricity at the capacity. It is worth noting that not all power plants, namely hydroelectric dams, fuel cells, and wind turbines list a MWt rating they have other means of accounting for losses.

[467] "New Zealand Geothermal Fields," *New Zealand Geothermal Association*, https://nzgeothermal.org.nz/nz_geo_fields/, (Accessed November 26, 2018).

of power production in a 60 MW plant. Unlike traditional systems that draw large amounts of water from other sources, require cooling water, hazardous treatment chemicals, and a need for water disposal, in a GCC system steam is first produced in a backpressure steam turbine and is subsequently condensed in a vaporizer of a binary plant, which produces more power. The liquid product of this process is then reinjected back into the ground.

Since they fought to obtain the right to develop and construct the plant on their terms, Tuaropaki trustees elected an engineering and equipment company who aligned with their interests in sustainability. The turnkey contractor and supplier of the equipment for the plant was ORMAT, an American renewable energy company based in Reno, Nevada and a global leader in geothermal construction since the 1970s.[468] In addition to the sustainable and ethical practices exhibited by Tuaropaki in the years after construction, the construction of the facility was in and of itself an exercise in Māori innovation and pragmatism on the 2,700 hectares of land, known as Tuaropaki E.[469] Combined Cycle technology is more modular and requires less environmentally damaging and time-consuming construction. The binary turbines required only simple low-level foundations because the high-efficiency turbines are smaller, and they do not rely on higher steam temperature or volume. Also, the turbines do not require an attached condenser, so the condenser units are built on a lower foundation.

[468] In 1965, Ormat was founded by the Bronicki family in Nebraska. They specialize in geothermal power, solar power, remote oil pipeline construction, and turbine design. https://www.ormat.com/en/company/welcome/history/ (Accessed November 1, 2018).
[469] "Tuaropaki Trust Trustees," Māori Land Court Minute Book 77 (2003). https://www.Māorilandcourt.govt.nz/assets/Documents/Decisions/Trustees-of-Tuaropaki-E-Tuaropaki-E-2002-77-Tpo-25.pdf (Accessed November 27, 2018).

As a result of the smaller facilities and absence of a large cooling tower, this style of plant does not create a significant visual impact, which was an important factor in Tuaropaki's decision to use this design. Tuaropaki was given permission to build in February 1998, the turbine generator was delivered February 1999, and the first plant was commissioned in 1999 by the Tuaropaki Power Company and Mighty River Power.[470] From the beginning, the station was designed to have a minimal environmental impact. Under normal operation, the geothermal fluid is completely contained from production to reinjection. This is true of the first 55 MW station built in 1999, the 40 MW station added on in 2005, and another 2007 addition brought the plant to 100 MW facility. Using geothermal energy, the Tuaropaki Power Company has made tremendous contributions to geothermal technology and altered the make-up of New Zealand's power production methods. In particular, they have demonstrated the utility of using direct heat from geothermal sources on an industrial scale. The expected growth of electric power demand exceeds the capabilities of existing and planned wells. Therefore, directly using the steam to power manufacture or provide heat cuts back on the demand for electric power. This is especially true in New Zealand, where the electric load is predicted to remain static and new wells are not being developed but it is also useful for countries taking on new geothermal projects.[471]

[470] Mighty River Power is one of the three state-owned generating companies, Mighty River, Genesis, and Meridian Energy, after the Electricity Corporation was dissolved in 1998. The Electricity Corporation was formed in the 1980s as an attempt to consolidate the underregulated local supply authorities under the Ministry of Energy, the body that took over after the Electricity Department was reformed in the 1960s. In July 2016, Mighty River became Mercury NZ. Ministry of Business, Innovation, and Employment, "Energy in New Zealand 2018," https://www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/publications/energy-in-new-zealand (Accessed November 27, 2018).
[471] DiPippo, 663.

As well as altering the technologies used to produce electricity, the Tuaropaki Power Company has challenged and transformed the colonial motivations behind electric power production in New Zealand. As a Dominion, Pākehā citizens, and politicians continued to employ colonial ideas about New Zealand's purpose and how it should generate electric power. Even after the Electricity Act (2003) dissolved the Electricity Corporation of New Zealand to create the Electricity Commission, and later the Electricity Authority (2010), to regulate electric power with less oversight from the Ministry of Energy, the central aim of the entity is to turn a profit for power companies, preserve New Zealand's energy self-sufficiency, and register all power providers under a single regulatory authority.[472] The rebranding of New Zealand's electric power marketplace, even with their occasional attention to environmental sustainability, continues to prioritize the expansion of electric power production at the expense of New Zealand environment and people. This is made most evident by the country's recent debates concerning drilling for more natural gas to generate electricity and export for profit.[473]

By contrast, the Tuaropaki Company uses profits and energy from the plant to build and power new sustainable industries that employ and educate Māori. In many ways, earlier Pākehā electrifications projects and Tuaropaki share the goal of self-sufficiency, yet there is a crucial difference in what they deemed necessary to accomplish self-sufficiency– Pākehā systems relied on hegemonic practices like resources extraction and theft of land. Māori efforts return political

[472] "Chronology of New Zealand Electricity Reform," The Ministry of Business, August 2015, Last Accessed December 2018, https://www.mbie.govt.nz/assets/2ba6419674/chronology-of-nz-electricity-reform.pdf

[473] Phil Rennie, "Gas a Big Opportunity for New Zealand," *Petroleum Exploration and Production Association of New Zealand,* November 15, 2017, last accessed March 27, https://www.pepanz.com/news/global-demand-for-natural-gas-a-big-opportunity-for-new-zealand/.

power to Māori, contribute to the Māori community's economic improvement, and utilize energy in a way that is consistent with Māori perspectives on resource use. I will introduce three of these industries, Temperature Controlled Horticulture, Miraka Dairy, and Ngaire George Sustainability Centre, and discuss how they decolonize structures of electric power production.

The Tuaropaki Companies establishment of Mokai Gourmet, Miraka Dairy, and Ngaire George Sustainability Centre demonstrates how the Māori sought to use the full potential of their geothermal resources to reclaim agricultural spaces previously lost to colonial exploitation, provide work for Māori, and create a sustainable export industry for New Zealand. Using geothermal steam as a source of heat, the Tuaropaki Trust entered into a venture for growing sustainable year-round crops for local consumption and export. In December 2002, Tuaropaki entered a joint venture a 25% shareholder, along with Gourmet Paprika Ltd. 50% share and Hauhungaroa Partnership's 25% share, to establish Gourmet Mokai, a 5.5 hectares climate-controlled glasshouse, which was expanded in 2006 to 11.7 hectares. The house was built on Tuaropaki land and is heated using steam from the Taupo fields. [474] The facility produces capsicum, Truss Tomatoes, blueberries, and other rotating crops. In keeping with the trust's commitment to longevity and low environmental impact, the greenhouses use hydroponics to grow individual plants in a soilless medium that is linked to centralized water and fertilizing system.

Following the success of Gourmet Mokai, in 2010 the trust entered into a partnership with Wairarapapa Moana, Waipapa 9, Hauhungaroa Partnership, Tauhara Moana Trust,

[474] Hauhungaroa is a 200.48-hectare property on the western side of Lake Taupo, the partnership is among a number of small trusts on that land. Gourmet Paprika is an Auckland-based greenhouse horticulture company established in 1993.

Pouakani Trust, Te Tumu Paerao, and Te Awahohonu to construct to establish Miraka, a dairy processing facility, on Tuaropaki land.[475] The company was designed as a permanently Māori-owned, vertically integrated company for the benefit of the involved trusts' communities. Tuaropaki agreed to host the dairy processing plant because the land could be centrally located in the region to benefit the numerous Māori dairies in the region and harness geothermal power. Construction began on the plant in late 2010 and was completed in December 2011. The facility includes a milk reception area, evaporator, dryer plant, spray drying facility, milk silos, packing facility, and warehouse. All of these components are used to create powdered milk. The entire plant is powered by renewable steam and electricity provided by the Tuaropaki Power Company, the first such facility in the world.[476] As of 2017, the Miraka plant can process supplies from 50,000 cows (210 million liters of milk per year), which results in 32,000 tons of whole milk powder. Another Māori Trustee, Global Dairy Network, sells the product to foodstuff industries in China, the United States, Malaysia, Taiwan, and Australia.[477]

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[475] The Wairarapa Moana Trust was established in 1987 to protect and provide for the descendants of the peoples that originally lived on Lake Wairarapapa before the Treaty of Waitagni, Waipapa 9 Trust is a large scale farming trust that administers to the land situated between 20 and 30 km's northwest of the Taupo township. The Tauhara Geothermal Charitable Trust was established in 2011 as a requirement of the resource consents for Contact Energy Ltd.'s Tauhara II Geothermal Project. The Pouakani is a Charitable Trust that was established to receive the Pouakani Treaty settlement (Pouakani Waitangi Tribunal Claim Wai 33) on 19 March 2001 on behalf of the Pouakani. The Pouakani are defined as the descendants of the original owners of the Pouakani Block as determined by the Māori Land Court on 4 August 1891. *Te Tumu Paeroa* is an independent organization supporting Māori landowners to protect and enhance their land. Te Awahohonu is a Forest Trust formed in 1971 that administers Tarawera C in the Awahohonu Forest.

[476] About 60 gigajoules of waste heat is produced daily and is processed and recycled at the facility.

[477] "About Us," *Global Dairy Network*, https://www.globaldairynetwork.com/ (Last Accessed January 8, 2019).

Sustainability is an integral part of the Trust's guiding principles. It operates from the philosophy that neglecting the environment will be a barrier to long-term survival at both the macro and micro level. They have established measures to repurpose waste from all of their facilities in keeping with this philosophy. In 2012, the trust opened the Ngaire George Sustainability Centre, named after a longtime trust chair, Ngaire George, to expand their sustainability model.[478] Wastewater and other materials are taken from Miraka, the glasshouses, and a number of the dairies and processed by worms to produce vermicompost. Vermicomposting is a type of composting that uses worms to rapidly decompose waste and geothermal steam keeps the mixture at optimal temperatures. As of 2018, there are 4.5 kilometers of worm rows dedicated to composting waste, a native plant nursery that produces 200,00 plants annually, a riparian planting program for all Tuaropaki lands, and a research center dedicated to preservation. These projects serve the trust's mission to continually reduce the environmental impact of its facilities. It removes the energy, outsourcing, and logistics costs associated with agricultural waste removal, which produces a nutrient dense compound that can that can be recycled Tuaropaki's industries.

The Tuaropaki Trust's many geothermal initiatives have promoted environmental awareness and wellbeing throughout New Zealand. Of their many projects, the facilitation of Māori farming is one of the most publicly celebrated accomplishments. Tuaropaki elders

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[478] Other than the appearance of her name on published and unclassified Tuaropaki Records, further definitive records of Ngaire George were not found. As of 2012, we know that George is listed as the Chairperson of the Mokai Marae Trust, a subsidiary trust of Tuaropaki. *Waihaha Māori Lands Trust v Mokai Māori Trust – Tuaropaki A and Others* [2018] Māori Land Court 191 Waiariki MB 234.

instilled the belief that, "if you look after the land the land will look after you."[479] For Māori, they and Pākehā exist in a constitutive partnership to sustainably produce energy in New Zealand. It's restructuring of electric power production repurposed colonial infrastructures, like land trusts and electric power bureaucracy, to develop a system that benefitted Māori, Pākehā, and the environment. As of 2017, 2,400 owners receive economic dividends and social benefits from these industries, not to mention the New Zealanders that use electricity or global customers. In 1982, the Trust made $4 million to $16 million in 2016 and employed 366 Māori in the Waikato region.[480] On January 28th, 2019 the Trust signed an agreement with the Obayashi Corporation to develop a "zero carbon" hydrogen production facility powered by the Trust's geothermal power.[481] These successes were made possible by the Māori innovation and commitment to sustainability founded in producing electric power using geothermal energy. Unlike Pākehā electric power facilities bent on constant expansion and unsustainable industrial profit, Tuaropaki's primary goal has been to, "Act as a beacon of hope and prosperity for our people."[482] They use the production of electricity to foster Māori employment, education, financial aid, and environmental sustainability and decolonize New Zealand.

Conclusion

[479] "Tuaropaki Trust Wins Excellence in Farming Award," *SCOOP*, Last Accessed, January 19, 2019, http://www.scoop.co.nz/stories/BU0703/S00565/tuaropaki-trust-wins-excellence-in-farming-award.htm

[480] "Financial Report," Mercury New Zealand Limited (June 30, 2018), 30; Evelyn Stokes, *The Legacy of Ngatoroirangi: Māori Customary Use of Geothermal Resources* (Hamilton: University of Waikato, 2000), 93.

[481] Obayashi is a Japanese construction company. "Joint Development Agreement," Obayashi Website, Last Accessed, February 28, 2019, https://www.obayashi.co.jp/en/news/detail/news20190121_en_1.html

[482] "Mission Statement," Tuaropaki Trust, http://www.tuaropaki.com/home/ (Last Accessed January 8, 2019).

On October 31, 2018, Eastern Group, a New Zealand based company, opened the largest geothermal power plant in New Zealand to date, the 25 MW Te Ahi O Maui Plant.[483] Eastern group partnered with the Kawerau Ahu Whenua Trust, contracted ORMAT Technologies and made sustainability their mission. It is a striking parallel to Tuaropaki and similar to a number of other recent developments, such as Taheke 8 (2010), Tauhara North No. 2 (2010), and Tikitere Geothermal Company (2011). Geothermal electric power production continues to expand in New Zealand and the Tuaropaki Power Company has served as a model for subsequent Māori and Pākehā geothermal schemes.

The success of Māori Geothermal power ventures and connected industries has generated international interest in promoting similar projects around the world and in New Zealand, the most recent being the Oklkaria Power Station in Kenya. Since the 1980s, the Kenya Electricity Generating Company (KenGen) and the Massai peoples have clashed about the development of geothermal fields.[484] In 2017, with the encouragement of Power Africa, the Massai and KenGen began a series of exchange missions with Māori at the Ohaaki Geothermal Power Station to learn how the power companies and Māori Trusts managed their relationships.[485] Using Māori values to guide its operation, much like the Tuaropaki Trust, Ohaaki is worked by Māori, provides mechanisms for underprivileged youth to enter the energy sector, maintains a sacred pool, and

[483] "Te Ahi O Maui Geothermal Project," http://www.eastland.nz/eastland-generation/projects/te-ahi-o-maui/ (Last Accessed January 8, 2019).
[484] The Massai are a Nilotic ethnic group in Kenya and northern Tanzania. Kenya's Constitution does not recognize them as indigenous peoples, instead of categorizing them as "Marginalized". Apart from the centuries of European colonization, the Kenyan and Tanzanian governments have strongly criticized their semi-nomadic lifestyle and pushed for assimilation. The expansion of the electric grid into that region is just another example. Ben R. Ole Koissaba, *Geothermal Energy and Indigenous Communities: The Olkaria Projects in Kenya* (Heinrich Böll Stiftung, 2018), 4-5.
[485] Ohaaki is operated by Contact Energy one of New Zealand's largest power companies.

provides flood mitigation structures.[486] Following many exchanges, KenGen and the Massai have begun to work out ways to establish a measure to share land ownership, observe Massai cultural ties to the region, and develop sustainable energy for Kenya.[487] In 2018, the Ngāti Tahu and Contact Energy received an award from the United States Energy Association (USEE) for their efforts.[488] The World Energy Council's Trilemma rating index placed New Zealand as 8th in the world for its energy security, sustainability, and equity with many wealthier European nations scoring higher. However, the council has noted that while other countries have better infrastructures in place, the model set forth by Māori-led geothermal power projects offers one of the most promising for improving energy equity around the world. This is especially relevant to the island populations threatened by climate change.[489] In New Zealand, the Tuaropaki Power Company demonstrated the ways in which Māori could reclaim their lands, promote environmental sustainability, and transform colonial models of electric power production that deplete resources, are concerned primarily with profit, and emphasize centralization. Amid mounting concerns over climate change, geothermal energy has proven an effective aid for other forms of alternative energy by supplementing wind and solar farms during off-hours. The development of the Tuaropaki Power Company points to the ways that electric power companies

[486] Power Africa is a U.S. Government-led partnership coordinated by the U.S. Agency for International Development (USAID).
[487] Caitlin Smith, Andrew Palmateer, David Stonehill, "The Sacred Nature of Geothermal Energy: How Power Africa is Sharing Best Practices on Community Engagement Across Cultures and Continents," *Medium*, August 15, 2017, https://medium.com/power-africa/the-sacred-nature-of-geothermal-energy-9f5f9f0de532 (Last Accessed January 8, 2019)
[488] "Contact Energy, Ngati Tahu win an international award on Kenyan geothermal engagement work," *ThinkGeo Energy*, April 20, 2018, http://www.thinkgeoenergy.com/contact-energy-and-ngati-tahu-win-international-award-on-geothermal-engagement-work-in-kenya/ (Last Accessed January 8, 2019).
[489] "New Zealand Energy Scenarios: Navigating Energy Futures to 2050," BusinessNZ Energy Council (2015), 45.

can adopt ethical energy systems that can change, rather than replicate, colonial technological infrastructures.

Conclusion: "Electricity and Exploitation"

> The ravaged beauty God alone could plan!
> Bitter the thought: 'Is this the price we pay–
> The price for progress–beauty swept away?'
>
> -William Pember Reeves, "The Passing of the Forest," 1898[490]

In 1962, biologist-activist J. T. Salmon published *Heritage Destroyed*, a book protesting environmental degradation and promoting reform in New Zealand's preservation system.[491] The primary source of his frustration was the construction of hydroelectric systems.

> In New Zealand the projects to develop our river systems for electrical power are being executed as engineering works only, without any thought for conservation principles, for landscape design, or for the preservation or enhancement of scenic attractions… The likely economic loss is not weighed against the probably economic gain of cheap electricity.[492]

His book and subsequent activism are often cited as the beginning of a decade-long reorganization of the National Parks Authority and a broader environmental movement in New Zealand.[493] At the heart of this book, and other similar protests, were the hydroelectric proposals for Lake Manapouri and the Aratiatia Rapids. Protesters argued that the facilities were detrimental to the environment, whereas the New Zealand Electricity Department, and the aluminum smelting company Consolidated Zinc, saw the project as means to generate enough electric power to unlock the "electro-industrial" potential of New Zealand's aluminum

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[490] William Pember Reeves, *New Zealand and Other Poems* (London: Grant Richards, 1898), 8
[491] Salmon was a senior lectured in biology at Victoria University in Wellington and celebrated member of the Royal Society of New Zealand.
[492] J.T. Salmon *Heritage Destroyed: The Crisis in Scenery Preservation in New Zealand* (Wellington: Reed, 1960), 67.
[493] Tony Nightingale and Paul Dingwall, *Our Picturesque Heritage: 100 Years of Scenery Preservation in New Zealand* (Wellington: Department of Conservation, 2003), 56.

resources.[494] This debate resonates with other similar environmental movements which challenged state power over nature. For the first time in the history of its electrification, many New Zealanders, Pākehā and Māori alike, agreed that the development of massive hydroelectric infrastructures did not adequately consider the consequences of electric power production for New Zealand's people or natural resources. New Zealand's electrical infrastructures had in fact never done so. In fact, electrification in New Zealand had been aimed at controlling New Zealand's people and resources.

The issues raised by the Manapouri controversy such as connecting New Zealand to the global economy, extracting the country's mineral wealth, exercising state power, and maintaining government-control over the land have been central to the country's electrification. Despite the protests, the Manapouri Hydroelectric Plant (800 MW) was completed in 1971 to power an aluminum smelting facility, and eventually a large swathe of the Southern Island Transmission Network.[495] The Manapouri plant is not an exception. It is the rule. Behind New Zealand's "green" or "clean" energy mantra exists dozens of hydro or fossil-fueled electric sources. With the exception of some new restructuring, the foundations of New Zealand's electric power infrastructures remain complicit in the settler colonial practices that lit Reefton, powered the Phoenix Mine, built Lake Coleridge, and necessitated Māori geothermal developments.

New Zealand is frequently cited as a sustainable and green country.[496] Numerous international organizations commend them for their commitment to renewable energy. As

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[494] Aaron Fox, "The Power Game: The Development of the Manapouri-Tiwai Point Electro-Industrial Complex, 1904-1969," PhD Thesis, University of Otago, 2001, 2–3

[495] It should be noted that the facility is capped at a certain water level to the efforts of environmental activists in the 1960s and again in the 1990s under Save Manapouri.

[496] https://www.cdp.net/en/cities/world-renewable-energy-cities

mentioned earlier, the vast majority of its renewable power comes from hydroelectric dams. Despite the benefit of a reduced carbon footprint, the country's green status is built on top centuries of colonial practices. Large hydroelectric infrastructures depend on land transformation and are built to provide massive amounts of electric power. Even if they result in less net pollution, they still reinforce exploitative practices that do not produce truly sustainable energy practices. To grapple with these issues, New Zealand will have to reconstruct their electric power generation practices.

By looking into these transformative moments of New Zealand's history we are better positioned to understand and, as the Māori have done, contest the influence of colonialism on contemporary systems. Reefton illustrates the ways that the Colonial Office and settlers used electric lighting to envision a "new" New Zealand. Prior to the official colonization of the islands (1840), the British saw New Zealand as the epitome of a colonial frontier because of the Māori, the geographic distance from Great Britain, and the challenging landscape. In Reefton, a mining outpost on the Western coast of the Southern Island, the introduction of electric lighting proved the supremacy of British technology, resonated with settler ideas about self-sufficiency, and promised to expand the island's productive potential. It was not an anomaly or technological marvel ahead of its time. Electric power in Reefton was just another exercise in British settler colonialism. Electric light and power served a rhetoric that appealed to a town filled with speculative investors and businessmen seeking profit from the mines and miners, a true resource frontier. The town serves as a starting point for highlighting how electric systems in New Zealand served imperial interests, as much as it served local interests in lighting and power. Lighting and electric power production was meant to benefit the expansion of production and tame the frontier in the name of the British Empire.

Similarly, the electrification of the Phoenix Mine highlights the motive behind the establishment of hydroelectric power systems in New Zealand, which was and remains to make the country more economically productive. In 1886, the Phoenix Gold Mine implemented a hydroelectric scheme to power mining equipment. Electrification promised to increase the mine's profits, conquer and utilize natural resources, and highlight British technological superiority. Hydroelectric power at the Phoenix Mine transformed New Zealand from a Pacific resource frontier, a materially exploitable region in the colonial periphery, into a model colony ready for urban energy infrastructure. The earliest hydroelectric structures were not pursued because they were renewable or preserved the environment. In fact, they destroyed existing environments and made the landscape suitable for only extractive industries and power production. As a cornerstone in the history of country's hydroelectric systems the Phoenix Mine's provides a means for understanding the colonial motives built into subsequent dams in New Zealand.

Just as electric power systems had fulfilled imperial visions of a self-reliant colony, the expansion and demand for electric power gave some officials cause to justify increased central government. The establishment of New Zealand's first national grid, which began with the Lake Coleridge Power Station in Canterbury epitomizes hydroimperialism in New Zealand because its construction hinged upon the repurposing of indigenous land, the establishment of national electric-power regulations, and support from a state agency, the Public Works Department. The centralization of electric power production behind a central authority was one of the many infrastructure developments that strengthened the cause for New Zealand's new national government. Furthermore, the dam demonstrates how Dominion, even with the decorum of independence, remained firmly within the framework of Britain's settler colonialism, especially

that of New Zealand. Rather than being seen as New Zealand's first step toward a modern electrical grid, Lake Coleridge was an adaptation of British colonialism that provided the physical infrastructure to justify a national government. Even at the end of the twentieth century when the state-run Electricity Corporation of New Zealand (ECNZ) disbanded and reconsolidated into private power boards, the physical infrastructure remained and enforced centralization, large-scale production, and exploitation of land.

As with so many other stories of electrification, these narratives can lead to the conclusion that certain methods of power production were simply inevitable. More than anything in this dissertation, I want to argue that the creation of large exploitative energy infrastructures was not inevitable. These systems developed because they benefitted political systems that relied on exploitation for expansion and production. That is why it is so important to pay attention to moments when those patterns are disrupted. The Māori example is so useful because even with the expansive colonial foundation of electric power production, Tuaropaki leaders found a means of restructuring the production of electric power. Just as New Zealand itself cannot remove or ignore its colonial heritage, it must acknowledge these colonial legacies built into its hydroelectric systems. Otherwise they continue to privilege exploitative energy infrastructures.

Moving forward I hope to add more Māori perspectives into this narrative by gaining permission to speak with the Māori who worked on transmission lines during the 1950s and meet with Māori involved in the construction of the Tuaropaki Power Station. Following the completion of that research I would like to begin a project about Māori energy technologies. Based on the exciting legal and energy policy work consulted for this dissertation, Māori ideas about energy and resource utilization will prove instrumental in guiding policy solutions to energy injustice. Just as energy transitions to socially and environmentally abusive energy

regimes were culturally constructed by industrial powers, like Great Britain, perhaps they can be reshaped by the very cultures imperialism sought to undo.

Appendix

General Timeline

- 1250-1300 Māori Arrival
- 1642 Abel Tasman charts New Zealand
- 1769 James Cook spots New Zealand
- 1790 British Settlement Begins
- 1839 New Zealand Company
- 1840 Treaty of Waitangi
- 1861 Otago Gold Rush
- 1870 Immigration and Public Works Act
- 1886 Reefton Electric Lights
- 1887 The Phoenix Mine Builds an Electric Stamper
- 1907 New Zealand becomes a Dominion
- 1914 Lake Coleridge Switched On
- 1951 Tuaropaki Trust Established
- 1953 Māori Affairs Act
- 2000 Mokai 1 Switched On

Māori Lexicon

Māori language terms will be used throughout this dissertation. Here is a list of the terms that will be used repeatedly. More descriptive explanations can be found in footnotes in relevant sections.

Whenua- Family
Marae- Meeting Place or Center of Culture
Hapu- Subtribe or family
Iwi- People or Nation, used to refer to a tribe or confederation of tribes
Māori – Indigenous Polynesian people of New Zealand
Moriori -Indigenous people of the Chatham Islands
Pākehā – Traditionally, but not exclusively, used to describe non-Māori of European descent.
Te Waipounamu- The Southern Island
Te Ika-a-Māui- The Northern Island
Tino Ranhatiratanga- Treaty of Waitangi (1840) term meaning, absolute sovereignty

Electric Power Bureaucracy

1865 Public Works Department
1946 State Hydro Electric Department
1958 State Electricity Department
1977 Ministry of Energy
1986 Electricity Corporation of New Zealand (ECNZ)
1998 Break Up of ECNZ
2000 Electricity Commission
2010 Electricity Authority

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Engineering and Mining Journal
Journal of the Institution of Electrical Engineers
Nature
New Zealand Journal of Science and Technology
Proceedings of the Electrical Engineering Advisory Committee
Proceedings of the New Zealand Institute
Telegraphic Journal and Electrical Review
The Electrician
The Electrical Engineer

The Electrical Journal
The Electrical World
Transactions of the Federated Institution of Mining Engineers
Transactions of the North of England Institute of Mining and Mechanical Engineers
Transactions of the Royal Society of New Zealand

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Ashburton Guardian
Ashburton Times
Auckland Star
Cromwell Argus
Evening Post
Grey River Argus
Inangahua Times
Kumara Times
Lake Wakatip Mail
Lyttleton Times
Nelson Examiner and New Zealand Chronicle
New Zealand Colonist
New Zealand Gazette
New Zealand Herald
New Zealand Times
Northern Advocate
North Otago Times
Otago Daily Times
Otago Witness
Taranaki Daily News
Thames Adviser
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The Colonist
The New Zealand Journal
The Press
The Spectator
Timaru Herald
Tuapeka Times
West Coast Times
Wellington Independent

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