ELECTRIC SPACE: SOCIAL AND NATURAL TRANSFORMATIONS IN BRITISH COLUMBIA'S HYDROELECTRIC INDUSTRY TO WORLD WAR II

BY

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A Thesis
Submitted to the Faculty of Graduate Studies
In Partial Fulfillment of the Requirements for the Degree of

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Abstract

The following study analyzes the interrelationship of the social and natural transformations effected by the development of hydroelectricity in British Columbia to World War II. The analysis is grounded in the literature on energy transitions and large-scale technological systems. It employs Henri Lefebvre's theory of the production of space to support its central argument that the production of electric space was characterized by several key factors: the concentration of the control society's energy sources in large corporations; increased space-time compression to meet the requirements of hydroelectric supply and demand; the imposition of electricity demand patterns on the natural rhythms of rivers dammed for hydroelectricity; the fetishization of energy; the increased discipline and control of different segments of society to facilitate both the production and consumption of electricity; the encouragement of the development of a suburban middle-class reliant on energy-intensive technologies.

The study begins with a theoretical discussion of the literature on hydroelectricity and river development. Chapter 2 outlines the history of early, small-scale hydroelectric projects in British Columbia which were locally controlled and required little capital, engineering expertise or centralized management. By World War II these small facilities had been superseded and marginalized by large-scale, capital-intensive, corporate facilities. Chapter 3 is a

case study of the development of hydroelectricity in British Columbia's Kootenay region. It traces the evolution of succeeding spatial formations, from Native space, to agricultural space to electric space. Chapter 4 explains how the electric industry's efforts to increase the consumption of electricity led to the transformation of public and private space in the city. Chapter 5 explains how the introduction of electricity created new hazards and how the electric industry sought to minimize concerns about real hazards while capitalizing on perceived hazards to increase demand for electricity. Chapter 6 summarizes the study's findings.

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This dissertation is dedicated to the memory of Douglas Cole.

Chapter 1

Introduction: Energy and Alienation

Introduction

The conversion and application of energy are fundamental ways in which society and nature are interconnected. All human existence is dependent on the continuous conversion of energy into useful forms. The centrality of energy conversion means that its effects are found in every aspect of life. Its economic importance is most evident, and while Marx had little to say about the specifics of energy flows, it is now well accepted by political economists that all forms of production, and capitalist production in particular, "are based on energy flows and transformations."[1] Energy also has a cultural and social history. Transformations in social structures, and their concomitant cultural aspects, have been influenced and shaped by the control and manipulation of new energy sources.[2]

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[1] James O'Connor, Natural Causes: Essays in Ecological Marxism (New York: Guildford Press, 1998) 122.
[2] The study of energy conversions and their social, cultural and economic aspects has been described as a separate sub-discipline called 'energetics.' See, Vaclav Smil, General Energetics (New York: John Wiley, 1991).

One of society's primary sources of energy is the kinetic energy of falling water. Until the late nineteenth century waterpower was utilized by converting it into mechanical energy through the installation of water wheels on fast flowing rivers. The development of the electric industry transformed the generation and use of waterpower by encouraging the development of hydroelectricity. Studies of the history of hydroelectricity in Canada have tended towards political economy, with special interest in the development of utility monopolies, Canadian economic sovereignty, and, more recently, the possible effects of deregulation.[3] In British Columbia the political aspects of the construction of hydroelectric dams on the

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[3] John Harkness Dales, Hydroelectricity and Industrial Development: Quebec, 1898-1940 (Cambridge, Mass.: Harvard University Press, 1957); Patricia E. Roy, "The British Columbia Electric Railway Company, 1897-1928: A British Company in British Columbia," Ph.D. Dissertation (University of British Columbia, 1970); H.V. Nelles, The Politics of Development: Forests, Mines & Hydro-Electric Power in Ontario, 1849-1941 (Toronto: Macmillan of Canada, 1974); Christopher Armstrong and H.V. Nelles, Monopoly's Moment: The Organization and Regulation of Canadian Utilities, 1830-1930 (Philadelphia: Temple University Press, 1986); Claude Bellavance, Shawinigan Water and Power, 1898-1963: Formation and Decline of an Industrial Group in Quebec (Montreal: Les Editions du Boreal, 1994); Neil B. Freeman, The Politics of Power: Ontario Hydro and Its Government, 1906-1995 (Toronto: University of Toronto Press, 1996); Aynsley Kellow, Transforming Power: The Politics of Electricity Planning (Cambridge: Cambridge University Press, 1996); Wayne Skene, Delusions of Power: Vanity, Folly and the Uncertain Future of Canada's Hydro Giants (Vancouver: Douglas & McIntyre, 1997); Karl Froschauer, White Gold: Hydroelectric Power in Canada (Vancouver: UBC Press, 1999).

Columbia River has received greatest interest.[4] Large-scale hydroelectric developments have been built far from Canada's major cities. Rural residents, not city dwellers, have borne the social and environmental effects of these developments. Their descriptions of how their lives were turned upside down, and their resentment towards the political and corporate interests responsible, make for compelling reading.[5] Canada's aboriginal communities have been particularly ill-served by large-scale hydroelectric projects. Flooding of their territories and the transformation of natural flows have disrupted or destroyed traditional subsistence patterns leaving many aboriginal communities marginalized and economically

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[4] Neil A. Swainson, Conflict over the Columbia: The Canadian Background to an Historic Treaty (Montreal: McGill-Queen's University Press, 1979); Richard C. Bocking, Canada's Water: For Sale? (Toronto: James Lewis & Samuel, Publishers, 1972); Larratt Higgins, "The Alienation of Canadian Resources: The Case of the Columbia River Treaty," Close the 49th Parallel, Etc.: The Americanization of Canada, Ian Lumsden ed. (Toronto: University of Toronto Press, 1970) 223-40;

[5] For British Columbia examples see: Donald Waterfield, Land Grab: One Man Versus the Authority (Toronto: Clarke, Irwin & Company Ltd., 1973); J.W. Wilson, People in the Way: The Human Aspects of the Columbia River Project (Toronto: University of Toronto Press, 1973); J.W. Wilson and Maureen Conn, "On Uprooting and Rerooting: Reflections on the Columbia River Project," BC Studies 58 (1983) 40-54; Earl K. Pollon, and Shirlee Smith Matheson, This Was Our Valley (Calgary: Detselig Enterprises Ltd., 1989); Jean Clark Giesbrecht, Heritage Lost: A People's History of the Ootsa Lake Region, 1905-1955 (Likely, B.C.: Quesnel Lake Publishing, 1994); Bev Christensen, Too Good to Be True: Alcan's Kemano Completion Project (Vancouver: Talonbooks, 1995).

dependent.[6] These studies have made significant contributions to our understanding of the political and economic forces which encouraged and shaped the development of hydroelectricity and the social and environmental consequences of these developments. None have seriously addressed the question of how these economic and environmental transformations were part of a single process that recreated nature and society.

Several American studies of river development have addressed this question but most have concentrated on damming rivers for irrigation and

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[6] Boyce Richardson, Strangers Devour the Land (New York: Alfred A. Knopf, 1976); Paul Charest, "Hydroelectric Dam Construction and the Foraging Activities of Eastern Quebec Montagnais," Politics and History in Band Societies, Eleanor Leacock and Richard Lee, eds. (Cambridge: Cambridge University Press, 1982) 413-26; James B. Waldram, As Long as the Rivers Run: Hydroelectric Development and Native Communities in Western Canada (Winnipeg: University of Manitoba Press, 1988); Frank Quinn, "As Long as the Rivers Run: The Impact of Corporate Water Development on Native Communities in Canada," Canadian Journal of Native Studies 11.1 (1991) 137-54; Sean McCutcheon, Electric Rivers: The Story of the James Bay Project (Montreal: Black Rose Books, 1991); Mary Koyl, "Cultural Chasm: A 1960s Hydro Development and the Tsay Keh Dene Native Community of Northern British Columbia," M.A. Thesis (University of Victoria, 1993). Katherine Buhler, "Come Hell and High Water: The Relocation of the Cheslatta First Nation," M.A. Thesis (University of Northern British Columbia, 1998); James F. Horing, ed. Social and Environmental Impacts of the James Bay Hydroelectric Project (Montreal: McGill-Queen's University Press, 1999); Jean L. Manore Cross-Currents: Hydroelectricity and the Engineering of Northern Ontario (Waterloo, Ont.: Wilfrid Laurier University Press, 1999).

domestic water supply, not hydroelectricity.[7] Theodore Steinberg's Nature Incorporated: Industrialization and the Waters of New England specifically analyzes the growth of industrial capitalism as an ecological system, but its subject is the conversion of waterpower to mechanical energy in the early nineteenth century, not hydroelectricity under corporate capitalism in the twentieth century.[8] Furthermore, its conclusions regarding the commodification and domination of nature do not adequately explain how relations between different segments of society and their energy sources was changed. James Williams's study of the history of energy in California specifically addresses the question of hydroelectricity and social and natural change, but it does not provide a workable

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[7] See for example, Norris Hundley, Jr., Water and the West: The Colorado River Compact and the Politics of Water in the American West (Berkeley: University of California Press, 1975); William L. Kahrl, Water and Power: The Conflict over Los Angeles' Water Supply in the Owens Valley (Berkeley: University of California Press, 1982); Donald Worster, Rivers of Empire: Water, Aridity, and the Growth of the American West (New York: Oxford University Press, 1985); Marc Reisner, Cadillac Desert: The American West and Its Disappearing Water (New York: Viking, 1986); James E. Sherow, Watering the Valley: Development Along the High Plains Arkansas River, 1870-1950 (Lawrence: University of Kansas Press, 1990); Donald J. Pisani, To Reclaim a Divided West: Water, Law, and Public Policy, 1848-1902 (Albuquerque: University of New Mexico Press, 1992); Norris Hundley, Jr. The Great Thirst: Californians and Water, 1770s-1990s (Berkeley: University of California Press, 1992).

[8] Theodore Steinberg, Nature Incorporated: Industrialization and the Waters of New England (New York: Cambridge University Press, 1991).

theory of how these changes were interconnected.[9] Richard White's Organic Machine has addressed the question of social and environmental relations transformed through the development of hydroelectricity on the Columbia River.[10] White's book exemplifies the problem of a cultural/environmental history that largely ignores political economy and systems of power and domination. Specific interests have exerted inordinate influence on the development of the Columbia and these interests have often been shortsighted, anti-democratic and destructive. White evades this basic question. His description implies that American society has been involved in an informed and vigorous debate over the Columbia and now must live with the consequences of its decisions. White's own work, as well as important publications by other historians and environmentalists repudiate this assumption. Until the 1970s a large majority of the population gave little sustained thought to the natural and social consequences of river development, exhibiting a willingness to either continue on in ignorance or to accept the hollow rhetoric and empty promises of politicians and developers.

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[9] James C. Williams, Energy and the Making of Modern California (Akron, Ohio: University of Akron Press, 1997).
[10] Richard White, The Organic Machine: The Remaking of the Columbia River (New York: Hill and Wang, 1995).

The American study which offers the best model for explaining the development of hydroelectricity is William Cronon's Nature's Metropolis, a book which did not address hydroelectricity or energy specifically.[11] Cronon undertook to explain how the growth of industrial capitalism and its control of the flow of staple commodities recreated the relationship between the city and the country in the American West. In many ways it was an American version of Raymond Williams' classic The Country and the City, with an analysis of cattle and grain substituting for prose and poetry.[12] The development of the electric industry is similar to the growth of the railways, a central factor in Cronon's study. Furthermore the commodification of waterpower and the flow of energy from the country to city has close parallels with Cronon's study of grain, cattle and other commodities. Cronon's book has been praised for its detailed story, but it has been criticized for paying scant attention to the larger questions of capitalist power and alienation.[13] Capitalism was the driving force in the recreation of the city and the country, but unlike Williams who rooted his study in class conflict and capitalist

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[11] William Cronon, Nature's Metropolis: Chicago and the Great West (New York: W.W. Norton & Company, 1991).
[12] Raymond Williams, The Country and the City (London: Chatto & Windus, 1973).
[13] O'Connor, Natural Causes, 110-11.

power, Cronon largely ignored the question of 'who rides whom and how.' As Cole Harris has noted, Nature's Metropolis does not offer a coherent explanation of people's increasing alienation as a result of natural transformations and Cronon does not "make sense of the social and environmental relations of capitalism."[14]

To engage these basic questions a theory is required that considers social and environmental transformations in the context of economic and social power. Henri Lefebvre's theory of the production of space meets these requirements.[15] Lefebvre asserted that the capitalist project was about more than rearranging or transforming objects in space, it was about the transformation of space itself, of the concrete, tactile space of everyday life to the abstract, regimented and homogenized space of corporate capitalism and the modern state. One of the strengths of Lefebvre's theory is that it provides a system of analysis which overcomes the perceived separation of nature and society, of the city and the country. There are a multiplicity of social spaces which interpenetrate and unite production and consumption, structure and superstructure, nature and society, labour and technology. These spaces are rarely, if ever, abolished. Even in the face

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[14] Cole Harris, "From Turner and Von Thunen to Marx and Leopold," Antipode 26.2 (1994) 124.
[15] Henri Lefebvre, The Production of Space, Trans. Donald Nicholson-Smith (Oxford: Basil Blackwell, 1991 (1974)).

of the most totalising and oppressive new forms of power and domination they continue to exist as remnants of earlier and alternative ways of being in the world.[16] Lefebvre's theory has been refined, expanded and applied by several scholars, and all have recognized that at the basis of Lefebvre's argument was a concern with the simultaneous transformation of nature and society.[17] The application of the theory of the production of space to the development of hydroelectricity requires a grounding in several other sub-disciplines which theorize the significance of energy, technology and efficiency.

Energy Regimes

Historians of energy and technology have emphasized the role of new energy sources in sweeping social transformations and have frequently periodized

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[16] Lefbvre, The Production of Space, 85-87.

[17] David Harvey's work is especially indebted to Lefebvre. See for example; David Harvey, The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change (Cambridge MA ; Oxford UK: Blackwell, 1990); David Harvey, Justice, Nature, and the Geography of Difference, (Cambridge, Mass.: Blackwell Publishers, 1996); David Harvey, Spaces of Hope (Berkeley: University of California Press, 2000). The best analysis of Lefebvre's and Harvey's work is Derek Gregory, Geographical Imaginations (Cambridge, MA: Blackwell, 1994). The best application of Lefebvre's theory is, Neil Smith, Uneven Development: Nature, Capital and the Production of Space 2nd Edition (Oxford: Blackwell, 1990).

human history based on the advent and development of revolutionary energy conversions. Lewis Mumford's schematic of three distinct phases of human history corresponding to new technologies and their accompanying energy sources is one of the best known.[18] For Mumford, the general period from 1000 to 1750 was the Eotechnic age, characterized by the dominance of wood and wind. The Paleotechnic age, the age of coal, followed and lasted until roughly 1900. In the closing years of the nineteenth century accumulated scientific knowledge, engineering expertise and capital united to develop hydroelectricity, an energy source which, according to Mumford, launched a distinctive new technological phase, the Neotechnic age. American historians continue to rely on a similar periodization to chart the development of technology. David E. Nye contends that American industrial development can be divided into periods based on the different energy sources of water, steam and electricity. "Each of these forms of power generation dictated the size, the location, and the form of industry…." Nye argues that a comparison of early industrial development in the United States and Britain reveals that different national energy sources generated different forms of industrialization with different spatial elements. British industry was based

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[18] Lewis Mumford, Technics and Civilization (New York: Harcourt, Brace & World, Inc., 1934).

primarily on steampower and became centred in large cities, while waterpower dominated in the United States which meant that industry was dispersed over the countryside and served as the impetus for numerous small towns. Consequently, different industrial formations, founded on different energy sources, "produced distinctive landscapes."[19]

Nye's argument may provoke accusations of `energetic' determinism, but his many books on the history of technology in the United States demonstrate that his analysis and insights are far too subtle and complex for this to be a serious criticism. Conversely, Mumford's writings, although often prescient, are riddled with a crude determinism, a common pitfall for historians of technology.[20] One of the dangers is to over emphasize the supposed revolutionary characteristics of a new technology or energy source. This discounts the long and arduous history of the development of new energy sources, a history that is often fraught with failures and dead ends. It also ignores the common resistance to change that greets promoters of a new energy source. An appreciation of this resistance is vital for understanding how energy sources are adopted and moulded by particular social,

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[19] David E. Nye, American Technological Sublime (Cambridge, Mass.: The MIT Press, 1994) 111.
[20] The classic example from the history of technology in the American West is Walter Prescott Webb, The Great Plains (New York: Grosset & Dunlap, 1931).

political and economic dynamics. Finally, revolutionary arguments conceal the persistence of established energy sources and their continuing viability as alternatives to seemingly hegemonic energy systems. For all these reasons, instead of discussing energy revolutions, it is more accurate to identify 'energy transitions' which are critical, but not determinative, of a complex matrix of social, economic, political and cultural change.[21] An additional subject of importance must be added: nature. Although it is an obvious truism, the fact that all discussions of energy transitions entail a discussion of a society's changing relationship with the non-human world is often lost in examinations of energy transitions. Every energy transition is equally a social, technological and ecological project.

An energy transition gives rise to a new 'energy system'. An energy system can be defined as a distinctive social, technological and ecological structure which relies on the conversion of specific sources of energy and which is "initiated or controlled by classes or social groups which develop and consolidate on the basis

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[21] Martin V. Melosi, "Energy Transitions in the Nineteenth-Century Economy" Energy and Transport: Historical Perspectives on Policy Issues, eds. George H. Daniels and Mark H. Rose (Beverly Hills: Sage Publications, 1982) 55-69.

of this control."[22] The appreciation of the element of class or group control is critical to analyzing the introduction and maturation of a new energy system. Energy systems and their accompanying technologies tend to be 'naturalized' and their structures and dynamics are too often explained as being preordained and apolitical. For this reason, energy systems are best described as 'energy regimes,' a term which captures the elements of governance, regimentation, discipline and power essential to every established energy system. Energy regimes, as described by Langdon Winner, entail specific social, economic and political structures which facilitate their development and maintenance. The creation of a new energy regime has far reaching ramifications because it "involves a partial reconstruction of society" including "broadscale changes in how people are able to live and work…." Nevertheless, the power dynamics of these transformations are often ignored. Winner cites the example of the electrical energy regime which is based on an assumed social contract where a central generating company is expect to meet only basic requirements of supplying cheap and reliable power. This simplification of the relationship obscures the reality that electric companies "tend

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[22] Jean Claude Debeir, Jean-Paul Deleage, and Daniel Hemery, In the Servitude of Power: Energy and Civilization through the Ages trans. John Barzman (London and Atlantic Highlands, NJ: Zed Books, Ltd., 1991) 5.

to be extremely large, complex, centralized, and hierarchically managed. Their enormous power is exercised on a wide variety of conditions in society which affect their operations; for example, continuing attempts to influence aggregate consumer demand."[23]

The history of attempts to increase demand for electricity is indicative of an important characteristic of the electric energy regime: the crisis of abundance.[24] Although there have been occasional local shortages of electric energy, the history of electricity since the late nineteenth century has generally been one of supply in search of demand. The impact has been felt at many different levels. Generally, the need to control massive amounts of energy has become an "obsessive twentieth-century concern…."[25] This concern has encouraged the development of complex technological systems which are powerful, centralized, homogeneous and inherently antidemocratic. The effects have been cultural, as well as economic and political. The growth of a new energy regime entails the popularization of an

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[23] Langdon Winner, "Energy Regimes and the Ideology of Efficiency" Energy and Transport: Historical Perspectives on Policy Issues, eds. George H. Daniels and Mark H. Rose (Beverly Hills: Sage Publications, 1982) 273.
[24] The reality and perception of abundant energy is basic to the history of energy in the United States. See, Martin Melosi, Coping with Abundance: Energy and Environment in Industrial America (Philadelphia: Temple University Press, 1985).
[25] Thomas P. Hughes, American Genesis: A Century of Invention and Technological Enthusiasm (New York: Penguin Books, 1989) 135.

accompanying 'energy myth' which holds that the new energy source is unlimited, faultless and promises to fulfil a society's highest aspirations.[26]

Electricity was heralded as 'white coal', a clean, abundant and benign energy which would emancipate housewives, 'energize' industry and bring leisure and prosperity to all. Importantly, glowing prognostications were not confined to electric industry boosters. Mumford's Technics and Civilization, published in 1934, epitomized the new optimism that accompanied the spread of electric energy. Among the many advantages of electricity, especially hydroelectric power, Mumford listed its promise for redistributing industry across countries and around the world to localities with abundant waterpower. It would also engender greater thrift in industry and careful conservation of natural resources.

> The smoke pall of the paleotechnic industry begins to lift: with electricity the clear sky and the clean waters of the eotechnic phase come back again: the water that runs through the immaculate disks of the turbine, unlike the water filled with the washings of the coal seams or the refuse of the old chemical factories, is just as pure when it emerges.[27]

Mumford's enthusiasm for hydroelectricity was short-lived. Later in life he railed against the 'megamachine' that was extending its influence and control over every

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[26] George Basalla, "Some Persistent Energy Myths" Energy and Transport: Historical Perspectives on Policy Issues, eds. George H. Daniels and Mark H. Rose (Beverly Hills: Sage Publications, 1982) 27-38.
[27] Mumford, Technics and Civilization, 255-56.

aspect of modern life.[28] Ironically, the megamachine was best exemplified by the large central generating stations that soon came to represent hydroelectricity in both Canada and the United States. His reversal of opinion is instructive because it supports a key criticism of the predominant culture of emerging energy regimes. "Energy myths are particularly dangerous because they blind us to the realities of new energy sources by promising a golden land of the future and ignoring the real problems of today."[29] This has been particularly true of hydroelectric developments. The image of pure, clean water flowing from hydroelectric turbines, has been replaced by the reality of flooded communities, submerged spawning grounds and salmon entrained in the turbines' whirling blades.

An explanation of the contradiction between the long lasting perception of 'good' hydroelectricity and its less-benign political, social and ecological realities requires further investigation. Such an economic and cultural study entails an appreciation of capitalism's power to abstract commodities from their concrete social and ecological relationships. In Marxist theory this is expressed as the transformation from 'use-value' to 'exchange-value' and as the fetishization of

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[28] Lewis Mumford, The Pentagon of Power (New York: Harcourt Brace & World, 1970).
[29] Basalla, "Some Persistent Energy Myths," 28.

commodities. Fetishization involves imbuing an object with significance and value unassociated with its true nature and relevance. It sunders objects from the social relations of their production, conceals these relations and presents the objects as the product of secondary relations, complete with a new set of values and qualities. The growth of the market and the circulation of money led directly to both commodification and fetishization. "We move from a social condition, in which we depend directly on those we know personally, to one in which we depend on impersonal and objective relations with others."[30] The concrete space of everyday life, of tangible and knowable bonds and relations between people and between communities and nature are undermined; the role of producers and the conditions of production and consumption are obscured.

The process of fetishization applies to technology and energy just as it does to money and commodities. Technology becomes fetishized when it is assumed that it is autonomous from social relations and is instead the result of relations between objects, machines and artefacts. Consequently, the political and economic forces which promote and shape technology are shrouded by an uncritical and popular belief that technology is a driving force unto itself, a force which is

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[30] Harvey, The Condition of Postmodernity, 100.

apolitical and disinterested.[31] Similarly, modern energy conversions, especially hydroelectric systems, obscure the relationships between production, consumption and nature. The electric industry works to fetishize the natural kinetic energy of falling water, making it appear to exist outside of nature and independent of social and natural relations. This alienation from the conditions of production (rivers, dams and reservoirs) creates a space where electricity can represent a set of values and ideas (modernity, prosperity, freedom and power) which further disguise its authentic social, political and ecological origins.

A belief in abundance, as well as the uncritical acceptance of the necessity and desire for continual and unlimited growth, soon developed around the electric industry. This dedication to growth was fully compatible with the goals of electric engineers, boosters and capitalists who adopted it as their platform for increasing both supply and demand.[32] The executive director of the American Public Power Association captured the essence of the culture of the electric energy regime and

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[31] Bryan Pfaffenberger, "Fetishised Objects and Humanised Nature: Towards an Anthropology of Technology," Man 23 (1988) 236-252 and Langdon Winner, Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought (Cambridge, Mass.: MIT Press, 1977).
[32] Thomas P. Hughes, Networks of Power: Electrification of Western Society, 1880-1930 (Baltimore: John Hopkins University Press, 1983). Hughes found this was especially true for American regional systems of the 1920s. See pp. 363-64.

its technological optimism in a 1948 plea for greater development. He argued that low-cost electric power was essential, not only for industrial progress, but also to expand international trade and the achievement of world peace. He explained that "prosperity depends on increasing productivity per man hour. Productivity is increasingly dependent upon the machine. And the machine, as we all know, is dependent upon energy. Unhampered development of the nation's power resources becomes then a goal for all progressive Americans."[33]

The social and ecological effects of the fetishization of electric energy as growth and prosperity have been extensive. Winner has identified a connection between the expansion of energy regimes in the United States and acceptance of growth as an end in itself. He has encouraged an examination of the effects of this process on democracy, the structures of political power and the distribution of wealth.[34] A key characteristic of the representation of energy as growth and prosperity has been a prevailing blindness to the political, economic and ecological structures and effects of modern energy regimes. Instead of an awareness of the realities of production and distribution, the vast majority of

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[33] Carlton L. Nau, "Electric Power" Saving American Capitalism: A Liberal Economic Program, ed. Seymour E. Harris (New York: Alfred A. Knopf, 1948) 117-18.
[34] Winner, "Energy Regimes," 267.

Americans and Canadians have experienced and understood modern energy regimes solely at the level of consumption. While ordinary people participate in these new energy regimes, they do so "not by controlling the manner of its production or distribution, but by enjoying the wealth created by increasing energy use, by filling their lives with the various commodities—automobiles, heaters, radios, televisions, hair dryers, lawn mowers, and the like—that the economy makes available to everyone, regardless (so it is hoped) of social class."[35] An understanding of the growth and perpetuation of modern energy regimes, including their idealization, power dynamics and conditions of production and consumption, is crucial to the analysis of the natural and social transformations that have been wrought by the development of hydroelectricity.

Technology

At the core of hydroelectric history is the conversion, distribution and utilization of the energy of falling water. The process requires a sophisticated and expansive technological system. For this reason an explanation of how society and nature have been intertwined through the growth of hydroelectricity requires a

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[35] Winner, "Energy Regimes," 269.

theoretical structure that encompasses the workings of technological systems, as well as energy regimes. There are two attributes of all technological systems which are critical to understanding the role of hydroelectricity in natural and social transformations: technological systems are fundamentally social not technical, and technological systems form a dialectic between society and nature. The argument that technology is a social phenomenon is well established in the history of technology. Influential works by Langdon Winner and David Noble have demonstrated that far from being determinant, autonomous or somnambulant, technology is infused with social, political, cultural and economic forces which influence its development and effects on society.[36] Extended to their logical ends, the arguments for technology as a social process support Heidegger's aphorism that the essence of technology is nothing technical.

While technology may not be exclusively technical, neither is it singularly social. Technology and the development of complex technological systems are inherently ecological projects. Marx recognized this, asserting that it was the study

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[36] Winner, Autonomous Technology; Langdon Winner, The Whale and the Reactor: A Search for Limits in an Age of High Technology (Chicago and London: University of Chicago Press, 1986); David F. Noble, America by Design: Science, Technology, and the Rise of Corporate Capitalism (New York: Alfred A. Knopf, 1977); David F. Noble, The Religion of Technology: The Divinity of Man and the Spirit of Invention (New York: Alfred A. Knopf, 1997).

of technology that revealed society's relationship with the non-human world.[37] Marx understood that technology represented a society's method for sustaining life (through energy conversions), creating social relations, and embedding these relations in nature through its ecological and technical projects.[38] For these reasons technology, instead of existing outside of society and nature, is best understood as the extension of humanity into nature.[39] Neither this extension nor its effects is unidirectional. As much as society extends itself into nature through the development of technology, and by doing so imprints its social and political relations on the natural world, it also incorporates natural conditions into its social structure, even if these natural elements are often distorted and difficult to identify. This dialectical relationship means that through technology society not only produces a second nature, with both intended and unintended consequences, but it also subsumes natural elements into its built environment and social relations and finds itself transformed in the process.[40] This process, as with the advent and promotion of all technological systems, is not determined merely through

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[37] Pfaffenberger, "Fetishised Objects and Humanised Nature," 236.
[38] David Harvey, Justice, Nature, and the Geography of Difference, 200.
[39] David Rothenberg, Hand's End: Technology and the Limits of Nature (Berkeley: University of California Press, 1993).
[40] Marx's dialectic of man and nature is discussed in William Leiss, The Domination of Nature (New York: George Braziller, 1972).

technical, rational or economic criteria. The process entails a series of political, social and ecological choices, largely influenced by the set of meanings that is attributed to the new technology. For this reason the development of a technological system, in all its social and natural forms, includes the exercise of power over society and nature.

The development of hydroelectricity as a technological system, as opposed to an assortment of individual machines, is an important aspect to consider when analyzing its role in transforming both society and nature. Thomas Hughes has repeatedly argued that the defining characteristic of modern technology is that machines are rarely, if ever, invented and refined to operate in isolation from other machines and larger systems of organization. They are conceived and designed to work within established and evolving large-scale systems. These systems influence the form and function of the new machine as well as its social effects.[41] For example, the seemingly innocuous electric toaster was designed to fit within a large and complex system that included electric outlets, wired homes, a central generating station, transformers, transmission lines, electric turbines, dams and reservoirs. Electricity epitomizes modern large-scale technological systems, but it

[41] Hughes, American Genesis and Networks of Power.

is unique among energy systems in that the entire system had to be invented, developed and established before it became viable.[42] Over a period of roughly a hundred years scientists, inventors, promoters and business managers including, among many others, Michael Faraday, Nicola Tesla, Thomas Edison, Elihu Thomson and Samuel Insull made important contributions to what became in the end a unique energy regime based on new systems of production, distribution and consumption. Of all the contributors, it is Edison who is widely regarded as having made the greatest contribution to the conception and development of the electric system.[43] While others invented and enhanced specific component parts, it was Edison, the great systematizer, who imagined the total integrated system. "It was the conception of their total functioning together as a practicable kit for generating, controlling, measuring, distributing and utilizing power derived from a central generating station that is the great invention."[44]

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[42] Smil, General Energetics 175 and Energy in World History (Boulder, Col.: Westview Press, 1994) 169.

[43] Hughes, Networks of Power; Smil, Energy in World History, 169-70; Neil Baldwin, Edison: Inventing the Century (New York: Hyperion, 1995); and Andre Millard, Edison and the Business of Innovation (Baltimore: Johns Hopkins University Press, 1990).

[44] Reyner Banham, The Architecture of the Well-Tempered Environment (Chicago and London: The Architectural Press, London and University of Chicago Press, 1969) 61.

Edison's system, in its specific formation as hydroelectricity, was as much natural as it was technical, social and economic. Ultimately it was natural because the utilized energy was derived from fast flowing, mountainous rivers, but it was also a natural system in the sense that it was designed in response to physical and natural obstacles and resistance. It was no accident that many of the major innovations in hydroelectric technology during its formative years were first developed in California. The state's relative paucity of wood and coal, taken together with its numerous waterpower sites and immense spaces, constituted an environment that necessitated innovations in long-distance electric transmission. It was in California during the 1890s that modern three-phase transmission of alternating current was demonstrated, with the first effective operation involving a hydroelectric plant on the American River and a 22 mile-long transmission line to Sacramento in 1895.[45] "The history of the episode," according to Hughes, "is a striking example of human beings using technology to mediate between themselves and nature, a relationship as old as human history."[46] Older forms of

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[45] Williams, Energy and the Making of Modern California, 176. Also, see Charles M. Coleman, P.G. and E. of California: The Centennial Story of Pacific Gas and Electric Company, 1852-1952 (New York: McGraw-Hill, 1952) and Hughes Networks of Power, 262-284.
[46] Hughes, Networks of Power, 265.

mediations between humans and the power of falling water had involved the conversion of kinetic energy into mechanical energy, usually involving a selection from a wide variety of waterwheels and their connection to a system of gears and shafts. The defining characteristic of these systems was that they were inevitably local. The energy, whether used for milling, mining or crafts had to be utilized at the site of its conversion, which meant along the banks of the river that was its source. The development of long-distance electric transmission in the 1890s altered this relationship by creating radically new possibilities for the spatial dimension of the electric energy regime. Furthermore, hydroelectricity became 'natural' in the sense that as with all large-scale technological systems, the boundary between the individual artefacts or machines, and the rest of the components of the system, including rivers and lakes, became increasing blurred.[47] As the system developed it became difficult to separate artifice from nature. Finally, hydroelectricity has become a 'natural phenomenon' because the human element, the ghost in the machine, has become near invisible. Unlike small individual tools or machines which require visible human presence and involvement, hydroelectricity appears to operate independently of human will.

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[47] Leo Marx discusses this attribute of all large socio-technical formations. See, "In the Driving-Seat," Times Literary Supplement August 29 (1997) 3-4.

Transmission lines, underground substations, powerhouses, dams and reservoirs have all become fixtures of the environment.[48]

The naturalization of technological systems has many consequences, one of which is that their characteristics and logic affect the non-human world as well as society's relationship with the environment. The extent to which society and nature acquire technological characteristics and whether this process is necessary is dependent on specific local, political and technological circumstances. Hughes's history of electric power's development contends that the highly ordered, centralized, coordinated and efficient world of electricity had a subtle but pervasive effect on modern society. In short, these same characteristics became predominant and were soon accepted as essential to the smooth functioning of social relations. The argument that technological systems are inherently political can be carried further, culminating in the hypothesis that technology not only imparts characteristics to society, but that it requires and even demands complementary social relations for its development and perpetuation. Alfred Chandler makes this assertion in his examination of the managerial history of large-scale American technological systems, including the railway and

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[48] The different human and natural qualities of technologies are discussed by Rothenberg, Hand's End, 32.

electricity.[49] Chandler argues that earlier political and economic formations, most notably the small family-owned and operated business, were unfit to manage large-scale technological systems which required new forms of organization that were technocratic, centralized and hierarchical. The degree to which centralized and bureaucratic technologies necessitate a similar reorganization of society is far from clear, as Winner avers, but it is obvious that their technological characteristics are at the very least highly compatible with centralized, bureaucratic and powerful political systems.[50]

The influence of technological systems, such as the railway and electricity, extend far beyond political formations to how people situate themselves in the world, how they imagine and experience space and time. Railways are often cited as the prime example, wherein the train is presented as the manifestation of Marx's dictum that capitalism annihilates space through time. The results include the widening spheres of capitalist influence and the integration of previously remote localities into the rules and circulation of the market.[51] The example of the railway is instructive. It reveals that the reorganization of space and time through

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[49] Alfred D. Chandler, The Visible Hand: The Managerial Revolution in American Business (Cambridge, Mass.: Belknap Press, 1977).
[50] Langdon Winner, "Do Artifacts have Politics?," Daedalus 109 (1980) 121-136.
[51] See, for example, Cronon, Nature's Metropolis, 92.

the development of large technological systems is complex and multidimensional. It also indicates that the effects complement other modern transformations in the history of energy systems. Wolfgang Schivelbusch's and Alan Trachtenberg's reflections on railway space and time suggest a correlation with the history of hydroelectricity.[52] Schivelbusch emphasizes the dramatic new scale of railway technology, a characteristic which set it apart from established forms of transportation technology that were animal powered. In a horse-drawn carriage the passing landscape unfolded at a scale that was concrete, organic and human. In contrast, railways tended to 'destroy' the space between places. At best, these spaces became abstracted spectacles seemingly produced by the technology or the railway company. At worst, they were simply incomprehensible as they appeared to rush by when viewed through the window of a railway car. The only spaces of consequence became points of departure and arrival. Significantly, these railway platforms and buildings were both figuratively and literally spaces created and dominated by railway companies.[53] The experience of travelling by rail fractured and then 'pulverized' space. It undermined long established relations between

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[52] Wolfgang Schivelbusch, "Railroad Space and Railroad Time," New German Critique 14 (1978) 31-40 and Alan Trachtenberg, The Incorporation of America (New York: Hill and Wang, 1982) 58-60.
[53] Trachtenberg, The Incorporation of America,119-120.

humans and the natural world. In its place space and nature became a spectacle created by railway companies. Nature as spectacle further obscured the true relationship between technology, society and nature. Similarly, the railway contributed to the commodification of goods and a sundering of production and consumption. Goods which had once been produced and utilized locally, were dislodged, transported through annihilated space, and 'reproduced' in the market place as objects of desire and consumption.

The process of fragmentation, dislocation and reproduction worked by the railways on grain, cattle and timber was similar to that effected by hydroelectricity on the kinetic energy of falling water. The correlation between the development of electricity and the modern crisis of space-time compression is acknowledged by Stephen Kern in The Culture of Time and Space, 1880-1918.[54] Kern briefly refers to the importance of new technological systems and energy regimes in creating the early twentieth century crisis of space-time compression, but his emphasis is on high culture, especially the modernist movement of artists whose work reflected

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[54] Stephen Kern, The Culture of Time and Space, 1880-1918 (Cambridge, Mass.: Harvard University Press, 1983).

the general crisis of discontinuity and fragmentation.[55] A more elaborate analysis of the dynamics of technological systems demonstrates their importance in transforming social and natural relations through space-time compression.

The adoption of electricity by industry in the late nineteenth century exemplified one of the interconnected transformations. The necessity that each factory have its own energy converter, usually a waterwheel or steam engine, prescribed its energy utilization. The factory could only use as much energy as it could generate through its own facilities and therefore supply was limited. Also, the use of mechanical energy demanded that all equipment be connected to a stationary system of shafts and belts. Electricity led to significant transformations. First, waterwheels and steam engines were replaced with thermal or hydroelectric generators. The most popular early method of generating electricity was thermal—the steam turbine. Instead of depending on the conversion of the kinetic energy of falling water to mechanical energy through the use of waterwheels, these generators converted the chemical energy stored in coal into thermal energy which powered the steam turbine and produced electrical energy. By making the

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[55] Kern, The Culture of Time and Space, 8-9, 29 and 155. For a critique of Kern's contribution see Harvey, Condition of Postmodernity 265-283. For the crisis of modernity see Marshall Berman, All That is Solid Melts Into Air: The Experience of Modernity (New York: Penguin Books, 1988 [1982]).

waterwheel obsolete and switching the energy source from water to fossil fuels, the steam turbine abolished dependence on the river and the necessity to situate a factory along the river's banks. Many factories simply connected these new energy converters to their established system of shafts and belts.[56] The invention of the alternating current electric induction motor precipitated a radical reconfiguration of the factory floor. It separated the motor from a mechanical connection to the central converter and allowed factory owners to remove the elaborate system of shafts and belts. The fact that machines no longer had to be interconnected allowed for a revolution in the spatial ordering within factories, as demonstrated by Henry Ford's Highland Park Plant which opened in Detroit in 1910.[57]

Prospective users of hydroelectric generators were initially denied the mobility allowed their competitors with thermal generators, until, as described above, new long-distance transmission technology enabled factories situated hundreds of miles from the river, the site of the energy conversion, to utilize hydroelectricity. The development of the electric transformer in the mid-1880s was integral to the new long-distance transmission networks, allowing electric current to be transmitted at high-voltage and then stepped down to a lower voltage

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[56] Nye, Electrifying America 193-195.
[57] Nye, Technological Sublime 129-130.

for local distribution. Without transformers "electricity distribution distances would have to be minimized and the inevitable decentralization of power generation would have precluded taking the advantage of enormous economies of scale associated with larger sizes of turbines and plants."[58] The transformer, and other advances in long-distance transmission, not only annihilated the space between the conversion of hydroelectric energy and its utilization, it also facilitated the increased centralization and concentration of hydroelectric generation. Long distance transmission encouraged a movement toward gigantic generators which could capitalize on the economies of large-scale generation and distribution. The result was another example of the 'crisis' of abundance in modern energy regimes and a reversal of the demand-supply formula.[59]

By replacing the energy generated by local and privately controlled waterwheels, steam engines or thermal generators with the seemingly limitless

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[58] Smil, General Energetics,177. For more on the importance of the electric transformer see J.W. Coltman, "The Transformer," Scientific American 258.1 (1988) 86-95.

[59] The same logic of the economies of scale resulted in the concentration of thermal generating stations during World War I. See Harold L. Platt, The Electric City: Energy and the Growth of the Chicago Area, 1880-1930 (Chicago: University of Chicago, 1991) 212-13. Also, Debeir, et al, assert the primacy of production over demand in capitalist energy regimes; see In the Servitude of Power, 108.

supply of electricity offered by large central generating stations, factory owners accepted a radical transformation of energy and space. They relinquished control of and responsibility for the energy that powered their machinery and illuminated their buildings. Their choice was representative of a wider social movement. Gradually, other segments of society chose to surrender control of their extrasomatic energy, the energy derived from natural sources outside of their bodies, to the corporate and government entities that operated central generating stations. The transfer of control of this energy also entailed the transfer of control of time and space.[60]

Efficiency

The ability of new technological systems and energy regimes to affect the basic elements of social organization is complex and paradoxical. While the technology is employed in new ways to separate society from nature, as in the case of factories being located far from rivers, it simultaneously connects a society to the non-human world in new set of abstruse relations. Attributes which bridge the perceived separation between society and nature illustrate the depth of connection

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[60] Debeir, et al, In the Servitude of Power, 7.

and the workings of this social and natural dialectic. One of these attributes is the perceived necessity of greater efficiency. The efficiency debates which gained momentum in the United States during the 1880s and 1890s, later spilling over into Canada and finally becoming an accepted principle in both countries after World War II, had their roots in environmental concerns, especially the need to regulate water in the American West.[61] The application of centralized, scientific and efficient management spread to other natural resources, including forests and wildlife. In Canada between 1885 and 1919 a small group of government officials, inspired by the various conservationist and preservationist platforms of Americans ranging from John Muir to Gifford Pinchot and Teddy Roosevelt, convinced Canadian politicians to support the compilation of a series of inventories of the country's natural resources.[62] In 1910 the Canadian Commission of Conservation began inspecting waterpower sites across the country. Its work resulted in the publication of massive inventories of the nation's rivers and their potential for generating hydroelectric power.

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[61] Samuel P. Hays, Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920 (New York: Atheneum, 1980 [1959]).
[62] Janet Foster, Working for Wildlife: The Beginning of Preservation in Canada 2nd ed (Toronto: University of Toronto Press, 1998).

The efficient management of natural resources was only the first step in a wider efficiency revolution that necessitated similar transformations in industry. Industry's increasing dedication to efficiency during the last quarter of the nineteenth century was closely related to a greater concern with standardization. For large technological systems and large corporations to function efficiently and at the highest level of profitability, the materials derived from nature and the machinery which transformed them had to be standardized. The development of the electric industry, especially the struggle between the competing systems of alternating current and direct current, epitomized this new reality. The men in the vanguard of the development of electricity, including Edison, Westinghouse and Insull, understood that for the industry to triumph over established energy regimes, especially coal and gas, they had to develop a standardized system of production, distribution and consumption in which the constituent parts were interchangeable and the output was adaptable to every situation.

The opening of Edison's famous Pearl Street station in New York City in 1882, the first central generating facility in North America, did not precipitate a flood of similar developments nor did it ensure the rapid adoption of electricity. Because the high cost of electricity made it a luxury that few could afford, the customers of early central generating stations were mostly businesses and wealthy residents of the urban core. For the industry to expand the overall cost of the service had to be lowered. The best way to achieve this goal was to make every aspect of the industry more efficient. The efficiency project undertaken by the industry in the 1880s and 1890s included applying new knowledge of electromagnetism to improve dynamos in electric generators, developing more efficient and powerful steam and water turbines, and ensuring the precise measurement of the amount of energy generated and consumed. As Edison worked to develop the mechanics of the electric industry, he was well aware that the industry's ultimate success would depend upon increased consumption of electricity, which would only be achieved through a wide and flourishing market for electrical goods. For this to occur the cost of electric appliances had to decrease, making them affordable to the middle class. Lower costs could be achieved through greater standardization and efficiency in manufacturing. Throughout the 1880s Edison concentrated on economies in the manufacture of electrical goods, especially the incandescent lamp, including where possible, replacing workers with machines.[63]

Where it was impossible to substitute mechanical processes for human effort the alternative was to make workers more like machines. This was to be

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[63] For a descriptions of some of these innovations see Millard, Edison and the Business of Innovation, 88-9.

achieved through the application of greater efficiency as popularised through the principles of scientific management. The link between natural resources, technology and labour was readily apparent for engineers dedicated to realizing the economies of scale promised by new technological systems and corporate organizations. "The scientific management of labor followed directly, in the minds of the engineers, from the standardization of materials and machinery."[64] Not only were the principles of efficiency equally applicable to nature, machine and humanity, but efficiency was a natural law which the efficiency engineers, led by their spiritual leader, Frederick W. Taylor, were charged with revealing.[65] Their various 'speed up' systems, often based on time and motion studies, accelerated the space-time compression that was already underway at the end of the nineteenth century. Significantly, the movement's greatest public success in the United States involved one of the great modern technological systems, the railway. In 1910-11 Louis D. Brandeis made Taylorism a household word when he argued that greater efficiency could save the nation's railway companies a million dollars a day.

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[64] Noble, America by Design 82.

[65] Samuel Haber, Efficiency and Uplift: Scientific Management in the Progressive Era, 1890-1920 (Chicago: University of Chicago Press, 1964).

In the 1910s and 1920s efficiency became more than a means of conserving natural resources and maximizing corporate profits. It became a campaign for the complete restructuring of society to facilitate greater ease in production and consumption. The drive for increased efficiency spread from nature, to the factory, to the office and finally to the home. In the United States domestic efficiency experts including Christine Frederick, Lillian Gilbreth and Mary Pattison spread the gospel of efficiency first through popular women's magazines, and then through their own widely read manifestos. Typical titles included Scientific Management in the Home and Principles of Domestic Engineering.[66] These women mined Taylor's writings for insights into how production in the home could be made more efficient. Everywhere a home-maker turned in the 1910s and 1920s, she was bombarded with the supposed parallels between industry and domesticity and with metaphors that reinforced the idea of the home as a factory.[67] By the 1930s the association had spread to the design of household appliances;

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[66] Christine Frederick, Scientific Management in the Home: Household Engineering (London, 1920); Mary Pattison, Principles of Domestic Engineering (New York, 1915).
[67] Gwendolyn Wright, Building the Dream, a Social History of Housing in America (New York: Pantheon Books, 1981) 156.

manufacturers deliberately fashioned irons, vacuum cleaners and stoves to resemble industrial machinery in order to create an image of efficiency.[68]

The drive to recreate the home as factory was paradoxical. Rapid urbanization and the perceived acceleration of the pace of modern life had fostered the expectation that the home would be a refuge from modernity. The middle-class home was idealized as the bastion of the domestic sphere, a sanctuary for the nuclear family, where a working man could escape the pressures of the market and be rejuvenated through the love of his wife and children. But when he opened the door of his ideal suburban bungalow he found an imitation of the factory or office from which he was fleeing. The contradictions were everywhere. His wife was instructed to operate the home as a modern business, complete with an up-to-date and detailed set of accounts which tracked household income, expenditures and liabilities: but there was no capitalist profit motive. She was to 'Taylorize' domestic production even though it required her, as the only person responsible, to act as both manager and worker. Similarly, the adoption of 'electrical servants'

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[68] Adrian Forty, Objects of Desire: Design and Society since 1750 (London: Thames and Hudson, 1995 (1986)) 217.

meant that she was both servant and mistress.[69] Riddled with contradictions, the modern suburban home mirrored developments in the natural world, where an increasingly contrived and artificial nature was idealized as a refuge from urbanization, where nature was to be both a wilderness and a storehouse of resources, both organic and mechanical.

The application of Taylorism to urban homes from 1900 through to World War II epitomized the spread of the gospel of efficiency and its tendency to inform all aspects of social and natural relations. It was the central precept of the new 'technique' which subjugated ends to means and created narratives of the 'one best way'.[70] The efficiency mantra both exemplified and facilitated modern capitalism's appropriation of nature, everyday life and ultimately the human body. Taylor's plan for social betterment was quickly captured by capitalists and placed at the centre of a larger agenda to reduce all of creation to a collection of inputs.

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[69] Ellen Lupton and J. Abbott Miller, The Bathroom, the Kitchen, and the Aesthetics of Waste (New York: Princeton Architectural Press, 1992) 13-15.
[70] Jacques Ellul, The Technological Society trans. John Wilkinson (New York: Alfred A. Knopf, 1967) 133 and Martha Banta, Taylored Lives: Narrative Productions in the Age of Taylor, Veblen, and Ford (Chicago: The University of Chicago Press, 1993).

Life was a series of categories of raw material which included nature and humans; the elusive goal was ever greater appropriation and accumulation.[71]

The Myth of the Organic Machine

Capitalism's adoption of the efficiency doctrine, and of the new and powerful technological systems which depended on efficiency, was supported by the popularization of the myth of the machine and the rhetoric of progress. Leo Marx has described the close relationship between the idea of the machine, material progress and nature in the industrialization of the United States. By the 1840s a myth had emerged, embodied by the railway, that North America's unique natural environment would purge Old World machines of their negative characteristics. The machine, reborn in the New World, would transform the relationship between society and nature and become the instrument of democracy, progress and material plenty.[72] In the early 1930s, Mumford, inspired by the technology of the electric industry, published Technics and Civilization, his

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[71] For a discussion of capitalism's appropriation of the human and non-human world see Raymond Williams, Towards 2000 (London: Chatto & Windus, 1983) 261-63.

[72] Leo Marx, The Machine in the Garden: Technology and the Pastoral Ideal in America, (New York: Oxford University Press, 2000 (1964)).

passionate paean to the machine. He argued that the machine was being revitalized and that its transformation would enhance the beauty and power of organic creations. The immediate challenge to society was to reintegrate the mechanical and organic; success would mean happiness and material prosperity for all.[73] Mumford's optimism helped to popularize a conception of the relationship between the mechanical and the organic which supported modern capitalism. His homage to the myth of the machine and his dream of melding the mechanical and the organic perpetuated a conceptual error that continues to obscure the relationship between technology, nature and society. Less than 20 years after the publication of Technics and Civilization Marshall McLuhan criticized Mumford for basing his ideas on "the dubious assumption that the organic is the opposite of the mechanical." McLuhan argued that even if this basic dualism ever existed, which he doubted, it was no longer valid; machines had become organic and "the old rivalry between mechanism and vitalism is finished."[74]

Historian Richard White has recently advanced a similar argument based on the development of the Columbia River. Echoing Leo Marx, White emphasizes

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[73] Mumford, Technics and Civilization 428-35.
[74] Marshall McLuhan, The Mechanical Bride: Folklore of Industrial Man (New York: Vanguard Press, 1951) 34.

Emerson's role in propagating the idea that utility and nature could be reconciled; Emerson, according to White, was "American capitalism's poet/philosopher."[75] The myth that nature could be allied with the machine, artfully supported by Mumford, justified the transformation of the Columbia from a free-flowing river into a series of slack reservoirs, the servants of transportation, irrigation and hydroelectric power. White describes the new Columbia as an 'organic machine', the result of the merging of the "human and the natural, the mechanical and the organic...." But with the benefit of 60 years of history, White's account spurns Mumford's optimism; instead of a rosy future, White depicts a disappointing past, a failed marriage with unintended and regrettable consequences for future generations.[76]

White's version of the 'organic machine' is valuable in so far as it cautions against the false assumption that the organic and the mechanical are separate spheres, but it fails to engage seriously the more pressing question of the divide between the reality and the myth of the organic machine, between a particular social practice and the myths which lend it support. David Harvey asserts that the process of social reproduction and spatial reorganization is shaped and encouraged

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[75] White, The Organic Machine, 34.
[76] White, The Organic Machine 108-9.

through myths and ideology. "Social practices may invoke certain myths and push for certain spatial and temporal representations as part and parcel of their drive to implant and reinforce their hold on society." Harvey acknowledges that these myths are not easy to identify in capitalism because it is by nature revolutionary, fragmented and ephemeral, but the myth of the machine is an obvious example.[77] As Leo Marx has explained, the development of the myth of the machine in America was dependent on the capitalist rhetoric of progress and the assumption (however dubious), that the melding of technology and nature would irrevocably lead to greater democracy and material plenty. In service to this idea Mumford emphasized the supposed positive correlation between the growth of the organic machine and greater democracy; the integration of nature and the machine was to lead to greater happiness, prosperity and equality for all of society. But Mumford's ideal of the organic machine was soon captured by capitalists and transformed into a new version of an earlier outlook: now one encountered the myth of the organic machine.

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[77] Harvey, The Condition of Postmodernity 217. Another example of a capitalist myth is the theory of progress and survival of the fittest (a perversion of Darwin's theory of natural selection) which supports the bourgeoisie's dominance and privilege. Another is the myth of retrospective regret; see Williams, The Country and the City, 82-83.

The idea of the organic machine is a capitalist myth, one which specifically seeks to reorganize and justify new relations between society and nature. It is a social practice masquerading as a 'realized myth' which reinforces modern capitalism's hold on society. It is also a manifestation of a larger conceptual illusion, deeply rooted in ideology. The myth of the organic machine is based on what Henri Lefebvre has described as the erroneous perception that space itself is neutral, empty, fixed and indifferent. This misconception results from a series of errors and illusions which obscure the fact that the state, and the social classes which support it, act as one to ensure their continued existence and dominance. One way they achieve this goal is to endorse the existence of a political and strategic space "which seeks to impose itself as reality despite the fact that it is an abstraction, albeit one endowed with enormous powers because it is the locus and medium of power."[78] The myth of the 'organic machine' is such an abstraction. It is an example of the abstract space that represents and explains how technology mediates between society and nature, an explanation that supports a capitalist state.

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[78] Lefebvre, The Production of Space, 94.

White concludes that we now live with the consequences of the Columbia becoming an 'organic machine' and that we have to come to terms with the consequences of the merging of the "human and the natural, the mechanical and the organic...."[79] By arguing that today's river is the result of the merging of the organic and the mechanical, White contradicts his basic assumption that natural and human worlds are inseparable; if they have now been merged, then they must have at one time been separate. More importantly, contrary to White's conclusions, the critical issue is not that the Columbia has become an 'organic machine': the critical issue is that we now think of the Columbia as an organic machine. Marx emphasized this important distinction. In the Grundrisse he explained that the crucial question was not how society had become unified with the natural world, but rather how and why society had grown to perceive itself as separate from nature.

> It is not the unity of living and active humanity with the natural, inorganic conditions of their metabolic exchange with nature, and hence their appropriation of nature which requires explanation, or is the result of a historic process, but rather the separation between these inorganic

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[79] White, The Organic Machine 108.

> conditions of human existence and this active existence, a separation which is completely posited only in the relation to wage labour and capital.[80]

The perception of nature as an organic machine, articulated by Emerson, celebrated by Mumford and adopted by capitalists has become the dominant ideology. It has served to recreate nature for purely economic purposes and to obscure and even obliterate other possible relationships between humans and nature.

Conclusion

What follows is an examination of the development of a new energy regime, the hydroelectric industry in British Columbia to World War II, in an attempt to explain the social and environmental relations of corporate capitalism and how they contributed to the apparent but illusory separation of society and nature. The study is based on a wide range of primary sources including ethnographies, the lands and water department records of the British Columbia provincial government, the water and Indian Affairs records of the federal government and the electric industry's trade journals. B.C. Electric's records have

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[80] Quoted in John Bellamy Foster, Marx's Ecology: Materialism and Nature (New York: Monthly Review Press, 2000) 159.

been relied on extensively for the analysis of the development of electric space in the cities of Victoria and Vancouver. B.C. Electric's records have been surprisingly underused by historians, especially the company's extensive pre-World War II newspaper clippings collection which provides a unique perspective on B.C. Electric's wide-range of interests.

The argument is developed through increasing levels of abstraction. Chapter 2 sets out the basic story of the development of hydroelectricity in British Columbia to World War II. It emphasizes the similarities and differences between older forms of waterpower technology and hydroelectricity, the relationship between greater corporate power and the increasing size of hydroelectric facilities, and the state's role in supporting hydroelectric development. Chapter 3 is a case study of the development of hydroelectricity in the Kootenays region of south eastern British Columbia to World War II. It describes a succession of spaces, from Native to agricultural to electric space, and how their production was grounded in the transformation of the natural rhythms of the area's hydrologic cycle. In Chapter 4 the focus moves from the country to the city, from a space of production to a space of consumption. It explains how in the pre-World War II period the electric industry worked to produce space that allowed for and encouraged the 'consumption' of electricity. Chapter 5 analyzes the real and perceived hazardous space produced through the development of hydroelectricity and how the electric industry capitalized on these hazards to further the production of electric space. As a whole, these chapters are a case study of the production of electric space in British Columbia to World War II.

Several themes are emphasized throughout the study. These include the concentration of the control of energy in parallel with the growth of corporate power, cooperation within the electric industry and between the industry and the state, the production of space that favoured the urban and suburban middle-class over the country, spatial reorganization through new energy conversions, forms of discipline and power in the production of space, resistance, the interpenetration of space, and the paradox of alienation. The study explains how the development of a new energy source, based on a large-scale technological system and corporate capitalism, led to the homogenisation of space in both the country and the city, how space was 'pulverized' both between the city and the country and within the city, and how natural temporal rhythms were flattened out, or even inverted, to conform to the demands of production and consumption in the hydroelectric industry.

Chapter 2

Corporate Space: The Growth of Large-Scale Hydroelectricity in British Columbia to World War II

Introduction

The development of hydroelectricity in British Columbia to World War II illustrates many of the central themes in the development of a new energy regime based on a new technological system and new material natural relations. Initially hydroelectricity was an alternative, small-scale, locally-controlled energy source that was utilized near the site of the energy conversion. There were natural and technological limitations to this system. The energy could not be transmitted very far, only a relatively small amount of energy could be generated and the supply of water was undependable. The industries that utilized and marketed electricity wanted power in sufficient amounts regardless of the season or the time of day. To meet these requirements the hydroelectric industry needed to invest more capital. Before corporations would risk this capital they sought to capture a guaranteed market by suppressing competitors and extending their monopoly. The larger projects extended the space between the production and consumption of electricity. They also required elaborate water diversions and large storage reservoirs. The result was the increasing power of large corporations that operated with the cooperation of the state.

Early Waterpower in British Columbia

The history of the use of the conversion of waterpower to mechanical energy established several factors central to the later development of hydroelectricity. All forms of waterpower, whether the conversion is directly to mechanical power or to electricity, are embedded in nature; at their core they are ecological projects. Through the twin factors of elevation and water flow nature provides society with an opportunity to convert the kinetic energy of falling water to useful forms of energy. This opportunity is only available at specific geographic locations. Consequently, until the development of hydroelectricity and long-distance transmission, the converted energy had to be utilized at the point of conversion, the river bank. There were also limitations on how much energy could be generated and, just as importantly, when it could be generated. During a river's natural low water flow little or no energy could be generated. The adoption and proliferation of the overshot waterwheel allowed for the generation of greater amounts of energy based on greater regulation and control of natural water flows. Overshot waterwheels required water storage and an artificial head; the beginning of modern dams and water reservoirs. As the demands and the uses for greater amounts of energy generated by overshot waterwheels increased efforts escalated to overcome natural limitations through water diversions and storage dams. These works required larger and larger capital investments. The concentration of both capital and energy entailed the greater concentration of social and economic power.

Waterwheel technology was introduced on Canada's west coast by the Hudson's Bay Company. When James Douglas investigated the south end of Vancouver Island for a site for the future Fort Victoria in 1842, one of the criteria was the availability of sufficient waterpower. In his report to the colonial government he admitted that his chosen location lacked a suitable fresh-water stream that could power a waterwheel, but there was the possibility of installing a tide mill approximately two miles from the fort at a site named the Gorge. Tide mills are usually powered by undershot horizontal waterwheels, positioned to utilize tidal power during twice a day tide fluctuations. They operate for two to three hours during each tidal change and impose a workday rhythm based on the moon instead of the sun, a daily routine common to coastal fishing communities. Douglas reported that the Gorge held great promise for a tide mill if it were placed in a channel "through which the tide rushes out and in with a degree of force and velocity capable of driving the most powerful machinery, if guided and applied by mechanical skill."[1]

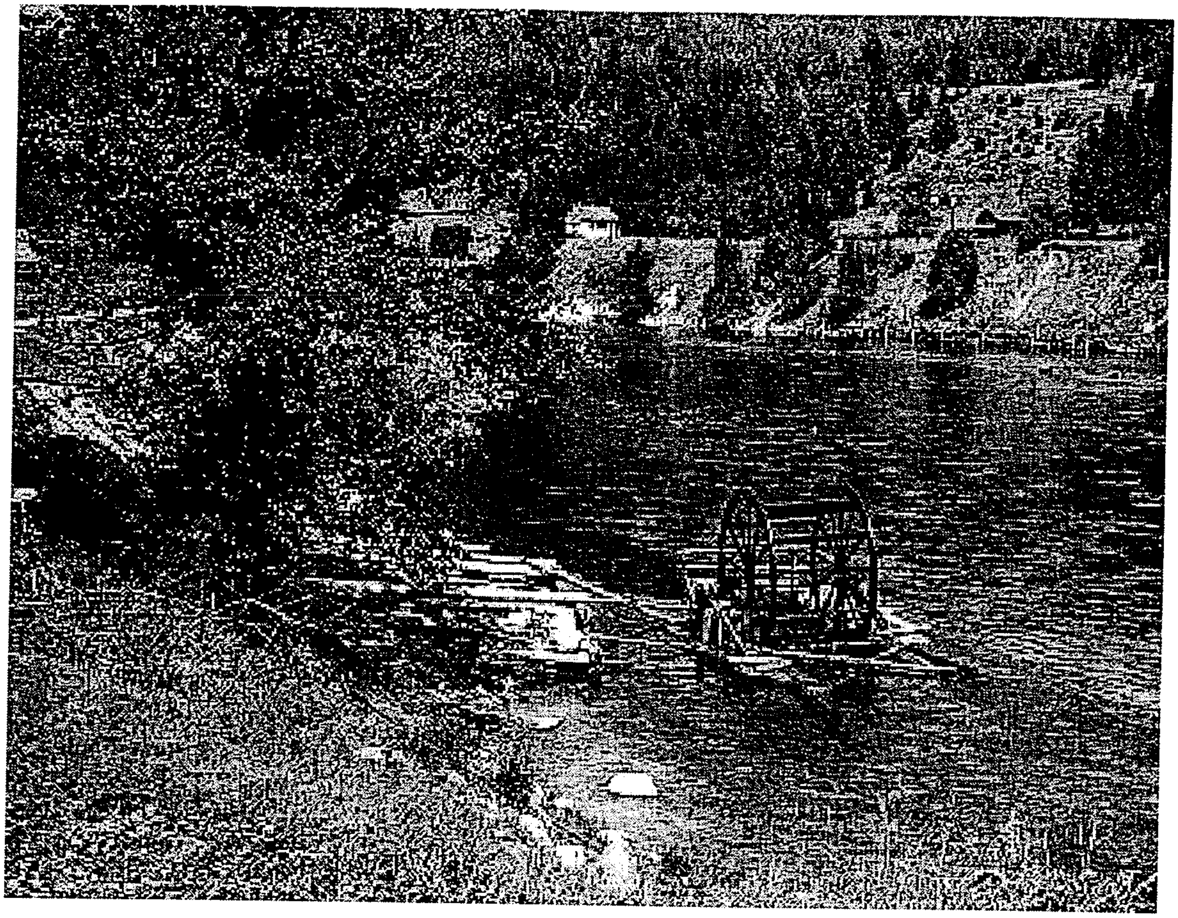

Figure 2.1. Floating undershot waterwheel powering a water pump on the Kettle River in southern B.C., 1930.
Source: BCA, D-07188.

Despite Douglas' enthusiasm for a tide mill at the Gorge, it was never built. Instead, in August 1847 the Hudson's Bay Company chose a site on the

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[1] Douglas to Hudson's Bay Company London Committee, cited in W. Kaye Lamb, "Early Lumbering on Vancouver Island, Part I: 1844-1855," British Columbia Historical Quarterly January (1938) 38.

appropriately named Millstream at the head of Esquimalt Harbour for a waterwheel that would power a combination sawmill and gristmill. Construction began in January 1848 but by the time it was completed in the summer there was not enough water to power it. The Hudson's Bay Company had discovered a natural factor that limited potential waterpower generation in the Victoria area. The south east corner of Vancouver Island is in a rain shadow cast by the Vancouver Island and Olympic Mountains to the west. The result is a type of 'Mediterranean' climate distinct from the rest of Vancouver island and the British Columbia coast.[2] While Victoria receives a great deal of precipitation during the winter and spring, its summers are usually warm and dry. As a result the Millstream water flow was greatly reduced and the mill sat quiet throughout the summer of 1848. The Hudson's Bay Company responded to this natural shortfall by contemplating British Columbia's first spatial reorganization to support waterpower. An inspection was made of nearby rivers and lakes that could be diverted into Millstream, but none was suitable. In November seasonal rains alleviated the problem and the first batch of lumber was sawn.[3] In May, 1853 the Hudson's Bay Company began construction on a second water-powered sawmill

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[2] British Columbia, Ministry of Forests, Biogeoclimatic Zones of British Columbia 1988. Map (Victoria: British Columbia Ministry of Forests, 1988).
[3] Richard Mackie, "Colonial Land, Indian Labour and Company Capital: The Economy of Vancouver Island, 1849-1858," (M.A. University of British Columbia, 1984) 141-150.

at Nanaimo on Vancouver Island. The mill began operation in the fall of 1854, but like its southern cousin, it often stood silent for lack of water. An excess of water also proved to be a problem for these early mills. In 1854 a spring freshet washed away the waterwheel at the Millstream mill and damaged the sawmill and gristmill. The waterwheel was replaced but from then on only powered the gristmill.[4]

The utilization of waterwheels in early British Columbia laid the groundwork for the later development of hydroelectricity. In the later nineteenth century, newly developed electric generators were installed as part of an established waterpower system that included waterwheels, small dams and storage ponds. They were often installed in locations where waterwheels had already been utilized for the generation of mechanical energy. The new developments required relatively little capital and engineering. They generated little electricity and were undependable, often sitting idle during seasonal low water periods. Nonetheless, they did represent an important spatial change in how waterpower was utilized. The generation of electricity and its transmission allowed for the utilization of waterpower at sites separate from the point of generation. Initially the distances

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[4] Lamb, "Early Lumbering," 40 and Mackie, "Colonial Land," fn. 250. See also, "Water Power Resources of B.C.," 31 October, 1941, The Financial News p. 6, in BCA, GR 1006, box 1, file 10.

were not great but as the ability to transmit electricity improved this became an increasingly important factor.

Figure 2.2. Hydraulic Mining at Big Bend, B.C., c. 1900.

Source: BCA, A-03815.

The development of hydroelectricity in British Columbia was closely associated with the mining industry. Engineers working in the gold mines of California's Sierra Nevada mountains developed techniques to utilize snow-packs and the high heads and water flows of mountain streams.[5] This technology was

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[5] For an overview of the development of hydroelectricity in California see James C. Williams, Energy and the Making of Modern California (Akron, Ohio: University of Akron Press, 1997) 166-198.

transferred to British Columbia with the gold rushes of the 1850s and 1860s. The basics of diverting, channeling and impounding mountain streams were well known to miners who used waterwheels and direct waterpower for hydraulic mining (see Figure 2.2).[6] This expertise, combined with available waterpower sites and the mining industry's demand for electricity, led to the electrification of small mining towns in advance of larger urban centres. The first was the 'city' of Nelson in the centre of British Columbia's most important nineteenth century mining district. Unlike other towns which were supplied with electricity from hydroelectric facilities primarily intended to supply local mines, Nelson built its own facility dedicated to meeting the town's demands. In April, 1892 local entrepreneurs received the province's approval for the incorporation of the Nelson Electric Light Company which intended to construct a hydroelectric generation station on Cottonwood Creek, a short distance south of town. The government stipulated that the company was not to interfere with the operations of the Nelson Sawmill Company which had operated a portable sawmill on Cottonwood Creek powered by a waterwheel since 1890. Although the company was committed to commence operations within a few months, several obstacles delayed the project and, as an interim measure, a steam electric generator was installed in 1894 in

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[6] D.M. LeBourdais, Metals and Men: The Story of Canadian Mining (Toronto: McClelland and Stewart Ltd., 1957) 22.

order to service the town with electricity.[7] Construction of the province's first hydroelectric facility began in earnest in 1896. A small, wooden dam was built above the falls on Cottonwood Creek and a five hundred foot flume diverted the water to the powerhouse below the falls. The flume was connected to a steel pipe which directed the water to two Pelton waterwheels which operated under a 185 foot head. The waterwheels turned two thirty-five kilowatt direct current generators. On 1 February, 1896 hydroelectricity was transmitted the short distance to Nelson. Initially the power was used primarily for lighting the town's streets, businesses and homes although a handful of industries, including a smelter and meatpacking plant also became electric customers. In 1898 the company was purchased by the City of Nelson.[8]

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[7] John Norris, Historic Nelson: The Early Years (Lantzville, B.C.: Oolichan Books, 1995) 211; Douglas V. Parker, Streetcars in the Kootenays: Nelson's Tramways, 1899-1922 (Edmonton: Havelock House, 1992) 31. For an overview of hydroelectric power in the Kootenays, see Jeremy Mouat, The Business of Power: Hydro-Electricity in Southeastern British Columbia, 1897-1997 (Victoria: Sono Nis Press, 1997).

[8] Boyd C. Affleck "A History of the Cottonwood Falls Hydro-Electric Plant, Nelson, B.C.," Nelson Museum, Mss 262.

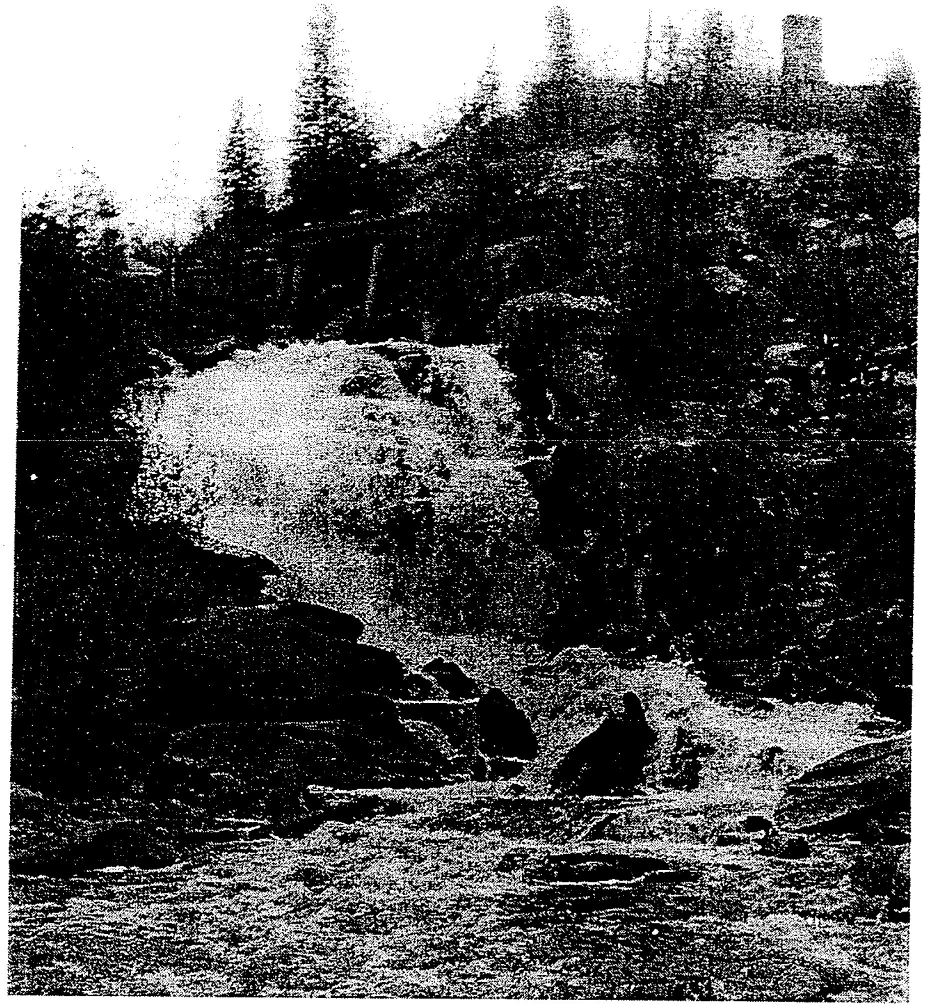

Figure 2.3. Cottonwood Falls, site of British Columbia's first hydroelectric facility.

Source: Nelson Museum, Neg. #1413.

From its inception the Cottonwood facility was plagued by problems, the greatest being a chronic shortage of water. The water flow on Cottonwood Creek fluctuated wildly depending on the season and the small dam was unable to provide enough storage to even out the seasonal changes. When the creek froze over during cold winters the water flow was further reduced. A shortage of water necessitated a reduction in service. Often electricity was only generated after dark to supply power for lighting. In 1899 the water shortage problem was partly alleviated through British Columbia's first hydroelectric water diversion. A flume, over 9,000 ft in length was built to divert water from the Whitewater Creek into Cottonwood Creek. In 1900 an attempt to increase storage was made by raising the existing dam by four feet, but when the reservoir filled in August the dam collapsed, sending a torrent of water through Nelson's streets. 1901 brought yet another attempt to increase storage. A dam was constructed at the outlet of Cottonwood Lake, but this also failed, washing out parts of the Great Northern Railway line. In 1904 a forest fire destroyed much of the flume and electric service again suffered. Finally, in 1907, the Cottonwood facility was decommissioned, having been superseded by Nelson's new hydroelectric development at Upper Bonnington Falls, ten miles west of town on the Kootenay River.[9] The new plant had a generating capacity of three thousand kilowatts, forty times the capacity of the original Cottonwood Creek plant. Even though the new plant was a run-of-river operation it was situated on one of the region's biggest

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[9] David Scott and Edna H. Hanic, Nelson: Queen City of the Kootenays (Vancouver: Mitchell Press, 1972) 59-71; "Water Power Resources of B.C.," 31 October, 1941, The Financial News p. 6; Affleck, "A History of Cottonwood Falls Hydro-Electric Plant." One of the waterwheels and generators was sold to a company at the north end of Kootenay Lake and it was later purchased by local residents who in 1913 used the equipment as part of a locally controlled, co-operative hydroelectric facility which operated for over 20 years

rivers; the water supply was therefore greater and more reliable than Cottonwood Creek.

The Cottonwood Creek plant was only the first of many small hydroelectric plants in British Columbia's mining district (Appendix A). As early as 1895 a publication on mining prospects in the Kootenay region trumpeted the available waterpower on Cottonwood and Grohman Creeks and speculated that the waterfalls on the Kootenay River "would give power enough to drive all the machinery in the country."[10] The underground drills of the region's first mines were powered by compressed air. A steam engine was connected to a compressor above ground that piped air to drills below ground in the mine. Mine owners were eager to reduce the expense of the steam engines and, given the advances in both the generation and transmission of electricity, they seized on the possibility of enlisting nearby waterfalls as an alternative and cheaper source of energy. The numerous advantages of hydroelectricity over steam generators were obvious and included its seemingly benign consequences for the natural world.[11] By 1913 30-40 mines in southern British Columbia operated their own small hydroelectric

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[10] Charles St. Barbe, Kootenay Mines: A Sketch of Their Progress and Condition to-Day (Nelson, B.C.: The Miner Print & Publishing Co. Ltd., 1895) 4.
[11] B.C. Sessional Papers, 1913, Department of Lands. For a detailed description of one operation see Harry D. Barnes, "Early History of Hedley Camp," British Columbia Historical Quarterly 12.2 (1948) 103-25. For the advantages of hydroelectricity over steam power in California see "The Conversion of Water Power into Electric Energy for Mining Operations," Mining Reporter (1905) 83-84.

plants.[12] Electricity was used for an increasing number of purposes including electric lights, fans, drills, locomotives and tramways. These small mining plants had several common characteristics. They all had small generating capacities, often less than two hundred kilowatts, were locally controlled, required only a small capital investment and were run-of-river projects, often on small creeks, with minimal engineering for water control.

Several other industries also began to utilize electricity generated by small, local hydroelectric plants. Next to mining, the greatest industrial use for hydroelectricity was the manufacture of pulp and paper. By World War I several companies had developed hydroelectric facilities on the British Columbia coast including the Ocean Falls Company (later renamed Pacific Mills) on Link River, the Powell River Pulp and Paper Company on the Powell River and Swanson Bay Forests Ltd. on Mule Creek. The developments usually began with small dams and little storage, but as demand increased so did the scope of the projects, which included the drilling of diversion tunnels and the merging of small lakes into larger reservoirs. The canning industry was also quick to appreciate the advantages of electricity. In the Vancouver area canneries were supplied by B.C. Electric, while Prince Rupert canneries were serviced by the city-owned hydroelectric development on nearby Woodworth Lake. By 1915 the Kincolith Packing

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[12] "Report of the British Columbia Hydrological Survey, 1913," Water Resources Paper No. 8 (Ottawa, 1915) 43-45.

Company was using pelton waterwheels to generate electricity from two small tributaries of the Nass River. In south-central British Columbia the agricultural industry also began to utilize electricity to power irrigation works.[13] Hydroelectricity was such a cost efficient prime mover that even Canadian Collieries, the major coal mining company on Vancouver Island, replaced its coal burning steam engines with a hydroelectric facility on the Puntledge River.

By World War I several small towns also had their own hydroelectric facilities. Outside Vancouver, Victoria and the mining towns of the Kootenays, Ashcroft, Armstrong, Revelstoke and Kamloops were among the first to develop hydroelectricity. These plants were often municipal enterprises. Because they were run-of-river facilities with little water storage most were supplemented by auxiliary steam generators powered by coal or oil which could be put into service during seasonal low-water levels. Electricity was transmitted short distances to town where it was used mostly for lighting. [14] Some facilities were operated by

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[13] G.R.G. Conway, Water Powers of Canada: Province of British Columbia (Ottawa: Dominion Water Power Branch, 1915) 89-155; British Columbia, Department of Lands, Water Powers of British Columbia Canada. 1924, BCA, GR884, box 1, file 1, pp. 53-9, 67; "Water-Power Resources of British Columbia," Electrical World 92.9 (1928) 409; George E. Luxton, "The Electric Power Industry in British Columbia," Graduating Essay, UBC, 1933; UBC Special Collections

[14] Department of Lands, Water Powers of British Columbia Canada, 77-82; Conway, Water Powers of Canada: Province of British Columbia, 119-42; G.W. Taylor, Builders of British Columbia: An Industrial History (Victoria: Morriss Publishing, 1982) 177; Canada, Department of the Interior, Water Power Branch,

local businessmen speculating in a new energy regime. A Mr. Clemens invested $12,500 to build a seventy-five kilowatt hydroelectric plant on Murray Creek to supply electricity to Spences Bridge, a small town on the Thompson River. Clemens' facility was relatively expensive. At Field, British Columbia a seventy-five kilowatt hydroelectric plant was installed for less than $4000 while a salmon cannery installed a 112 kilowatt plant on the Nass River in northern British Columbia for $3,650.[15] The capital and technological thresholds for hydroelectric developments during the industry's formative years were low enough that individuals often installed plants for their personal use. "Many small ranchers have small hydro-electrical plants to supply light and power for their own use. This is made practicable by the many small streams coming from the hills and cheap developments are possible."[16] The provincial and federal governments focused most of their energy on promoting the development of large-scale hydroelectric plants on the province's major rivers, but until World War I they continued to acknowledge the viability of small, locally-owned and controlled plants:

"Report on Railway Belt Hydrographic Survey for 1911-12," Sessional Papers (Ottawa: Department of the Interior, 1914).

[15] Canada, Department of the Interior, Report of the Superintendent of Power, "Report on Small Water-Powers," Sessional Papers. Water Resources Paper No. 14 (Ottawa, 1914) 274-282.

[16] Canada, Department of the Interior, Dominion Water Power Branch, "British Columbia Hydrologic Survey, 1914," Sessional Papers. Water Resources Paper No. 14 (Ottawa,1915) 23.

> There is, however, in the development by farmers and others, of power upon the smaller streams, a very great immediate future. The rational handling of irrigation water may enable a rancher to operate a small plant, producing sufficient power at a very low cost for his farm needs. Power to light house and barns, power for cooking purposes, power for wood-sawing and for a hundred and one necessities, lies at many a door, and is capable of very cheap and efficient development.[17]

The possibility of a new energy regime based on small locally controlled hydroelectric plants was short-lived. As hydroelectricity expanded in British Columbia small plants were soon dwarfed and marginalized by large plants controlled by powerful corporations.

Corporate Hydroelectricity

The period from 1875 to World War I is often referred to as the Second Industrial Revolution. During these years many of the technological cornerstones of modern society were introduced, including the telephone, phonograph, central electric power plant, electric street railway, the electrolytic process, automobiles and airplanes. It was also the period of dramatic urbanization, the beginnings of modern labour movements, the growth of corporate capitalism and the beginnings of the transition to new energy sources including oil and electricity. The new technologies played an important role in the Second Industrial Revolution, but

[17] Dominion Water Power Branch, "British Columbia Hydrologic Survey, 1914," 23.

they were not determinative and for the most part were not even revolutionary.[18] As with the case of waterpower which had become an important component of the electric industry, they had developed over a long period, not overnight. It was only when isolated from the new social and economic models of the pre-World War I period that they appeared dramatically different.

The key economic development was the emergence of corporate capitalism. The history of the growth of the electric industry illustrates many of the central characteristics of this new and powerful economic form. In particular, Edison's career exemplified the transition during the Second Industrial Revolution from the small, innovative companies of the 1870s and 1880s, often founded on partnerships or familial ties, to the large, centralized corporations of the 1890s dominated by corporate managers.[19] Edison's innovations gave rise to a handful of powerful multinationals, including General Electric.[20] The development of the electric industry also illustrated how the technological innovations of the late nineteenth century encouraged and supported many of the new organizational

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[18] George Basalla, The Evolution of Technology (Cambridge: Cambridge University Press, 1988) 61-62.
[19] David E. Nye. Electrifying America: Social Meanings of a New Technology, 1880-1940 (Cambridge, Mass.: The MIT Press, 1990) 170 and Andre Millard. Edison and the Business of Innovation (Baltimore: Johns Hopkins University Press, 1990).
[20] Alfred D. Chandler. The Visible Hand: The Managerial Revolution in American Business (Cambridge, Mass.: Belknap Press, 1977).

methods of modern corporations.[21] A principal aspect of this transformation was the centralization of economic power in fewer and fewer hands. Simultaneous with the decreasing reliance on local, personally controlled energy sources was the decreasing importance of local, small enterprise. As the generating capacity and electric grids of large electric companies grew these behemoths testified to the new reality that to "cling to entrepreneurial autonomy and energy independence in the new world of the Second Industrial Revolution would have been a quixotic act."[22] Early hydroelectric developments were soon superseded by the development of hydroelectricity for industry and the concomitant development of large projects to capitalize on economies of scale. In pre-World War II British Columbia two large corporations emerged to dominate the generation and distribution of hydroelectricity.

In the southern interior of the province West Kootenay Light and Power grew into a large, centrally-organized and well financed company that controlled the region's primary energy source, its rivers. The company was formed by local miners looking to supply inexpensive hydroelectricity to the mines at Rossland, a small community south of the Kootenay River. In 1897 West Kootenay Power

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[21] W. Bernard Carlson, Innovation as a Social Process: Elihu Thomson and the Rise of General Electric, 1870-1900 (Cambridge and New York: Cambridge University Press, 1991) 11.

[22] Wolfgang Schivelbusch, Disenchanted Night: The Industrialisation of Light in the Nineteenth Century, Trans. Angela Davies (Berkeley: University of California Press, 1988) 74-75.

constructed the first hydroelectric plant on the Kootenay River, a small run-of-river facility at Bonnington Falls. With waterwheels imported from Ohio, electric generators from Ontario and an operating head of thirty-four feet, it began to generate electricity on 15 July, 1898, transmitting it over thirty miles south to the mines at Rossland. In the same year West Kootenay Power agreed to supply electricity to a newly refurbished smelter at Trail which had been purchased by the Canadian Pacific Railway (CPR). Soon after the CPR acquired control of West Kootenay Power, bringing it under the wing of one of Canada's largest corporations. Over the next thirty years West Kootenay Power expanded to serve the CPR's mining interests, building expensive, high capacity plants reliant on greater and greater control of the region's hydrology (see Chapter 3).[23]

While West Kootenay Power expanded to serve corporate mining interests in the southern interior of British Columbia, another large corporation emerged to supply electricity for lighting, power and public transportation to the province's two urban centres. Separate lighting and street railway companies were incorporated in Vancouver and Victoria during the late 1880s but because their services were similar and complementary they later merged to form combined lighting and railway companies. For example, the Vancouver Electric Illuminating Company was formed in 1887 and began service on August 8th. The Vancouver

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[23] This expansion is detailed in Mouat, The Business of Power.

Street Railway was formed in 1888 with authorization to construct a street railway using horses, cable, gas or electricity. The initial decision was to operate horsecars on tracks. Tracks were laid down, stables were erected and the horses were purchased. But before the first horsecars began to roll on Vancouver's streets, the company had a sudden change of mind. It decided to abandon horses and install an electric generating system to power its cars.

Support and encouragement in this direction came from the Thomson-Houston Electric Company.[24] Thomson-Houston co-founder Elihu Thomson ranks with Edison and Westinghouse as an inventor in the electric industry and was equally important for developing an organizational system to link inventions with marketing and business strategies. His professional career also exemplifies how small, independent companies were "transformed into the modern corporation of the twentieth century."[25] Thomson's most influential contribution was his role in the creation of the central generating station, the most important component of the electric industry.[26] The central generating station was a new entity in society and in each location it had to be created through the cooperation of local capitalists and multi-national electric companies that supplied the technology. Thomson and his cohorts in the vanguard of the electric industry in the late nineteenth century were

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[24] Roy, "The British Columbia Railway Company," 20-22.
[25] Carlson, Innovation as a Social Process, 3.
[26] Carlson, Innovation as a Social Process, 9 and 354.

instrumental in developing a social and corporate system for the generation, marketing and consumption of electricity.

One of Thomson's strategies was to accept stock in fledgling electric streetcar and generating companies in partial payment for large purchases of equipment.[27] Having decided to investigate the possibility of building an electric streetcar system in Vancouver instead of introducing horsecars, in late 1889 the Vancouver Street Railway Company queried various electrical manufacturers as to how much stock they would accept in lieu of cash. They ultimately entered into an arrangement with Thomson-Houston who had also supplied equipment to the Vancouver Electric Illuminating Company. With the decision made in late 1889 to switch to electric-powered cars, the existing track was modified and service began on 28 June, 1890. Less than a month later, on 22 May, 1890 the two companies amalgamated to form the Vancouver Electric Railway & Lighting Company. It is likely that Thomson-Houston was instrumental in effecting the merger of the Vancouver companies.[28]

The early 1890s were an inopportune time to begin a new streetcar service in Vancouver. The city was gripped by the economic depression that followed its initial boom years. The streetcar company built lines in advance of demand and

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[27] Nye, Electrifying America,171.

[28] "Early Development and Progress of the B.C. Electric Railway Company," BCEEM 8.12 (March, 1926) 5-41 and Roy, "The British Columbia Electric Railway Company," 20-22.

soon found itself unable to service its debt. In 1891 the entire enterprise was offered to the city at cost, but while city council supported the purchase, it was forced to backtrack in the face of public opposition. In 1893 a proposal to guarantee the streetcar company's debt was also defeated and led to the reduction or complete discontinuance of service to some parts of the city. After another proposal for the city to purchase the company was defeated in 1894, the enterprise as well as the Westminster and Vancouver Tramway and the Victoria Electric Railway and Light Company were reorganized in 1895 as the Consolidated Railway & Light Company which was backed by local and English entrepreneurs and represented by F.S. Barnard, the company's first general manager.[29] The new company was initially successful but poor financial decisions and the Point Ellice bridge disaster of May 1896 forced it into receivership. The bankrupt company re-emerged in April 1897 as the B.C. Electric Railway Company, an enterprise destined to dominate the development of hydroelectricity in British Columbia for over 60 years.[30] B.C. Electric quickly became a large, centralized, hierarchical

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[29] "Early Development and Progress of the B.C. Electric Railway Company," BCEEM 8.12 (March, 1926) 5-41

[30] For the history of BCE's predecessor companies see, Roy, "The British Columbia Railway Company," 1-43; "Early Development and Progress of the B.C. Electric Railway Company," BCEEM 8.12 (March, 1926) 5-41; and "General History B.C. Electric," Add Mss 321, vol. 1, Vancouver City Archives.

corporation, one of the first in the Vancouver region.[31] From 1897 to World War II it developed along a path similar to that of other central generating stations in Canada, the United States and Europe in that it sought to consolidate its power. It either thwarted or acquired potential competitors while engaging in a simultaneously co-operative and antagonistic relationship with various levels of government.

The State

Private enterprise led the way in developing hydroelectricity in British Columbia but it did so with the growing support and encouragement of the state. In British Columbia the provincial and federal governments contributed to the production of electric space by quantifying, naming and compartmentalizing nature. They also instituted a legal regime that empowered the electric industry and sanctioned its appropriation and control of water and space. In the second half of the nineteenth century British Columbia's legal regime developed to separate the ownership of water and land. Riparian rights, which had impeded the systematic exploitation of water resources in the American West through a labyrinth of claims and counter-claims, were abolished in British Columbia and replaced by a policy of 'beneficial use'. The beneficial use policy effectively

[31] Robert A.J. McDonald, Making Vancouver: Class, Status, and Social Boundaries, 1863-1913 (Vancouver: UBC Press, 1996) 94-95.

divorced water from the land and designated it as a separate entity which demanded maximum exploitation for the 'public good'. This state control was introduced to promote the exploitation of water for mining and irrigation, but it was also a policy tailor-made for large-scale, corporate, hydroelectric development.

British Columbia's first legislation to control the development of water resources was the Gold Fields Act of 1859. The act authorized the Gold Commissioner to grant exclusive rights for the use of water in return for the payment of a water rental. The license holder could sell the water, providing that the fees were fair and non-discriminatory. Importantly, the 'neglect' or 'wasting' of water were grounds for cancellation of the license. The 1870 Land Ordinance provided for the unilateral diversion of water across Crown land, or that of another owner, no matter how extensive the damage, in return for reasonable compensation. In 1892 the Water Privileges Act confirmed that the right to use water was invested in the Crown, and so officially abolished future riparian rights.[32]

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[32] Robert E. Cail, Land, Man and the Law: The Disposal of Crown Lands in British Columbia, 1871-1913 (Vancouver: University of British Columbia Press, 1974) 111-16; "Draft history of the Water Rights Branch," n.d., BCA, GR 1006, box 4, file 7; Overview of development of B.C. water legislation, n.d., BCA, GR 1006, box 1, file 21; "The Work of the Water Rights Branch," 1953, BCA, GR 1006, box 1, file 18.

For over 50 years water rights in British Columbia were allocated by local government officials, often stipendiary magistrates, in a haphazard and uncoordinated manner. No attempt was made to identify the amount of water available in specific streams and rivers or to limit allocations. Consequently, numerous water licenses were issued and many water courses were drastically over subscribed. The federal government had begun to take hydrometric measurements of rivers in 1894 to support irrigation projects. In 1908 the federal Hydrographic Survey was created to formalize the programme and in 1911 the growing importance of hydroelectricity was illustrated by the establishment of the Dominion Water Power Branch. The province's 1909 Water Act invested the responsibility for recording and issuing water licenses with the Chief Water Commissioner and created a Board of Investigation to review and classify the province's water licenses.[33] The creation of the Water Rights Branch and the Board of Investigation put the provincial government on the road to a systematic and detailed hydrographic survey of the province's water resources. In British Columbia until 1910 hydrographic information was supplied by unqualified government officials, water users and water power companies. In that year, the provincial government began its first professional hydrographic surveys of British

[33] "Notes for speech re: water rights branch history," n.d., BCA, GR 1006, box 1, file 6; "Report of Water Rights Branch," B.C. Sessional Papers, 1912; M.J. Patton, "The Water-Power Resources of Canada," Economic Geographer 2.2 (1926) 168-96.

Columbia's rivers south of the Railway Belt. In 1911 the Dominion Water Power and Hydrometric Bureau published its first annual report on British Columbia. With the transfer of the administration of water rights in the Railway Belt from the federal to the provincial government in 1913 the responsibilities of the Water Rights Branch were expanded and the British Columbia Hydrographic Survey was formed. Many of the early surveys concentrated on the use of water for irrigation and domestic purposes, but by the 1920s potential hydroelectric sites were of the greatest interest.[34]

Part of the state's contribution to the production of space is its role in bureaucratizing space.[35] This process involves assigning official names to natural features and creating administrative districts. At the beginning of the growth of the hydroelectric industry the provincial government had relatively little knowledge of the province's water resources. One of the first tasks was to name all the physical features that would be of interest to capitalists. The newly formed Water Rights

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[34] "Report of Water Rights Branch," B.C. Sessional Papers, 1912; "Report of Water Rights Branch," B.C. Sessional Papers, 1913; "Report of Water Rights Branch," B.C. Sessional Papers, 1914; "Draft history of the Water Rights Branch," n.d., BCA, GR 1006, box 4, file 7; "The Work of the Water Rights Branch," 1953, BCAR, GR 1006, box 1, file 18; Luxton, "The Electric Power Industry," 93; B.C. Power Commission, The John Hart Development of the British Columbia Power Commission (Campbell River, B.C.: B.C. Power Commission, 1947). It was also during the 1920s and 1930s that many of the most ambitious water diversion plans were developed (often by provincial surveyor Frederick Knewstubb) including the Campbell River and the Nechako schemes

[35] Derek Gregory, Geographical Imaginations (Cambridge, MA: Blackwell, 1994) 401.

Branch began to assign official names to the province's rivers and streams, many of which were known by several names or duplicate names. Similarly, the British Columbia Hydrographic Survey divided the province into water power districts roughly based on the province's major watersheds.

As both the provincial and federal governments accumulated more and increasingly detailed information on British Columbia's water resources, they moved to make the information available to potential developers. In 1915 the federal Water Power Branch issued one of the first government publications dedicated to extolling British Columbia's untapped water power potential. The book, prepared by a B.C. Electric engineer, was intended for distribution through Canada's water power exhibit in the Canadian Pavilion at the Panama-Pacific International Exposition in San Francisco. Along with descriptions of developed and undeveloped water power sites in British Columbia and the province's physical geography, the publication trumpeted opportunities to employ the province's hydroelectric potential in the emerging electro-chemical and electro-metallurgical industries. According to the publication, the increasing likelihood of the disruption of the supply of saltpeter from Chile lent added urgency to the development of hydroelectricity for the fixation of nitrogen, an endeavour required to ensure the continued supremacy of the "great Caucasian race...."[36]

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[36] Conway, Water Powers of Canada: Province of British Columbia, 21.

The Panama-Pacific Exposition publication was soon followed by more detailed examinations of British Columbia's water power potential. In 1910 Canada's Commission on Conservation undertook to publish a mammoth multi-volume collection on Canada's water power. The first volume appeared in 1911. It included a short chapter on British Columbia explaining the legal regime in place to allow for the exploitation of water resources and short descriptions of the province's developed and potential hydroelectric sites. A much more detailed and expansive report, over 600 pages, was published in 1919 entitled Water Powers of British Columbia.[37] The provincial government soon followed suit with its own publication. In 1924 it published its Water Powers of British Columbia, a small, leather-bound volume which was placed on observation cars on trans-continental trains, in libraries and government offices. Filled with glossy photographs of pristine mountain lakes and rivers labeled 'storage' and 'undeveloped power' the volume included a list of available engineering reports as well as information on how to acquire a water license.[38]

The federal and provincial governments' enthusiasm for promoting the development of hydroelectric facilities in British Columbia often conflicted with

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[37] Canada. Commission of Conservation, Water Powers of British Columbia (Ottawa: Commission of Conservation, 1919).
[38] B.C. Department of Lands, Water Powers of British Columbia (Victoria: British Columbia, 1924); "Water Power Investigation," 8 June, 1929, BCA, GR 884, box 1, file 15.

their shared responsibilities for the province's fisheries. Under the British North America Act, 1867 the federal government has authority over fisheries, but in practice individual provinces have carved out their own control of specific aspects of their fisheries. British Columbia passed its own Fisheries Act in 1901 and appointed John P. Babcock as the province's first Commissioner of Fisheries.[39] While licensing and regulating of hydroelectric facilities on non-navigable rivers was a provincial responsibility, the federal government, through its Department of Fisheries, could insist on certain conditions, including the construction of fishways to facilitate the movement of fish past a hydroelectric dam. To exercise this power the government first had to identify important fisheries that required protection. Based on the early proposals floated by the Hydrographic Survey, the government was largely ignorant of the identity of important fishing rivers. In 1913 the Hydrographic Survey described the Adams River, one of British Columbia's most productive salmon rivers, as one of the best potential hydroelectric rivers in the British Columbia interior. It was especially attractive to the electric industry because Adams Lake could act as a reservoir: "Adams lake [sic] forms an

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[39] Diane Newell, Tangled Webs of History: Indians and the Law in Canada's Pacific Coast Fisheries (Toronto: University of Toronto Press, 1993) 101-15. Babcock's position was changed to Deputy Commissioner in 1902.

excellent storage basin, and no very important interests would be affected by damming its outlet."[40]

Even when important fishing rivers were identified, government assigned little value to them in comparison to hydroelectricity. In 1922 the newly formed East Kootenay Power Company proposed to construct a 150 foot high hydroelectric dam on the Elk River at a site which had been investigated and promoted by the provincial government in 1912. The facility was intended to supply electricity to the coal mines of the Crow's Nest Pass region.[41] The Elk River supported a thriving trout fishery and the local rod and gun club expressed concern that the dam would prevent the fish from ascending the river. James Motherwell, the federal government's head of fisheries in British Columbia from 1921 to 1946, believed that given the value of the hydroelectric dam to the local and provincial economies, the fate of the trout fishery was of little importance. "It would appear to the writer that every encouragement should be given such an enterprise and that the Fishery Department should not embarrass them in any way whatsoever." Motherwell concluded that, at best, his department might support the

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[40] Canada, Department of the Interior, Water Power Branch, "Report of the British Columbia Hydrographic Survey," Sessional Papers. Water Resources Paper No. 8 (Ottawa, 1915) 35.
[41] "Report of Water Rights Branch," B.C. Sessional Papers, 1913; Fred J. Smyth, Tales of the Kootenays (Vancouver: J.J. Douglas Ltd., 1977) 169-70; B.C. Department of Lands, Water Powers of British Columbia (Victoria: British Columbia, 1924) 94.

release of fish fry and eggs above the dam in the hope of maintaining the fishery. Babcock agreed on behalf of the provincial government, and noted that given the height of the proposed dam a fishway was simply impractical.[42]

Motherwell's desire to save hydroelectric developers from any possible embarrassment attributable to the need to accommodate or protect fish stocks became a constant refrain. B.C. Electric's Alouette Lake dam raised similar concerns in 1923. Although Alouette River and Lake were a rich salmon spawning ground, Motherwell believed that it was "not of tremendous importance" to the local commercial fishery while B.C. Electric's diversion dam was a "very necessary addition.... I think that you will agree with me that although it is imperative to protect the fish where at all possible, at the same time it is not possible to embarrass such development as is proposed."[43] Motherwell later informed Babcock that the federal government accepted that the dam would eliminate the Alouette's spawning ground and believed that a fishway would be of no use. Nonetheless, his department had decided not to protest the matter and concluded "that there should be no obstacle placed in the way of the proposed development."[44] As a result, a fishway was not constructed and the B.C. Electric's

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[42] Motherwell to Babcock, 28 December, 1922 and Babcock to Motherwell, 30 December, 1922, BCA, GR 435, box 62, f. 587.
[43] Motherwell to Sloan, 21 August 1923, BCA, GR 435, box 63, file 590.
[44] Motherwell to Babcock, 5 Nov. 1923, BCA, GR 435, box 63, file 590.

water license allowed the company to divert the entire flow of the river through its tunnel into Stave Lake.

Even when early hydroelectric developers chose to install a fishway, the provincial government was of little assistance. In 1908 the Granby Consolidated Mining, Smelting and Power Company expressed interest in adding a fish ladder to its hydroelectric dam on the Kettle River in the southern Interior. A.B.W. Hodges, the company's local manager, wrote to Babcock about fish ladders, stating "I would like to put in one if I knew how to build one."[45] Babcock's suggestions were unhelpful and impractical, prompting Hodges to ask him for more information and a photograph of a functioning fish ladder that would give him a better idea of how one should be built.[46] Similarly, in 1912 the City of Kamloops approached the province for information on installing a fishway as part of its construction of a hydroelectric dam on the Barriere river, forty miles north of Kamloops. Babcock replied that the government did not have any standard plans for fishways but if the city provided more detailed information he would be able to offer advice.[47] In 1921 Babcock was again asked for fishway plans, this time by a colleague from Washington State. He replied that he did not have any plans and that in his 20 year career he had only been involved in the building of two

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[45] Hodges to Babcock, 19 October, 1908, BCA, GR 435, box 62, f. 587.
[46] Hodges to Babcock 27 October, 1908, BCA, GR 435, box 62, f. 587.
[47] Dutchie to Fisheries Department, 11 October, 1912 and Babcock to Dutchie, 14 October, 1912, BCA, GR 435, box 62, f. 587.

significant fishways in British Columbia.[48] Instead of promoting the construction of fishways, Babcock was resigned to the fact that fish and hydroelectric power were simply incompatible. In 1924 he advised an American engineer that while he believed that a fishway could be built for any dam, no matter the height, they were futile enterprises since they did nothing to solve the problem of downstream migration. The only route for fingerlings travelling downstream was through the turbines and this meant almost certain death. "Even the smallest fish cannot pass through power wheels alive." In Babcock's opinion the development of a major hydroelectric dam necessarily doomed the local fishery. "In my judgment the establishment of a large power plant in any salmon stream will be fatal to the salmon."[49]

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[48] Cobb to Babcock, 24 August 1921 and Babcock to Cobb, 27 August, 1921, BCA, GR 435, box 62, f. 587. The two fishways had been constructed on the Quesnel and Meziadin Rivers.

[49] Assistant commissioner to Clary, 11 August, 1924, BCA, GR 435, box 63, file 591.

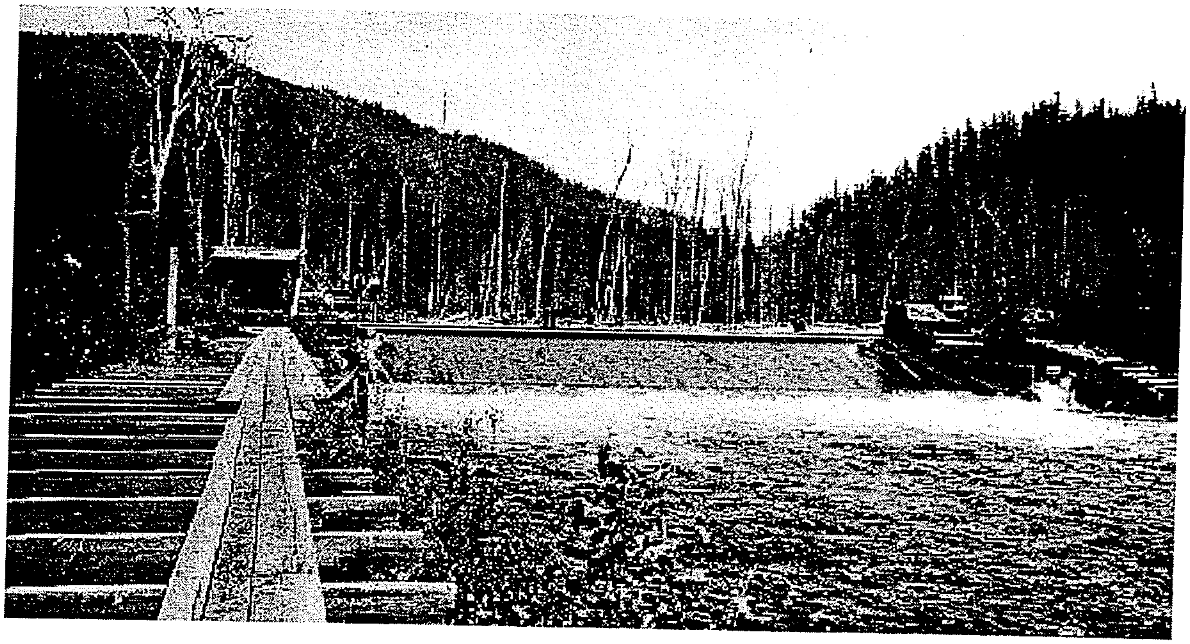

Figure 2.4. Barrier Dam, c. 1915

Source: BCA, C-03223.

Corporate Power for Victoria

Although the promise of small hydroelectric facilities had been initially acknowledged, the state's role in hydroelectric development was increasingly limited to promoting and facilitating the growth of corporate hydroelectricity. B.C. Electric's British directors were initially skeptical of waterpower as a means of generating electricity, but by the late 1890s the obvious economic advantages were too great to ignore.[50] In 1897 B.C. Electric entered into an agreement with the

[50] Christopher Armstrong and H.V. Nelles, Monopoly's Moment: The Organization and Regulation of Canadian Utilities, 1830-1930 (Philadelphia: Temple University Press, 1986) 99-100.

Esquimalt Water Works Company to generate electricity for Victoria. The water company agreed to build new reservoirs and an eight thousand foot pipeline at its Goldstream facility, twelve miles north of Victoria, while B.C. Electric constructed a powerhouse and transmission lines. Electricity was generated by connecting two Pelton waterwheels to two electrical generators. Having powered the waterwheels, the water was returned to the water company's reservoir below the powerhouse and transported to Victoria for domestic usage.[51]

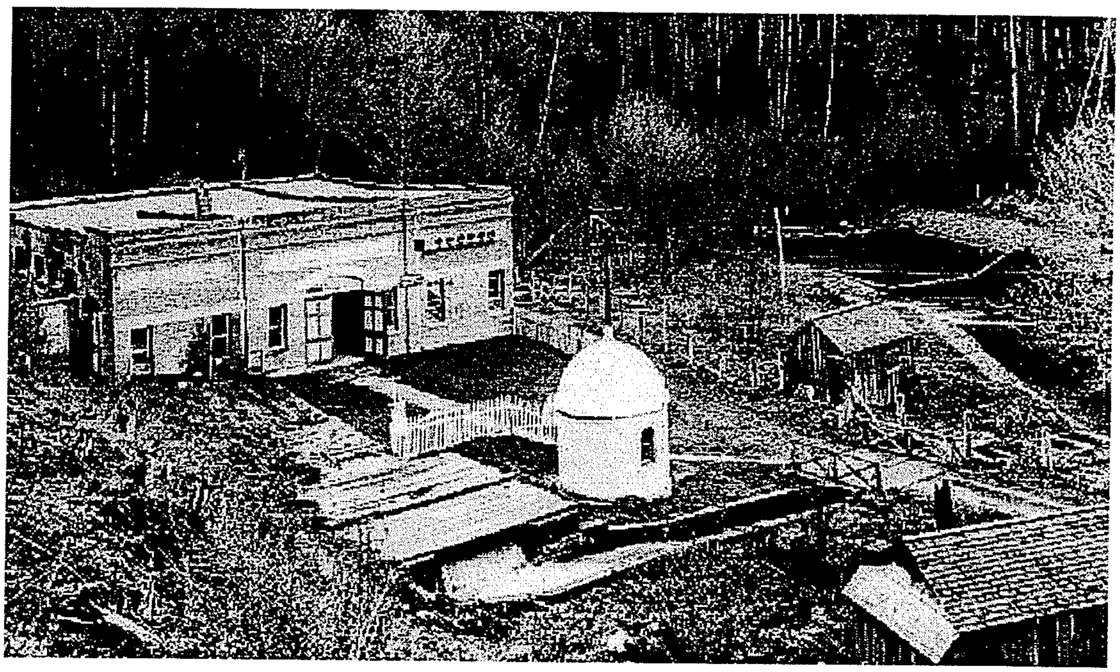

Figure 2.5. Goldstream Powerhouse, c. 1920.

Source: BCA, I-52551.

[51] "Early Development and Progress of the B.C. Electric Railway Company," B.C. Electric Employees' Magazine (hereafter BCEEM) 8.12 (March, 1926) 17; Conway, Water Powers of Canada: Province of British Columbia, 36.

The month to month operation of the Goldstream plant was dependent on the availability of water. When the proposal was first considered in 1893 it was projected that due to the limited storage capacity and seasonal fluctuations in the river's flow, the plant would be able to generate up to fifteen hundred kilowatts in the winter, but less than one thousand kilowatts during summer months.[52] Despite seasonal fluctuations the Goldstream plant was Victoria's primary source of electricity for over ten years. As the city became increasingly dependent on electricity for transportation and lighting, its citizens grew less willing to accept that their lighting and public transportation were governed by the seasons and could be limited by hot and dry weather. During the summer of 1907 southern Vancouver Island experienced a drought which, aside from the usual concerns about crops and drinking water supplies, created serious problems with the city's transportation and lighting systems.

By October, even with its auxiliary steam plant operating, B.C. Electric was unable to meet the city's demand for electricity. According to the Victoria Times, the "absence of rain" had created a crisis in the city.[53]As the drought continued Victoria's lights began to dim, prompting the local newspaper to editorialize that

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[52] Douglas V. Parker, No Horsecars in Paradise: A History of the Street Railways and Public Utilities in Victoria, British Columbia before 1897 (Vancouver: Whitecap Books, 1981) 63.
[53] "Shortage of Water for Power and Light," Victoria Times, 22 October 1907. See also, "A Crisis, and the City's Interest in It," Victoria Times, 23 October 1907.

those now reliant on hydroelectricity should pray that "the floodgates of heaven may soon be opened."[54] Relief finally arrived in late November in the form of winter rains, filling the Goldstream reservoirs and allowing B.C. Electric to resume regular service.[55] But during the following autumn Victoria again found itself suffering from a shortage of rain and a concomitant reduction in its electrical services. B.C. Electric delayed switching on the electric light supply until late in the afternoon and cut the power to residential districts at 11 p.m. each evening. Once again it was expected that winter rains would allow the resumption of full service.[56]

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[54] "Enthusiasm Run Wild," Victoria Times, 24 October 1907.
[55] "Copious Rains Give Full Water Supply," Victoria Colonist, 24 November 1907.
[56] "Timely Rains Mean Addition of Power," Victoria Colonist, 31 October 1908; "Company Explains its Power Shortage," 3 November 1908, Victoria Colonist.

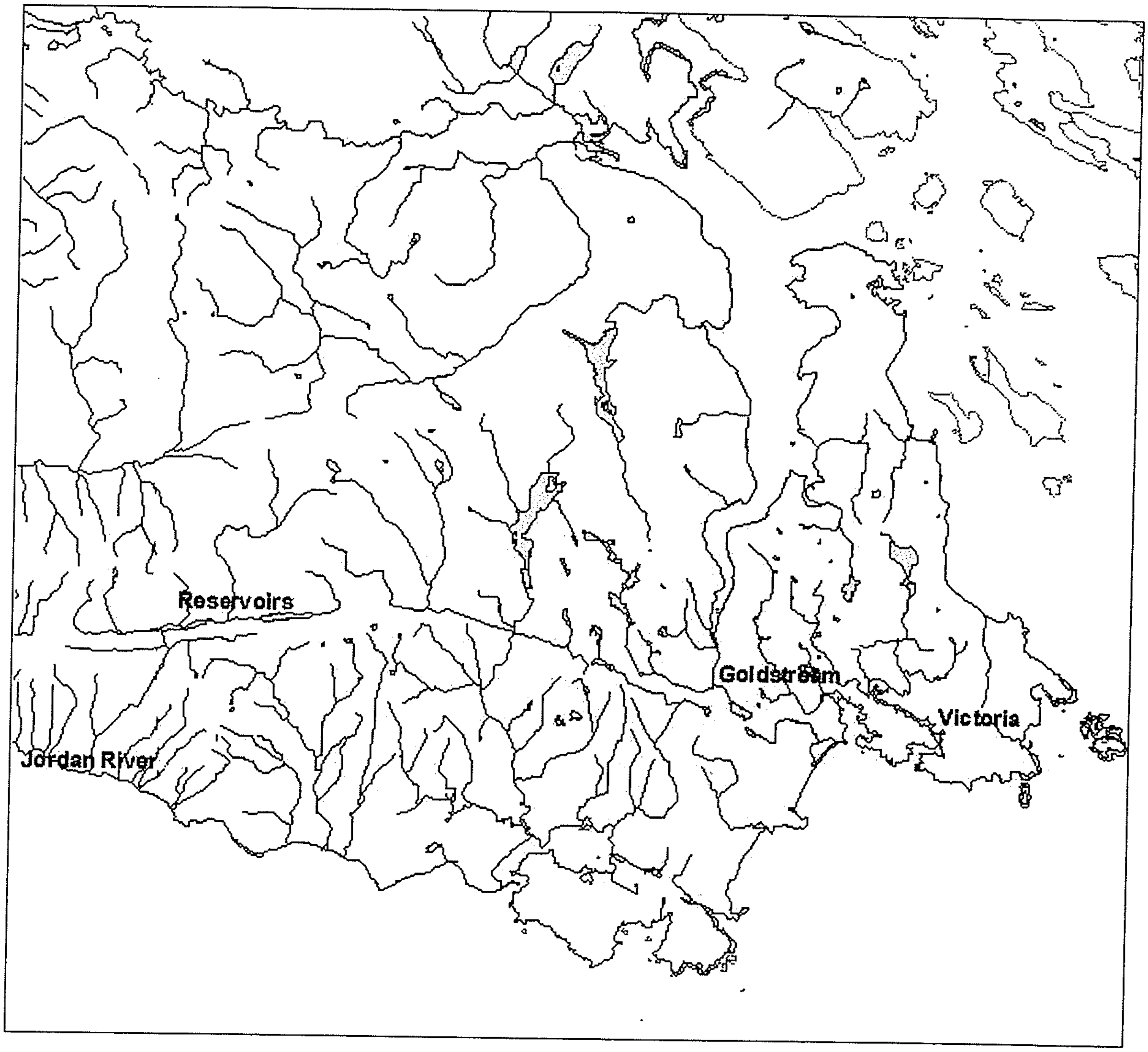

Figure 2.6. Victoria Area Hydroelectric Plants

Source: Base map derived from data at British Columbia, Minister of Energy and Mines; http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/default.htm.

By 1909 it was apparent that, given the seasonal fluctuations in the water supply, the Goldstream plant could not supply the electricity demands for the

Victoria region.[57] B.C. Electric decided that the solution was to draw on waterpower from outside of the Victoria area rain shadow. Its attention turned to the Jordan River, which it had first investigated during the 1907 power shortage. The Jordan River is west of Victoria, across the Vancouver Island Mountains, in the rainy San Juan River watershed, part of British Columbia's coastal temperate rainforest. B.C. Electric decided that the Jordan River would be its next major hydroelectric development site but refused to begin construction until it had extracted further protection for its monopoly from the local government. B.C. Electric demanded that Victoria agree not to enter into competition with it without first offering to purchase the company's facilities. With the threat of further power disruptions hanging over them, Victoria's property owners approved the agreement in August, 1909.[58]

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[57] Goward to Sperling, 6 March, 1908; Tripp to Goward, 27 May, 1909 and Woodroofe to Sperling, 5 June, 1909, UBCSC, BCER Records, box 6, file 6-B164; "The Jordan River Power Development," Electrical World 60.15 (1912) 767-771.

[58] "One Taken; Other Left," News Advocate, 27 August 1909 and "Voters Split on the Bylaws," Victoria Colonist, 28 August 1909.

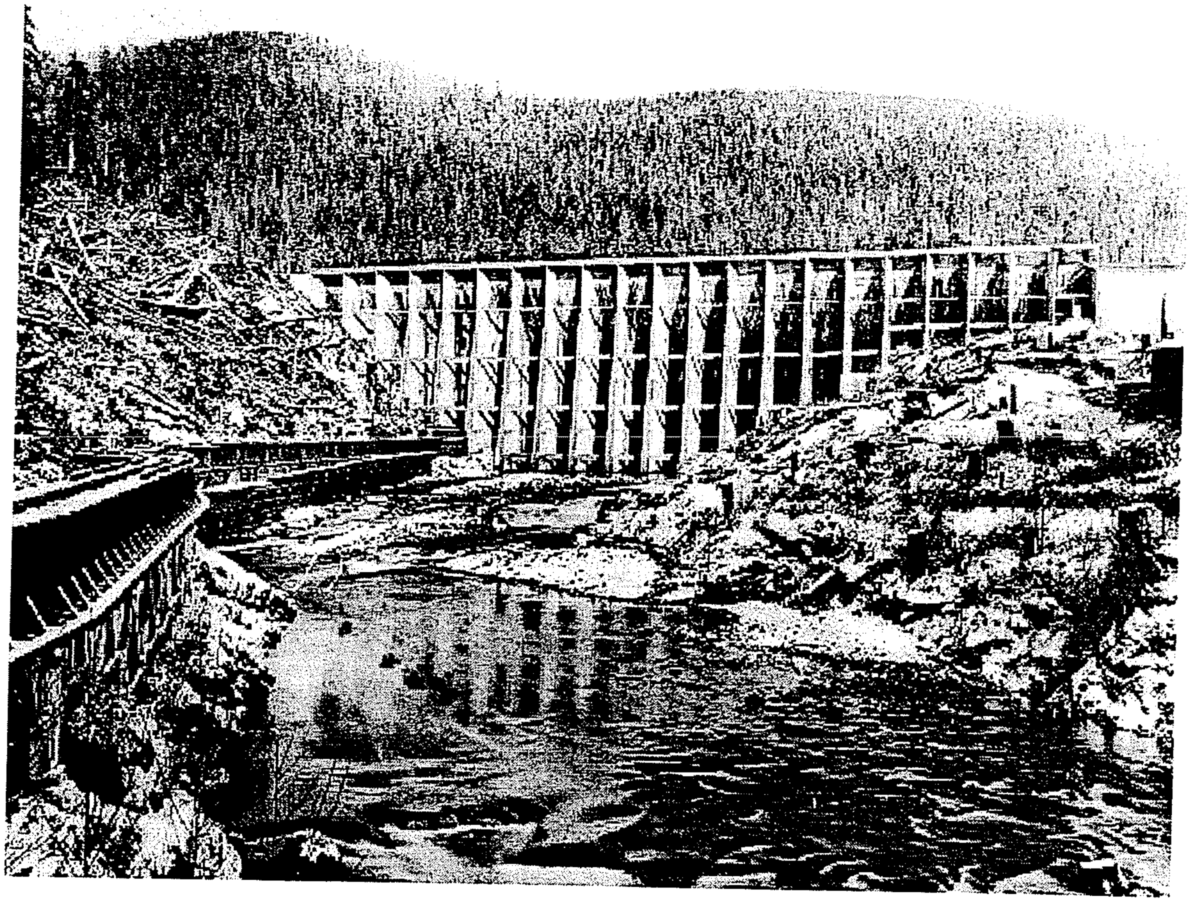

Figure 2.7. Jordan River Dam and Flume, c. 1920.

Source: BCA, I-52552.

B.C. Electric proceeded to implement its plans for the Jordan River watershed through its subsidiary, the Vancouver Island Power Company. The accepted solution to Victoria's annual electricity shortage was to store more of the winter rains so that the water could be used to generate electricity during the dry summers. This required a large dam capable of impounding millions of gallons of water. B.C. Electric actually built two dams, one on Bear Creak, a tributary of the Jordan River, that initially flooded 285 acres, and a second, larger dam, on the

Jordan River that flooded nearly 400 acres. The main Jordan River dam was several miles inland from the powerhouse on the coast, so an open flume, over 5 miles in length, was built to carry the water from the dams to the turbines.[59] The dams helped to alleviate the annual summer electricity shortage in Victoria but were not able to store enough water to completely obliterate seasonal differences. Figures 2.8 and 2.9 illustrate how even as late as 1940 the output at the Jordan plant dropped in the summer to only one third of its winter time output. To make up for the shortage B.C. Electric was forced to operate its steam auxiliary plant, an expensive operation in comparison to hydroelectricity.

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[59] "Report, Jordan River Power Development and Power Situation, Victoria," 25 July 1912, UBCSC, BCER Records, box 88, file VIP-7, part 1; British Columbia, Department of Lands, "Water Powers of British Columbia Canada, 1924," BCA, GR884, box 1, file 1, p. 14 and "Early Development and Progress of the B.C. Electric Railway Company," BCEEM 8.12 (March, 1926) 17.

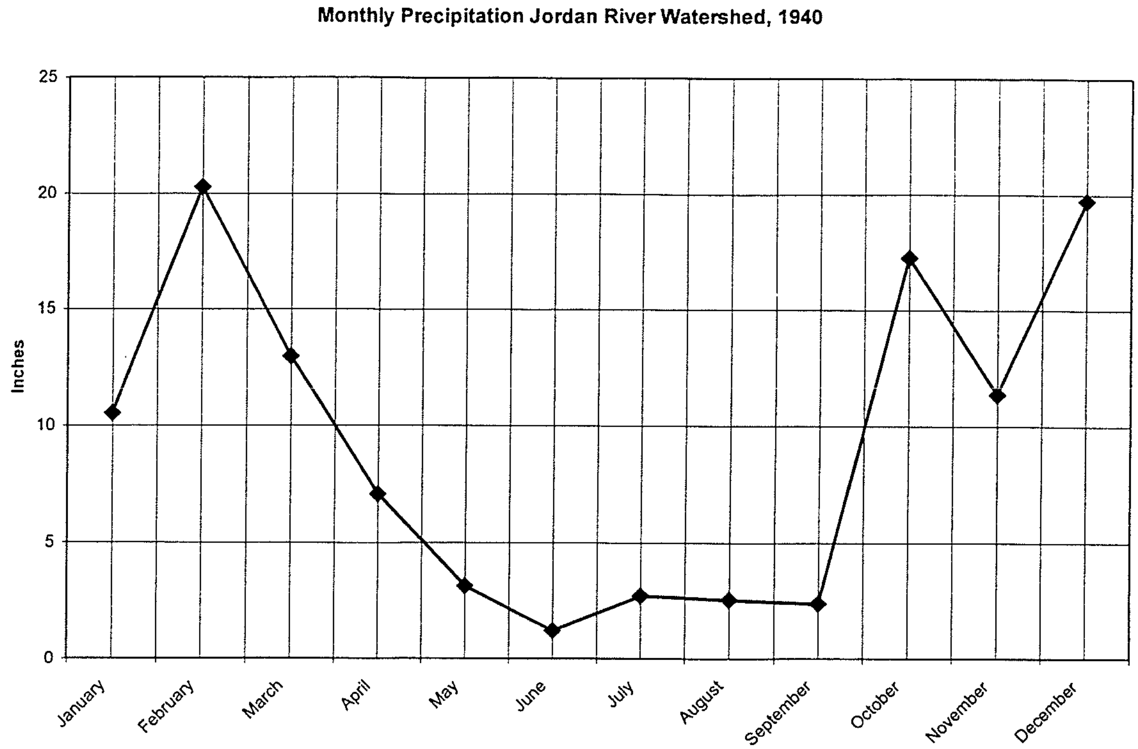

Figure 2.8. Monthly Precipitation, Jordan River Watershed, 1940

Source: Calculated from data contained in BCA, BCER Papers, MS-004, vol. 525.

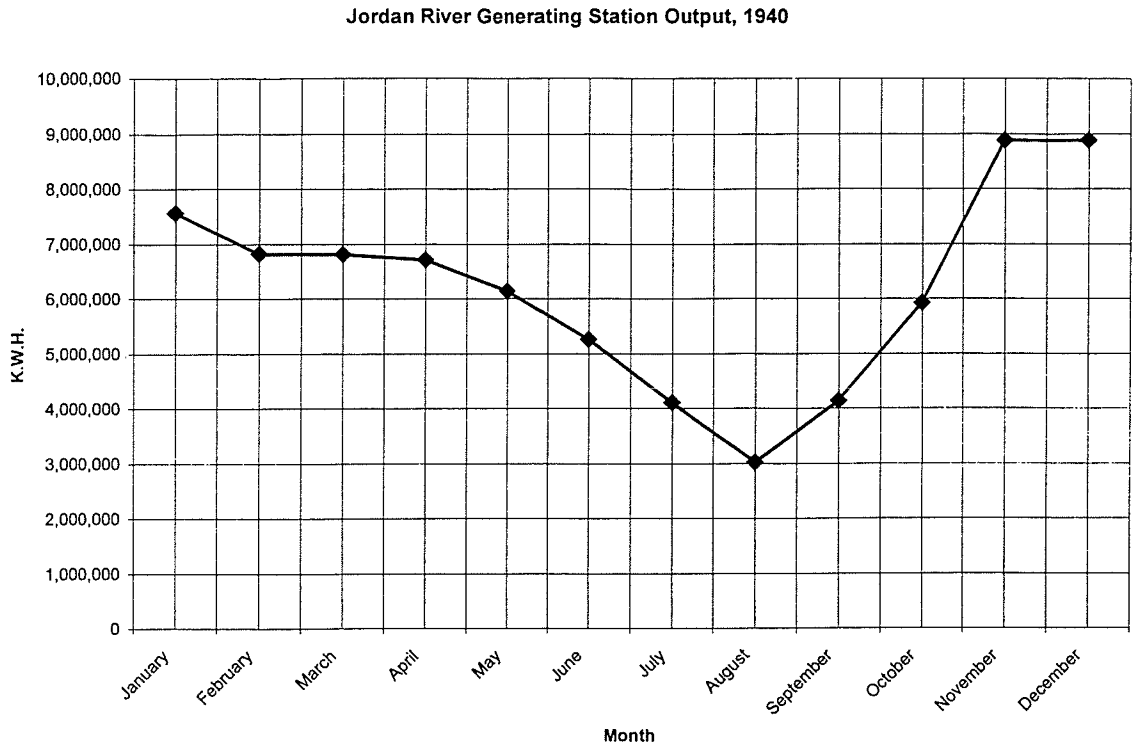

Figure 2.9. Jordan River Generating Station Output, 1940.

Source: Calculated from data derived in BCA, BCER Papers, MS-004, vol. 525.

The development of corporate-produced hydroelectricity for Victoria exemplified several characteristics of the early hydroelectricity industry in British Columbia. B.C. Electric did not decide to build the Jordan River hydroelectric facility simply because Victoria was experiencing a shortage of electricity. It pursued the project because there was an opportunity to accumulate more capital by supplying the city with more electricity. The natural hydrologic conditions of the Victoria area were a barrier to this goal. B.C. Electric could not store enough water for hydroelectric generation to meet demand through Victoria's dry summers. When this type of impediment to capital accumulation exists, entrepreneurs often respond by undertaking spatial reorganizations.[60] B.C. Electric's response was to relocate its main generation facility out of the Victoria area rain shadow. It chose a location in the rainy San Juan River watershed, thereby extending the distance between the site of production and consumption. It also responded by making a large capital investment to reorganize the water flow of the Jordan River to increase storage. Before it embarked on this project it solidified its position by extracting guarantees from the local government to protect its monopoly.

Corporate Power for Vancouver

B.C. Electric initially relied on a steam plant as its sole electric generating facility for the Vancouver area. By 1902 demand for electricity had increased to the point that the company decided it justified a major capital investment in hydroelectricity. It committed to spend $1.5 to $2 million to develop a hydroelectric plant to supply Vancouver and vicinity. The project was designed to capitalize on the four hundred foot difference in elevation between Lake Beautiful (soon to be renamed Lake Buntzen after B.C. Electric's general manager) and sea level on Indian Arm, an offshoot of Burrard Inlet. The first phase of the project

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[60] David Harvey, Justice, Nature, and the Geography of Difference (Cambridge, Mass.: Blackwell Publishers, 1996) 240, 295-96; David Harvey The Condition of Postmodernity : An Enquiry into the Origins of Cultural Change (Cambridge MA ; Oxford UK: Blackwell, 1990) 204.

included the construction of a small dam on Lake Buntzen and sending the water through steel pipes to the powerhouse on Indian Arm where it generated six thousand kilowatts. Vancouver began to receive its first hydroelectricity on 17 December, 1903. The unit cost to B.C. Electric was less than a third of the cost of generating electricity from steam and soon resulted in a twenty percent reduction in electricity rates which served to placate disgruntled customers and discourage competition.[61]

[61] A. Vilstrup, "Early History of the British Columbia Electric Power System in the Lower Mainland of British Columbia," address before the Vancouver section of the American Institute of Electrical Engineers, 20 March 1936, UBCSC; B.C. Department of Lands. Water Powers of British Columbia Canada. 1924, BCA, GR 884, box 1, file 1, p. 29; Henry Ewert, The Story of the B.C. Electric Railway Company (North Vancouver: Whitecap Books, 1986) 50-61; "Coquitlam-Buntzen Hydro-electric Development," Electrical World 66.4 (1915) 175-177; George Green, "Some Pioneers of Light and Power," British Columbia Historical Quarterly 2.3 (1938) 145-62; Patricia Roy, "The British Columbia Electric Railway Company," 156, 163; "General History B.C. Electric," Vancouver City Archives, add. mss. 321, vol. 1; Armstrong and Nelles, 99-100.

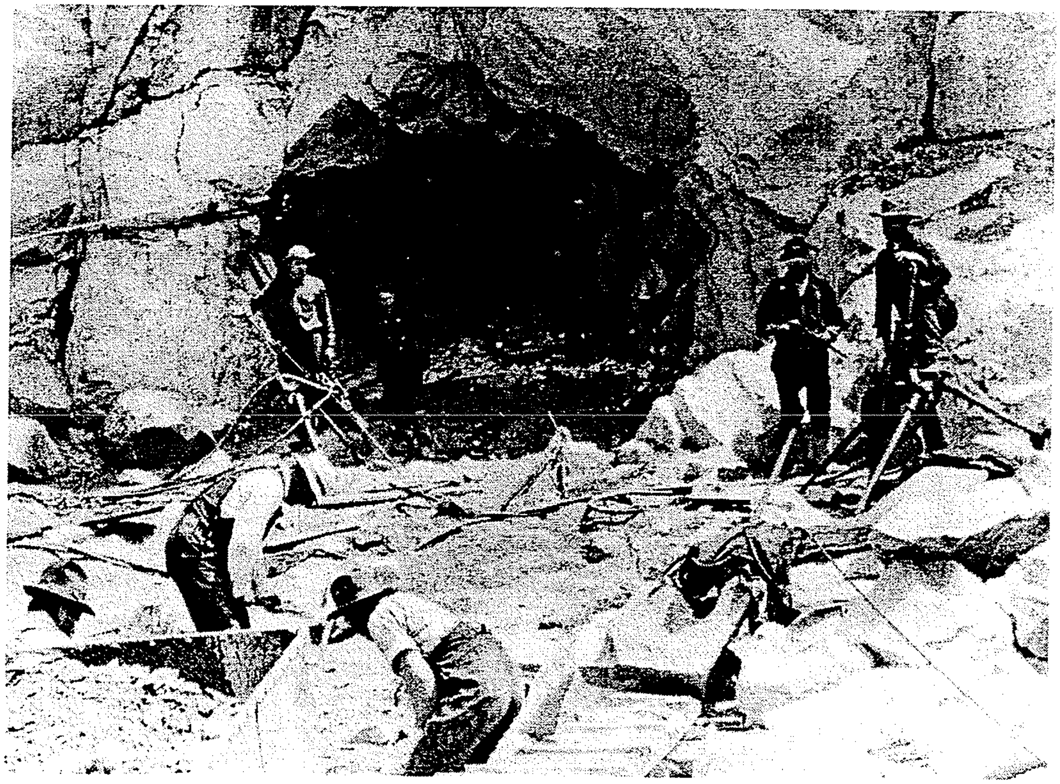

Figure 2.10. Construction of Buntzen Tunnel, circa 1902

Source: BC Hydro.

It was recognized from the outset that Lake Buntzen was too small to generate sufficient electricity for the Vancouver market. To meet demand further spatial reorganization was required. The second phase of the Buntzen development was intended to tap nearby Coquitlam Lake and its watershed which normally received over 150 inches of rain annually. In 1902 B.C. Electric began drilling a tunnel nearly four kilometers long between Buntzen Lake and Coquitlam Lake. In 1903, while work on the tunnel continued, a rock-filled, crib overflow dam was constructed at the south end of Coquitlam Lake to raise the lake's water level by eleven feet. The tunnel, the longest hydro-electric tunnel in the world at the time, was opened on 10 June, 1905. Access to the Coquitlam Lake water allowed B.C. Electric to install a new five thousand kilowatt generator in the Buntzen powerhouse, almost doubling its capacity to eleven thousand kilowatts. It also allowed B.C. Electric to close the Vancouver steam plant and for the first time completely meet its demands with hydroelectricity.[62] Rapid increase in demand for electricity soon justified a further investment of $6 million. The overflow dam on Coquitlam Lake was replaced with a large new dam capable of capturing the watershed's entire runoff and raising the water level on Coquitlam Lake by a further sixty feet. The existing tunnel was enlarged to handle the increased water flow to Buntzen Lake, the existing powerhouse on Indian Arm was expanded and a completely new powerhouse was built. When the project was completed in 1913 B.C. Electric had increased its Vancouver-area generating capacity almost six fold, from eleven thousand to 61,500 kilowatts.[63]

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[62] Canada, Department of the Interior, Dominion Water Power Branch, "Coquitlam-Buntzen Hydro-Electric Development, British Columbia," Sessional Papers. Water Resources Paper No. 13 (Ottawa,1915) 1-45.

[63] "Millions are Spent to Harness Coquitlam Power," Coquitlam Star, 8 May 1912; Dominion Water Power Branch, "Coquitlam-Buntzen Hydro-Electric Development, British Columbia,"; Conway, Water Powers of Canada: Province of British Columbia , 40; "The Power that Runs Down Hill," The British Columbia Magazine 7.5 (May 1911) 401-405; Roy, "The British Columbia Railway Company," 156-57.

Figure 2.11. Buntzen Powerhouse #2 on Indian Arm, c. 1920

Source: BCA, I-52543

The expanded Buntzen/Coquitlam project was completed shortly after the entrance of the first serious threat to B.C. Electric's dominance of Vancouver's electricity market. In early 1912 the Western Canada Power Company had completed a new hydroelectric facility on the Stave River, thirty-five miles east of Vancouver. The company, backed by the Bank of Montreal and capitalists from eastern Canada, had built a dam at Stave Falls seven miles south of Stave Lake and six miles north of the confluence of the Stave and Fraser Rivers. The dam flooded the Stave River valley north to Stave Lake to create a reservoir. A power station with an initial capacity of approximately twenty thousand kilowatts was installed.[64]

The redevelopment of B.C. Electric's Buntzen/Coquitlam project and the completion of the Stave Falls plant meant that within a year the installed generating capacity in the Vancouver area had increased by nearly 750% to a total of over eighty thousand kilowatts. It was the first, but not the last, example in British Columbia of the electric industry over building its generating capacity through the development of large-scale hydroelectric facilities. The excess energy created a situation of supply in search of demand. Even with a 1913 agreement to sell bulk power to B.C. Electric, Western Canada Power continued to struggle to find buyers for its electricity.[65] The company looked south across the border for a market and was able to convince the federal government to allow it to export surplus electricity to Bellingham, in Washington State. It also launched an aggressive advertising campaign targeted at Vancouver-area industries with the promise of cheap and reliable power from Stave Falls. Bold, stark advertisements

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[64] Taylor, Builders of British Columbia 181-82; Allen Seager, "The Resource Economy, 1871-1921," The Pacific Province: A History of British Columbia (Vancouver: Douglas & McIntyre, 1996) 220; Conway, Water Powers of Canada: Province of British Columbia, 59; Canada, Commission of Conservation, Water-Powers of Canada. (Ottawa: Mortimer Co., 1911) 317.

[65] Vilstrup, "Early History of the British Columbia Electric Power System in the Lower Mainland of British Columbia."

ran in British Columbia's manufacturers' magazine urging businesses to abandon their private generating plants and "USE STAVE LAKE POWER....You can build up a Profitable Manufacturing Business in dull times if you will." With an "unlimited" amount of power available day or night, a business's success would be assured.[66]

While the Stave Falls plant created a surplus of electricity for the Vancouver market, its full potential had yet to be realized. Alouette Lake lies to the west of Stave Lake, draining into the Pitt River, a tributary of the Fraser. Of particular interest to hydroelectric companies was Alouette Lake's elevation, 140 feet higher than Stave Lake. It was obvious from the earliest investigations of the area's hydroelectric potential that the capacity of the Stave Falls plant could be greatly increased if water was diverted from Alouette Lake into Stave Lake. The water rights to Alouette Lake were originally held by the Burrard Power Company, which B.C. Electric acquired in March, 1912 in order to thwart the Western Canada Power Company's expansion at Stave Falls.[67] The corporate standoff ended in early 1921 with B.C. Electric's acquisition of its competitor and the announcement of ambitious expansion plans of its own. B.C. Electric

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[66] Industrial Progress & Commercial Record 2.2 (August 1914) 35.
[67] Alouette Lake was initially named Lillooet Lake. Its water rights were the subject of the famous Burrard Power v. the King decision of 1911 which transferred water rights administration in the Railway Belt to the federal government.

immediately began installing a fourth ten thousand kilowatt generator at Stave Falls at a cost of $1 million. It also began to refurbish the existing generators to increase their capacity, and raise one of the dams by twenty-six feet at an additional cost of $1.25 million.[68]

B.C. Electric's plans for Stave Falls also included generating electricity with water from Alouette Lake. Originally, Alouette Lake was two lakes, separated by a small stream. B.C. Electric's plans entailed building a sixty-five foot high, one thousand foot long dam at the south end of the lake, raising the water level by forty-five feet to create a single lake, and drilling a tunnel thirty-six hundred feet through the mountain separating Alouette Lake from Stave Lake.[69] A small powerhouse was built at the end of the tunnel on the shore of Stave Lake to capture the 140 foot head; it began generating with a capacity of nine thousand kilowatts in 1928.[70]

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[68] "General History B.C. Electric," Vancouver City Archives, add. mss. 321, vol. 1; George Kidd, "Company Takes Over Western Power Company," BCEEM Magazine (3.10) 8; J. Newell, "Power Development on Our Mainland System," BCEEM (5.1) 2-3; "Rapid Progress Being Made at Stave Falls," BCEEM 5.7 (1922) 4;

[69] E.E. Carpenter, "Launching of Alouette Development Continues Company's Power Programme," BCEEM (7.1) 4-7; E.E. Carpenter, "Review of Construction Programme of 1924 and Outlook for 1925," BCEEM (7.10) 8-9; B.C. Department of Lands, "Water Powers of British Columbia Canada, 1924", BCA, GR 884, box 1, file 1, p. 45; Roy, "The British Columbia Railway Company", 177-178.

[70] A. Vilstrup, "Early History of the British Columbia Electric."

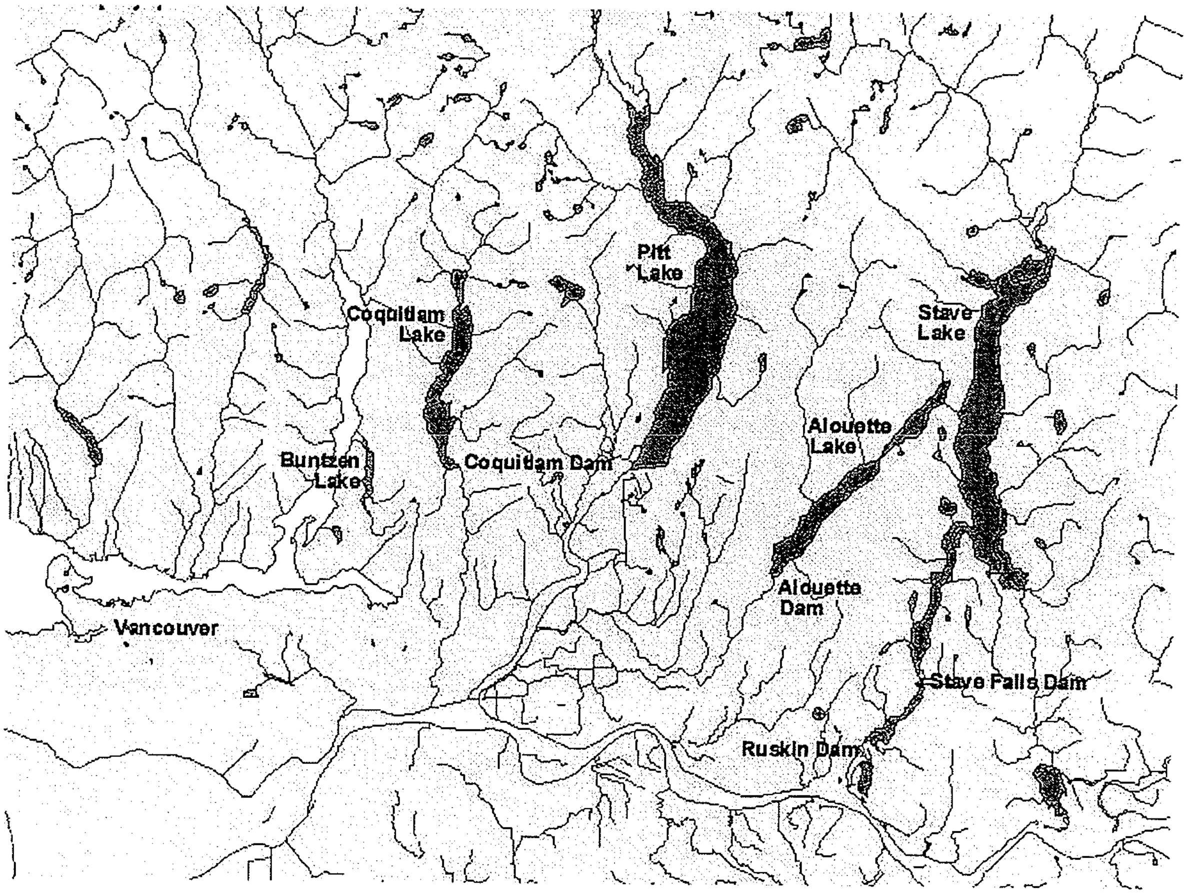

Figure 2.12. Vancouver Area Hydroelectric Developments.

Source: Base map derived from data at British Columbia, Minister of Energy and Mines; http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/default.htm

In concert with its construction work on Alouette Lake, B.C. Electric proceeded to expand and modernize the original Stave Falls plant in order to utilize fully the new water source. The existing dam was raised a further twenty-five feet, trebling the storage capacity on Stave Lake and increasing the available head. In 1925 B.C. Electric also completed the installation of a fifth generator in the Stave Falls powerhouse. The joint Alouette Lake/Stave Lake development now had a combined generating capacity of seventy-four thousand kilowatts.[71] B.C. Electric had one last opportunity to generate power with Alouette and Stave Lake water. In 1929 it began construction on a 183 foot concrete dam at Ruskin, downstream from Stave Falls, which began operation on 18 November, 1930 with a generating capacity of thirty-five thousand kilowatts.[72] The opening of the Ruskin facility brought B.C Electric's total installed generating capacity in the Vancouver area in 1930 to 172,500 kilowatts, a twenty-nine fold increase from the opening of its initial six-thousand-kilowatt Buntzen facility in 1903.

From 1921 to 1925 demand for electricity in the Vancouver area had increased by forty percent, prompting another potential competitor to consider challenging B.C. Electric's monopoly. In 1924 the Bridge River Power Company began to investigate seriously the possibility of developing a massive new hydroelectric facility that would dwarf B.C. Electric's installed and planned developments. This prompted B.C. Electric to move to protect its monopoly by acquiring control of the Bridge River Company. In 1925 it announced that it

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[71] George Kidd, "Company Takes Over Western Power Company," BCEEM (3.10) 8 ; "Work at Stave Falls Well Under Way," BCEEM 5.5 (1922) 5; "Rapid Progress Being Made at Stave Falls," BCEEM 5.7 (1922) 4; "Fifth Unit, Stave Falls, Ready for Service," BCEEM 8.5 (1925) 4-5; "Our Most Eventful Year Passes Into History," BCEEM 8.10 (1926) 4-5.
[72] "Contract Awarded for Ruskin Dam Construction," BCEEM 11.12 (March, 1929) 25; A. Vilstrup, "Early History of the British Columbia Electric."

would begin construction on Bridge River, a tributary of the Fraser River.[73] The project was intended to capitalize on a "freak of nature" that had resulted in Bridge River being at twelve hundred feet higher elevation than Seton Lake but within 2 ½ miles distance. By drilling a tunnel through Mission Mountain to divert Bridge River water to Seton Lake and constructing a series of storage dams, an estimated 500,000 kilowatts could be generated. In 1925 B.C. Electric believed that this would be enough power to serve Vancouver for 50 years. In 1926 work began on a diversion dam across Bridge River, a storage dam on Gunn Lake, and a fourteen thousand foot diversion tunnel to Seton Lake. [74] The tunnels were completed in 1930 before the economic depression brought a halt to work on the project. The project was not renewed until the surge in demand for electricity that accompanied World War II. By the mid-1950s it had a capacity of 185,000 kilowatts, making it the highest capacity hydroelectric station in Western Canada. [75]

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[73] "Fifth Unit at Stave Falls Now In Operation," BCEEM 8.7 (1925) 8- 9.
[74] Armstrong and Nelles, 254-62; F.H. Fullerton, "The Bridge River Power Plant," Electrical Review 103.2653 (September 28, 1928) 507-10; Cecil Maiden, Lighted Journey: The Story of B.C. Electric (Vancouver: British Columbia Electric Company Ltd., 1948) 105, 109, 113.
[75] British Columbia, Water Rights Branch, Water Powers, British Columbia, Canada 1954, BCA, GR 884, box 1, file 24, p. 54; "'Mountain Movers' Give B.C. New Lake and Big Power Dam," Vancouver Sun, 5 November, 1949: 17; "BCE Plans $33 Million Program," Vancouver Sun, 28 November, 1953: 1-2.

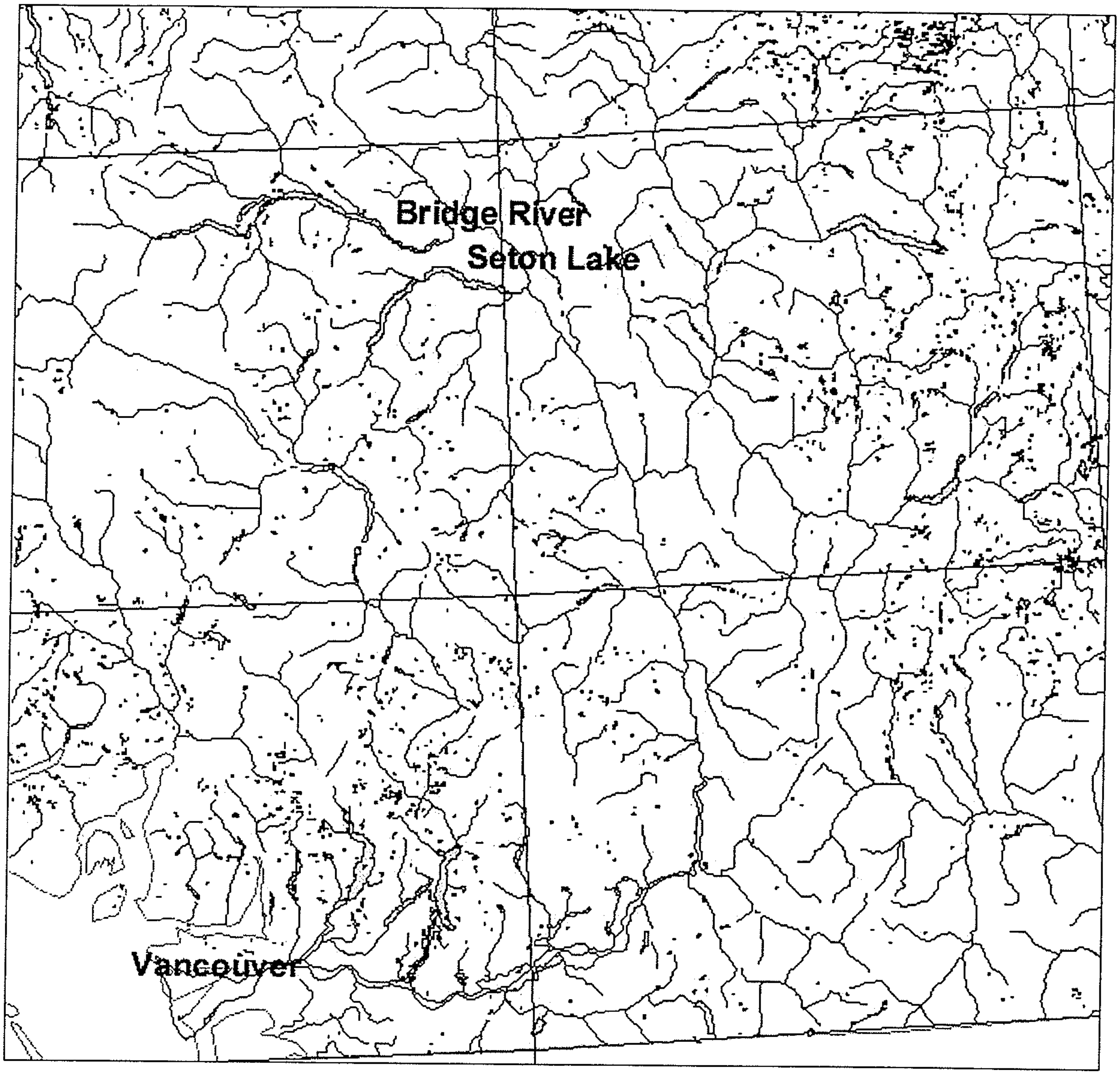

Figure 2.13. Bridge River development in relation to Vancouver (135 miles)

Source: Base map derived from data at British Columbia, Minister of Energy and Mines; http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/default.htm

Conclusion

The Bridge River development marked the culmination of the early history of hydroelectric development in British Columbia and the beginning of the 'Big Dam' era. B.C. Electric's decision to pursue it illustrated an important element in the logic of hydroelectric development. Increasing demand for electricity did not simply lead to more hydroelectric facilities but, in addition, to larger and larger hydroelectric facilities dependent on ever greater engineering of natural water flows and controlled by more powerful corporations. This was due to the economies of scale inherent in hydroelectricity. If a demand could either be found or created, the highest return on capital investment resulted from giant engineering schemes that generated unprecedented amounts of energy.

By World War II the hydroelectric industry in British Columbia had taken the basic form that continues to exist. During the industry's early years there had been numerous developments (see Appendix A). These facilities were small, often built and owned by individuals or small companies. Most generated less than two hundred kilowatts, cost only a few thousand dollars to develop, and did not require major spatial reorganizations either through large dams and storage reservoirs or by transmitting electricity long distances. Beginning with B.C. Electric's Buntzen/Coquitlam project in 1903 the face of hydroelectricity in British Columbia changed significantly. The projects that had been initiated by 1939 had a total ultimate generating capacity of nearly one million kilowatts, five times the installed capacity in 1914 (see Figure 2.14). As generating capacity increased, the number of facilities decreased. Twelve generating facilities were responsible for nearly ninety percent of the 1 million kilowatts ultimate generating capacity. Control of this energy had also been concentrated in a few hands. Two large corporations, B.C. Electric and Cominco, controlled eighty percent of this energy (see Figure 2.15).

Figure 2.14: Generating Capacity in kilowatts of British Columbia Hydroelectric Plants to World War II

Source: Derived from Canada, Water Resources Branch, Water Powers of Canada (Ottawa, 1958) 69.

Name	Installed to 1958	Ultimate	Operator
Bridge River	185058	205951	B.C. Electric
Ruskin	105214	140286	B.C. Electric
Buntzen/Coquitlam	78948	78948	B.C. Electric
Upper Bonnington	64173	64173	West Kootenay
Stave Falls	58950	58950	B.C. Electric
South Slocan	55965	55965	West Kootenay
Lower Bonnington	44772	44772	West Kootenay
Corra Linn	42533	42533	West Kootenay
Powell River	38026	38026	Powell River Company
Lois River	37310	37310	Powell River Company
Jordan River	30770	30770	B.C. Electric
Puntledge	26117	26117	Canadian Colleries (BCPC)
Falls River	4477	18655	Northern B.C. Power Company
Ocean Falls	13879	13879	Crown Zellerbach
Shuswap Falls	5820	13432	B.C. Power Corp
Britannia Creek	11566	11566	Britannia Mining and Smelting
Elk River	11193	11193	East Kootenay Power
Upper Bonnington	9939	9939	City of Nelson
Alouette	8954	8954	B.C. Electric
Bull River	5373	5373	East Kootenay Power
Anoyx	3731	3731	Cominco
Woodfibre	2724	2724	Alaska Pine and Cellulose
Goldstream	1716	2537	B.C. Electric
Total	847209	925784	

Figure 2.15: Generating Capacity by Operator

Source: Derived from Canada, Water Resources Branch, Water Powers of Canada (Ottawa, 1958) 69.

Operator	Installed to 1958	Ultimate Capacity
B.C. Electric	55%	57%
West Kootenay/Cominco	25%	23%
Other Corporations	14%	13%
Public Utilities	4%	4%

*Percentages have been rounded and do not total 100.

From an initial configuration of the generation of relatively small amounts of electricity that were locally controlled and utilized close to the point of generation, hydroelectricity in British Columbia had evolved into an industry dominated by large corporations that generated unprecedented amounts of energy and transmitted it far from the site of generation. The corporate facilities were quantitatively and qualitatively different. They required large capital investments of several million dollars. They were based on large-scale, often interbasin, reengineering of water flows with dams and water diversion tunnels. They relied on space-time compression to bring the energy of a river long distances to be utilized either in cities or industrial centres. They were predicated on the domination of markets through the protection of monopolies and the augmentation of corporate power.

Chapter 3

Productive Space: Hydroelectricity and the Kootenay River

Introduction

The development of hydroelectricity in British Columbia was based on the spatial reorganization of the province's hydrology. This process met with resistance from aboriginals who had developed social and economic relations based on a natural hydrologic cycle. The hydroelectric industry was also forced to either accommodate or overcome agriculturalists who favoured a different reconfiguring of the province's rivers and lakes. The development of hydroelectricity in the Kootenay region of south-eastern British Columbia to World War II exemplifies the competing social, economic and environmental factors that contributed to creation of productive space for hydroelectric generation.

Early hydroelectric facilities were dependent on a natural hydrologic cycle. They were run-of-river operations. Minimal water regulation was achieved by damming a river to create a small pond which served as a reservoir. These ponds provided regulated water to the turbines for a short period, usually only a matter of days. If they were not replenished due to low upriver stream flows the generators either operated below capacity or were stopped altogether. Conversely, during high stream flows the pond would overflow, allowing excess water to bypass the generators and escape downstream; the electric industry called this 'wastage.' By 1940 a new system of generating hydro-electricity had emerged based on large capital investments, massive water-storage dams, high capacity artificial reservoirs, long-distance transmission and political accommodations which transcended national boundaries; these innovations provided the basic elements for hydro-electric development throughout the rest of the twentieth century. The electric industry's achievement was the culmination of a long and contested process of imposing new physical structures, relations and rhythms on people, time and space.

Native Space

In south east British Columbia the production of electric space entailed the transformation of the rhythms of the regions' major rivers and the lives of its aboriginal peoples. The two primary Native groups affected were the Sinixt (Lakes) and the Ktunaxa (Kutenai).[1] For both the Sinixt and the Ktunaxa, prior to the arrival of non-Natives, the Columbia and Kootenay Rivers were at the centre of

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[1] Bill B. Brunton, "Kootenai," 223-37 and Dorothy Kennedy, and Randall T. Bouchard. "Northern Okanagan, Lakes, and Colville," 238-52 in Handbook of North American Indians, ed. Deward E. Walker Jr. vol. 12 (Washington: Smithsonian Institution, 1998). Anthropologists further divide the Ktunaxa into the Upper and Lower Ktunaxa based on both different dialects and their geographical position on the Kootenay River.

their territory, society and economy. Ktunaxa territory included almost the entire Kootenay River valley, making the Kootenay River "the thread which held them all together."[2] Similarly, the Sinixt were inseparable from the course of the Columbia River west of the Selkirk Mountains. Rigid political boundaries in the modern sense did not exist between aboriginal groups, but waterfalls and rapids often separated one traditional territory from another. For example, well into the nineteenth century the Sinixt's territory extended north along the Columbia River valley to the vicinity of Dalles des Morts, a section of rapids which derived its French name from the death toll it took on early fur traders. From Dalles des Morts, Sinixt territory reached south along the Columbia River, encompassing Upper and Lower Arrow Lakes as well as Trout Lake and the Slocan Valley, reaching as far as the Little Dalles and Kettle Falls in present-day Washington State. At one time the Sinixt's territory also extended up the valley of the Kettle River at least as far as Cascade Falls. Sinixt territory also encompassed the Kootenay River from its confluence with the Columbia east towards Kootenay Lake. Bonnington Falls, east of the confluence of the Slocan and Kootenay Rivers, appears to have been the accepted demarcation between the Sinixt and Ktunaxa although the Sinixt utilized the Kootenay River valley as far east as Kootenay

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[2] Harry Holbert Turney-High, Ethnography of the Kutenai. Memoirs of the American Anthropological Association, No. 56 (Menasha, Wisconsin: American Anthropological Association, 1941) 23.

Lake.[3]

The concentrated energy of waterfalls and rapids were factors in Native space. As with Bonnington Falls, they often marked the limit of canoe travel. The Ktunaxa would leave their canoes above the falls and proceed to the Bonnington Falls fishery on foot. The energy of rapids and waterfalls impeded or completely blocked the passage of fish. Where fish were able to pass the rush of water they had to expend a considerable amount of their own stored energy: they had to work. This reality was the basis for the Sinixt name for the Dalles des Morts and Little Dalles area. In the Sinixt language it was known as the "working place (when fish have to work hard to go up rapids."[4] Natives took advantage of the barrier created by the river's energy to catch fish that concentrated in the quiet pools at the base of waterfalls and rapids, gathering their energy for the struggle upriver. The precise technology employed "depended mainly on the species being harvested and prevailing hydrological conditions at the time of year and location of harvesting."[5] On the salmon rivers of the Interior, Natives often used traps and weirs, nets,

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[3] Randy Bouchard, Dorothy Kennedy and Mark Cox, Ethnography and Ethnohistory of the Keenleyside Powerplant Project Study Area (Victoria: Columbia Power Corporation, 1998) 7-11; Randy Bouchard and Dorothy Kennedy, Lakes Indian Ethnography and History (Victoria: B.C. Heritage Conservation Branch, 1985) 6-28; Dorothy Kennedy and Randall T. Bouchard. "Northern Okanagan, Lakes, and Colville," 238-9.
[4] Bouchard and Dorothy Kennedy, Lakes Indian Ethnography and History, 76.
[5] Diane Newell, Tangled Webs of History: Indians and the Law in Canada's Pacific Coast Fisheries (Toronto: University of Toronto Press, 1993) 33.

harpoons, spears, and gaff hooks with specific modifications depending on the depth of the pools, the height of the falls and whether they were fishing during daylight hours or at night.[6] Waterfalls and rapids were also important social and economic locations. When neighbouring Native groups gathered at major fisheries, including Kettle Falls and Bonnington Falls, they practiced and renewed important social and cultural customs and exchanged trade goods.

[6] Newell, Tangled Webs of History, 33-38.

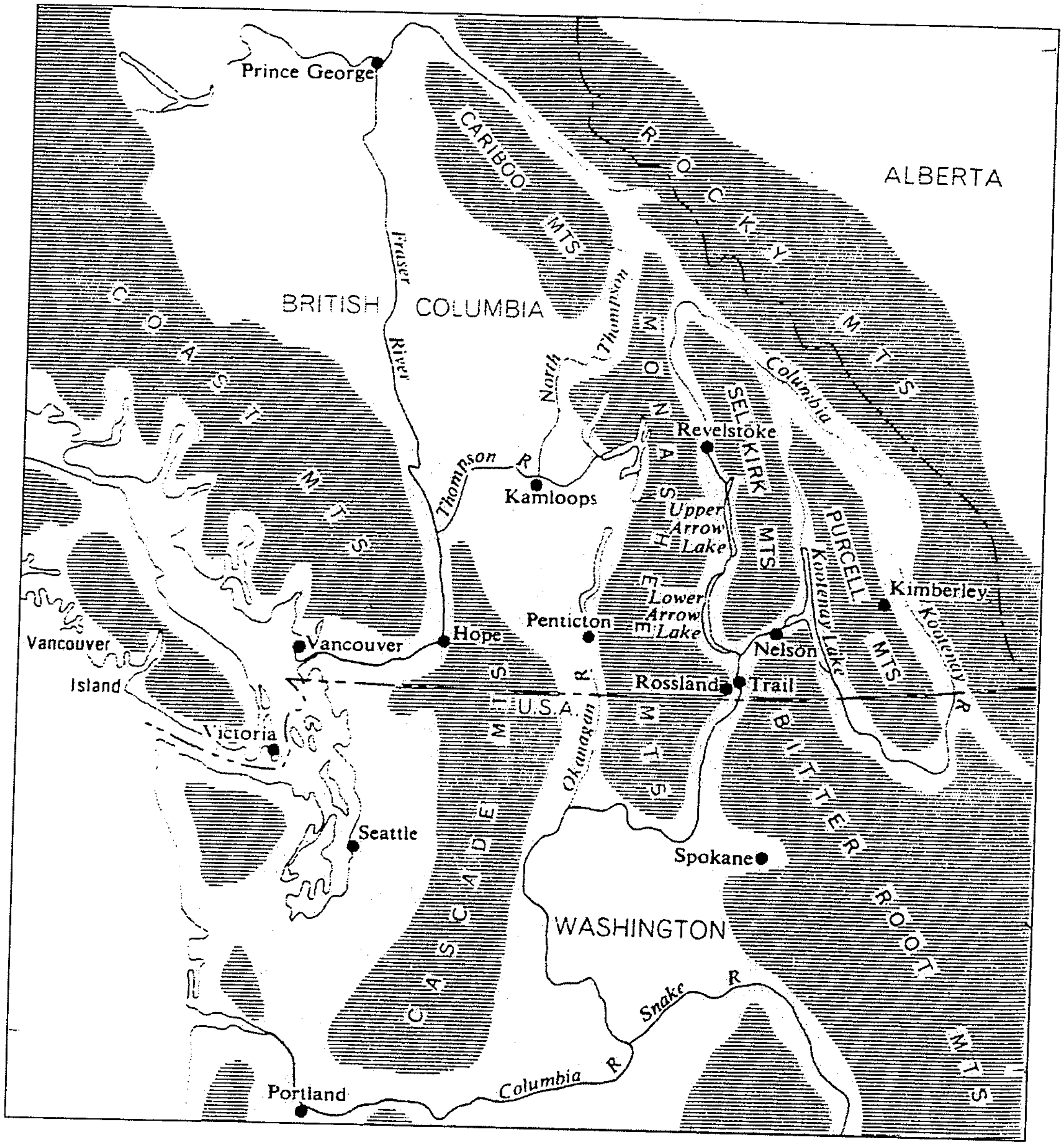

Figure 3.1. Mountain Ranges of British Columbia.
Source: J. V. Horwood, British Columbia: An Introduction to Geographic Studies (Toronto: McClelland and Stewart, 1966): 50.

For both the Sinixt and the Ktunaxa the Columbia and Kootenay rivers existed in time as well as space. The temporal character of the rivers is part of the region's larger hydrologic cycle. The Sinixt's and Ktunaxa's traditional territory includes two very different ecosystems separated by the Purcell Mountains. These ecosystems, as classified by British Columbia government's ministry of forestry, are distinguished by the area's dominant tree species. However, a fundamental ecosystem difference in British Columbia is associated with different levels of precipitation. The West Kootenays, which includes the Columbia River valley south of the Big Bend as well as Kootenay Lake and the lower Kootenay River, is often referred to as the Interior Wet Belt. This region resembles a temperate rainforest, dominated by cedar and hemlock. The upper river sections of the Columbia and Kootenay Rivers are in a rainshadow cast by the Selkirk and Purcell Mountains. The area is dry and hot, with a climate similar to the great Columbia Plateau of the British Columbia interior and the American Pacific Northwest. Douglas-fir dominate the lower valleys, except for the hottest and driest areas where ponderosa pine and bunchgrass abound.[7]

The high precipitation in the West Kootenays results from a combination of an eastern airflow and high mountain ranges. The warm eastern moving air picks up moisture over the valleys of British Columbia's Interior Plateau. The air currents are then forced up and over the Monashee and Selkirk Mountains. As the

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[7] Most of the West Kootenays are part of the Interior Cedar—Hemlock zone, while the dominate zones in the valleys of the East Kootenays are the Interior Douglas—fir zone and the Ponderosa Pine zone. See Dellis Vern Meidinger and Jim Pojar, Ecosystems of British Columbia (Victoria: Research Branch Ministry of Forests, 1991).

air rises it cools and deposits its accumulated moisture as snow in the winter and rain in the summer.[8] A deep snow pack accumulates high in the mountains during the winter. In the spring the snow melts, creating a freshet which, before hydroelectric development, increased the rivers' flow exponentially. Low water on the region's rivers and lakes usually occurred between December and February followed by high water from May to July. On the Columbia River at Revelstoke, for which hydrometric records date to 1912, the record minimum daily discharge was set in December, 1928 at 51 cubic meters per second. The record high occurred in June, 1948 at 5,040 cubic meters per second, nearly 100 times the record low. Similarly, the Kootenay River's record minimum flow at the Idaho—British Columbia border occurred in February, 1936 when under ice conditions it dropped to 39.1 cubic metres per second. Its record high occurred during the great flood of 1948 when on June 1 it reached 3,540 cubic feet per second, over 90 times its low.[9] In many locations the rivers' channels were unable to contain the spring freshet. This resulted in flooding and the seasonal replenishment of marshes and swamps. The most widespread flooding occurred along the Kootenay River south

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[8] A. L. Farley, Atlas of British Columbia: People, Environment, and Resource Use (Vancouver: University of British Columbia Press, 1979); Stuart Sowden Holland, Landforms of British Columbia : A Physiographic Outline, British Columbia Dept. Of Mines and Petroleum Resources Bulletin No. 48 (Victoria: British Columbia Dept. of Mines and Petroleum Resources, 1976).

[9] Canada Inland Waters Directorate Historical Streamflow Summary: British Columbia (Ottawa: Information Canada, 1990) 224 and 519.

of Kootenay Lake. For roughly 60 kilometres from Bonner's Ferry, Idaho to Kootenay Lake the Kootenay River meanders through a flat and wide valley between the Selkirk and Purcell Mountains. In May and June the river regularly overflowed its banks and covered this entire area in several feet of water. Over the summer the water slowly receded from the floodplain, returning the Kootenay River to its normal channel.

The region's hydrologic cycle was integral to the Native experience of time and space. The seasonal rhythm of snow, freshets, high water and receding water was a framework for the passage of time. For example, the Ktunaxa followed a lunar calendar. The third month was named for the melting of the snow while the fifth month was the time of deep water.[10] Similarly, both the Ktunaxa and the Sinixt moved through their territory based on the rivers' rhythms. In the winter, when the rivers were frozen, they made snowshoes and travelled on the river ice. In the summer, both the Sinixt and the Ktunaxa built their distinct sturgeon-nosed canoes which were designed to be stable and swift on the rough waters of Kootenay and the Arrow Lakes. The locations of their village and camp sites were also linked to the rivers' fluctuations. The Ktunaxa of the lower Kootenay River lived upriver during the winter and moved downriver in the spring.

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[10] Turney-High, Ethnography of the Kutenai, 96-97.

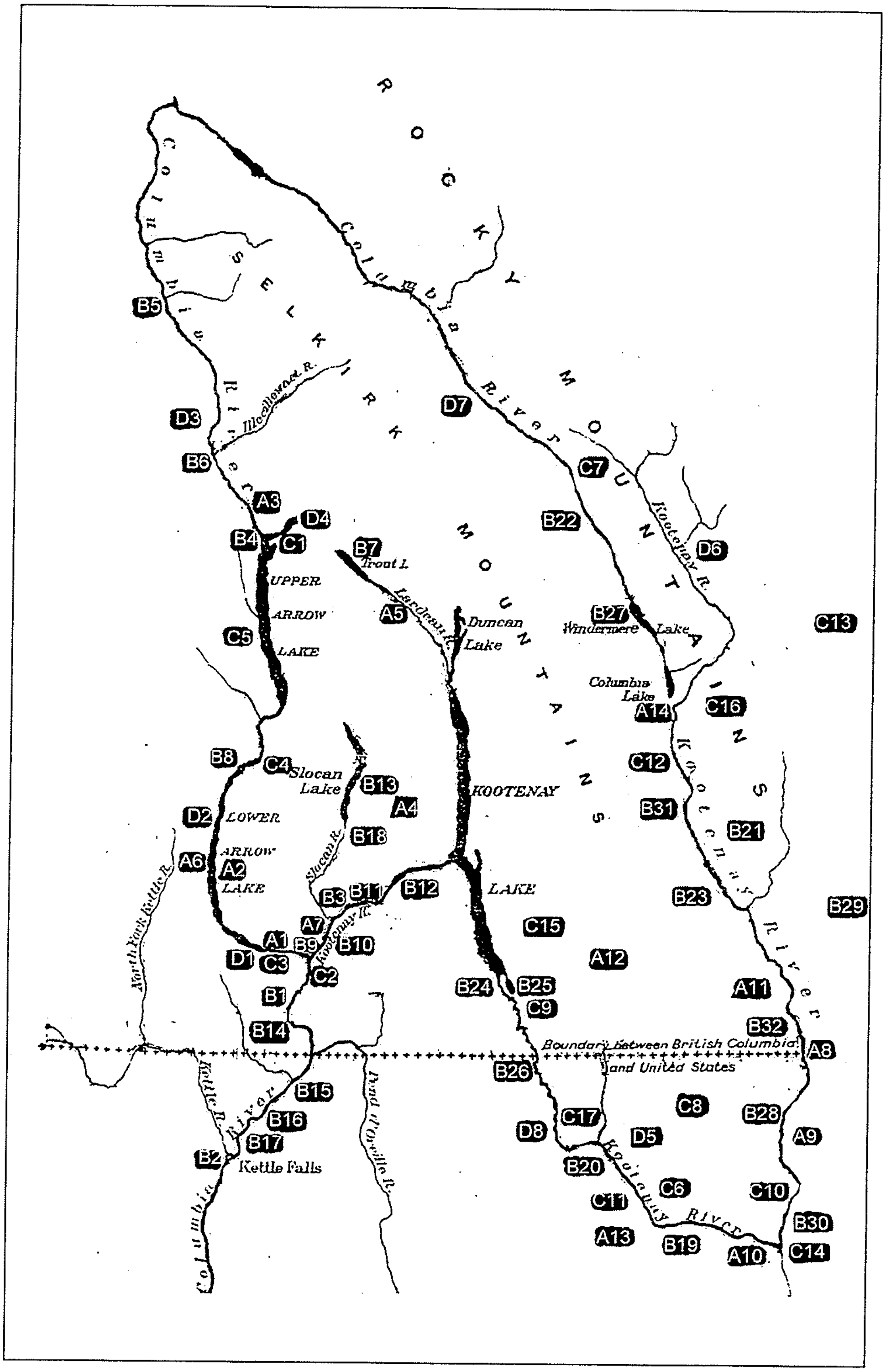

Figure 3.2. "Native Space": Sinixt and Ktunaxa Subsistence Cycles circa 1800.
Source: See footnote #11.

Table for Figure 3.2

Sinixt Subsistence Cycle

A1: Deer hunt
A2: Mountain goat hunt
A3: Gather lichen, roots and bulbs
A4: Caribou hunt
A5: Caribou hunt
A6: Caribou hunt
A7: Trout fishery
B1: Gather Blue Camas
B2: Chinook and sockeye fishery
B3: Chinook and sockeye fishery
B4: Pick berries, salmon fishery
B5: Salmon fishery
B6: Kokanee and salmon fishery, gather berries
B7: Dolly varden char fishery
B8: Gather huckleberries
B9: Salmon fishery
B10: Gather huckleberries
B11: Dolly varden char fishery
B12: Kokanee fishery
B13: Dolly varden char fishery
B14: Gather huckleberries and saskatoons
B15: Salmon fishery
B16: Salmon fishery
B17: Salmon fishery
B18: Salmon fishery
C1: Kokanee and trout fishery
C2: Coho fishery
C3: Deer hunt
C4: Kokanee fishery
C5: Kokanee fishery
D1: Deer hunt
D2: Bear hunt
D3: Sheep hunt
D4: Make canoes from white bark pine

Ktunaxa Subsistence Cycle

A8: Gather bitteroot
A9: Fishery
A10: Gather roots
A11: Deer hunt
A12: Caribou hunt
A13: Gather tree moss
A14: Gather wild onion
B19: Gather Blue Camas
B20: Gather huckleberries
B21: Mountain goat hunt
B22: Moose hunt
B23: Gopher hunt
B24: Goose hunt
B25: Duck hunt
B26: Whitefish, trout, sucker and char fishery
B27: Salmon fishery
B28: Trout fishery
B29: Bison hunt
B30: Gather wild strawberries
B31: Gather saskatoons
B32: Deer hunt
C6: Deer hunt
C7: Elk hunt
C8: Caribou hunt
C9: Duck hunt
C10: Whitefish fishery
C11: Sturgeon fishery
C12: Whitefish fishery
C13: Bison hunt
C14: Deer hunt
C15: Caribou hunt
C16: Bighorn sheep and mountain goat hunt
C17: Gather chokecherries
D5: Deer hunt
D6: Bison hunt
D7: Moose hunt
D8: Ling fishery

Figure 3.2 is a spatial representation of Sinixt and Ktunaxa subsistence cycles in the early nineteenth century. The activities have been divided by season ("A" spring; "B" summer; "C" fall; "D" winter) and plotted on the map based on the available ethnographic information as to where these activities would have occurred.[11] This is an estimation and it is not intended to be exhaustive. Both the Sinixt and the Ktunaxa exploited an incredibly wide variety of resources; not all of them have been identified here. Many resource activities were not limited to a single season and many occurred in locations not indicated on this map. Finally, elevation was also a critical factor in the Ktunaxa and Sinixt subsistence cycles. Different resources were available at different elevations throughout the year. This factor has not been incorporated into the above map.

The subsistence cycle of both the Ktunaxa and the Sinixt was intertwined with the region's hydrologic cycle, including the annual spring freshet. Many of the plants harvested by the Sinixt and the Ktunaxa were specifically reliant on the wet lands created by annual floods. For example, cat-tail (*Typha latifolia*) is found

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[11] Bouchard and Kennedy, Lakes Indian Ethnography and History; Bouchard, Kennedy and Cox, Ethnography and Ethnohistory of the Keenleyside Powerplant Project Study Area; Turney-High, Ethnography of the Kutenai; Claude E. Schaeffer "The Subsistence Quest of the Kutenai: A Study of the Interaction of Culture and Environment," (Ph.D., University of Pennsylvania, 1940); Nancy Turner, Food Plants of Interior First Peoples (Vancouver: UBC Press, 1997). The base map has been revised from W.A. Baillie-Grohman, "The Kootenay Country, Geographical Journal 52.1 (1918) 45.

in shallow marshes, swamps and along lake shores. The white rhizomes were a favourite spring-time food for Natives.[12] The bulbs of Blue camas (*Camassia quamash*) were an important food for many Native groups and were traded extensively across British Columbia, Washington, Idaho and Montana. The plant prefers habitat that is wet in the spring but dry in summer and so is found on floodplains, stream banks and in wet meadows. It was important to the Sinixt both as a food source and a trade good.[13] Similarly, Red Osier Dogwood (*Cornus sericea*) is a shrub that prefers swamps, riparian zones and floodplains. The Ktunaxa gathered its berries from August to October.[14]

The region's hydrologic cycle was also an important factor in hunting practices. The Sinixt and the lower river Ktunaxa were renowned deer hunters. The deep snow pack forced deer down from the mountains towards the lake shores to forage for food. The south end of Lower Arrow Lake did not freeze over in the winter, allowing the Sinixt to use dogs to drive the deer into the lake where they where killed by Sinixt men and women waiting in canoes.[15] The Ktunaxa employed a similar method on the lower Kootenay River. Using dogs, they would herd deer towards a stretch of fast-flowing, ice-free river. When the deer leaped in

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[12] Turner, Food Plants, 76-77.
[13] Turner, Food Plants, 66-67; Bouchard and Kennedy, Lakes Indian Ethnography and History, 47-58.
[14] Turner, Food Plants, 106-07.
[15] Bouchard and Kennedy, Lakes Indian Ethnography and History, 31-32.

the river to escape they were swept downstream towards the ice where Ktunaxa waited to kill them.[16]

The rivers and lakes of Sinixt and Ktunaxa territory were the source of a wide variety of fish species. Although the Sinixt relied on hunting more than their aboriginal neighbours, they were also active fishers. The Sinixt fished for three species of salmon, but the most important to them was the King salmon (*Oncorhynchus gorbuscha*) which were captured between April and August. Of lesser importance was the April run of sockeye (*Oncorhynchus nerka*) and the late fall run of coho (*Oncorhynchus kisutch*). The Sinixt also captured Kokanee (land-locked sockeye), Dolly Varden char (*Salvelinus malma)*, Rainbow trout (*Salmo gairdneri*), and other fish species.[17] In April the Sinixt would fish for trout in the shallow pools on the Kootenay River below Bonnington Falls. When the river level began to rise with the spring freshet they moved southward on the Columbia and participated in the chinook and sockeye salmon fishery at Kettle Falls, one of the richest fisheries on the Columbia River.[18]

The spring freshet was especially important for the upper Ktunaxa's fishery. The annual flooding created sloughs on the lower Kootenay River floodplain where trout, char and whitefish congregated. When the waters began to recede in

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[16] Schaeffer, "The Subsistence Quest of the Kutenai," 13-18.
[17] Bouchard, et al, Ethnography and Ethnohistory, 66-72.
[18] Bouchard and Kennedy, Lakes Indian Ethnography and History, 102.

July the Ktunaxa captured the fish returning to the main river by placing weirs and traps across the mouths of the sloughs. The Ktunaxa slowly moved north through the valley, fishing further downriver as the water and the fish retreated toward Kootenay Lake.[19] In the winter the Ktunaxa fished for ling (*Lota lota*) which spawned under the ice of the Kootenay River's tributaries. For approximately two weeks from the end of January through the first weeks of February, the Ktunaxa broke the river ice with stone mauls, built weirs and set funnel traps in the evening. By morning they might have captured up to thirty ling.[20]

The transformation of the Native subsistence cycle by new, outside forces began in the late eighteenth century. Over the next hundred years disease, Christianity, the state, non-Native agriculturalists and the mining and fur trade industries acted to transform Native space. The first major impact was due to European pathogens which reached the Ktunaxa and Sinixt through the extensive aboriginal trade network. Beginning in 1770 successive waves of smallpox, measles, diphtheria, chicken pox, influenza, tuberculosis and yellow fever swept over Native communities, sometimes killing over half of the inhabitants.[21] By killing so many Natives, and leaving others weak and immobile, these diseases eroded the Natives'

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[19] Turney-High, Ethnography of the Kutenai, 44; Schaeffer, "The Subsistence Quest of the Kutenai," 29-30.
[20] Schaeffer, "The Subsistence Quest of the Kutenai ," 34-35.
[21] Paula Pryce, 'Keeping the Lakes' Way': Reburial and the Re-Creation of a Moral World among an Invisible People (Toronto: University of Toronto Press, 1999) 40-41; Brunton, "Kootenai," 233.

ability to conduct their traditional hunting, fishing and gathering activities.

In the wake of the epidemics came the fur traders. In 1792, during one of their seasonal bison hunts, the Ktunaxa met Hudson's Bay Company employee Peter Fidler east of the Rocky Mountains. Fidler declined the opportunity to return with the Ktunaxa to their territory west of the Rockies but in 1807 David Thompson, of the North West Company, crossed the Rockies and established Kootenae House at the north end of Windermere Lake.[22] With the Pacific Fur Company's establishment of Fort Okanogan at the confluence of the Okanagan and Columbia Rivers in 1811, the Sinixt also began to deal directly with the fur traders. Although fur traders did not appropriate much Native land, the trade did have a significant effect on the Native subsistence cycle. In some locations important food resources were depleted by non-Natives. This occurred at Kettle Falls in 1858 when the presence of a large number of non-Natives led to a severe food shortage.[23] The fur trade also affected the intensity, duration and timing of Native resource-gathering activities. Through the fur trade the upper Ktunaxa secured more and better firearms, allowing them to make longer and deeper forays into Blackfoot territory to hunt bison.[24] The Sinixt, who developed a reputation as excellent trappers, also altered their seasonal resource

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[22] Irene M. Spry "Routes through the Rockies," Beaver 294 (1963) 27-28. Fidler believed that the number of Ktunaxa crossing the mountains to hunt bison had decreased since a 1781 smallpox epidemic had decimated their numbers.
[23] Pryce, 'Keeping the Lakes' Way', 50.
[24] Brunton, "Kootenai," 232.

activities by leaving their fall camps and winter villages to trap beavers.[25] Some Natives, especially those weakened by disease, began to reside year-round near fur trade posts, locations which had often been temporary, seasonal camps.

Agricultural Space

State intervention began with the Oregon Treaty of 1846 which established the forty-ninth parallel as the international boundary. The American government imposed treaties on the Native groups of the Columbia Plateau, and then established reserves and provided farming implements in an attempt to convince Natives to become sedentary agriculturalists. The Sinixt were assigned to the Colville Reservation, created in 1872. By the 1870s many Sinixt, facing depleted hunting grounds, an over-taxed fishery and pressure from miners, had established farms along the Columbia River between Kettle Falls and the international boundary. They continued to pursue their traditional resource activities, including hunting, gathering and fishing in their territory north of the boundary, but their presence in British Columbia had been diminished.[26]

The upper Ktunaxa had relied on the bison hunt of the great plains for a significant portion of their livelihood. By the late 1870s the northern herd that

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[25] Pryce, 'Keeping the Lakes' Way', 44; Bouchard and Kennedy, Lakes Indian Ethnography and History, 34-35.
[26] Pryce, 'Keeping the Lakes' Way', 53; Bouchard and Kennedy, Lakes Indian Ethnography and History, 18.

roamed present day Montana and southern Alberta was being decimated by hunters who took advantage of the railway construction in the northern United States to ship hundreds of thousands of hides to markets in the east. By 1882 approximately five thousand non-Natives pursued the bison in the northern United States and a year later the great northern herd was no more.[27] The destruction of the northern herd was a serious blow to the upper Ktunaxa subsistence cycle. Their three seasonal bison hunts (summer, fall, and winter) had provided them with food and hides and had extended their spatial boundaries east across the Rockies. With the end of the bison hunt upper Ktunaxa space shrank as they confined their movements to the Columbia and Kootenay River valleys.[28] The upper Ktunaxa began to place heavier reliance upon the gathering of plants, hunting, and fishing. They also began to intensify their commitment to agriculture. The Jesuits, led by Father De Smet, had encouraged Native agriculture as early as the 1840s, and by the 1860s the Ktunaxa had fields of maize, barley, oats and potatoes.[29] The climate and geography of the upper Kootenay River valley was well suited to ranching and the Ktunaxa, who had become expert horsemen, began to acquire more horses and cattle. Many became enthusiastic ranchers. By 1885 the Ktunaxa owned nearly five-hundred horses and over 2500

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[27] Richard White, 'It's Your Misfortune and None of My Own': A History of the American West (Norman and London: University of Oklahoma Press, 1991) 216-19.
[28] A.S. Farwell, "Report on the Kootenay Indians," B.C. Sessional Papers, 1883-84, 325.
[29] Pierre Jean de Smet, Life, Letters and Travels of Father Pierre-Jean De Smet, S.J., 1801-1873 (New York: F.P. Harper, 1905, rpt. 1969) 491, 957.

cattle.[30] The most successful Ktunaxa rancher was Chief Isadore who owned a large number of horses and cattle and was well respected by his non-Native neighbours.[31]

The Ktunaxa's increased commitment to farming and ranching coincided with renewed interest in the region by non-Natives. Non-Native settlement in the interior of British Columbia had been stalled during the early 1880s by disagreements between the provincial and federal governments. When William Smithe assumed the premiership of British Columbia in 1883 he found himself saddled with provincial-federal disputes which were blocking non-Native development in the province. Smithe quickly reached an agreement with the federal government. The Settlement Act, passed by the province in 1883 and the federal government in 1884, opened the railway lands in British Columbia to non-Native settlement and provided federal funding for important infrastructure improvements. Through the agreement Smithe was able to initiate an economic policy based on land sales and huge government grants to settlement schemes. Literally hundreds of thousands of acres of prime agricultural and timber land were granted at liberal terms to ambitious capitalists, many of whom happened to be friends of the new government. In Martin Robin's heated prose, the "great barbecue had begun and the

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30 ? to lands commissioner, 25 November 1884, BCA, GR 1440, f. 3086/84.
31 Farwell, "Report on the Kootenay Indians," 326.

wolves feasted at the public table."[32]

One of the most daring and imaginative of these 'wolves' was William Baillie-Grohman, one of Britain's last hunter-tourists to conduct individual safaris in the North American West.[33] Baillie-Grohman believed that pleasure and business should be combined and advised fellow hunters to scout for promising new agricultural opportunities while on the hunt.[34] In 1882, the hunt led Baillie-Grohman onto the floodplain of the upper Kootenay River where he discovered an opportunity that appeared too good to be true. The upper Kootenay Valley reminded Baillie-Grohman of "the choicest reaches of the Upper Thames." He later described it as including "wide park-like stretches of grass-land....sombre pine-forests...graceful plumes of the giant cedar...a truly charming landscape." But, he confessed, when he first "saw this scene it was not quite so alluring," and that there was a "slight drawback."[35] Baillie-Grohman arrived in the valley during the annual spring flood. For Baillie-Grohman this natural part of the region's hydrologic cycle was a problem to be fixed. After investigating the question further, he concluded that the Kootenay River's flooding was due to "unnatural obstructions" between the Columbia River

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[32] Martin Robin, The Rush for Spoils: The Company Province, 1871-1933 (Toronto: McClelland and Stewart, 1972) 60.
[33] Roderick Nash, "The Exporting and Importing of Nature: Nature-Appreciation as a Commodity, 1850-1980," Perspectives in American History 12 (1979) 528-30.
[34] Earl Pomeroy, In Search of the Golden West: The Tourist in Western America (Lincoln, Nebraska: University of Nebraska Press, 1990 (1957)) 78-79.
[35] W.A. Baillie-Grohman, "The Kootenay Lake District," in W. Henry Barneby, Life and Labour in the Far, Far West (London: Cassell & Company, 1884) 403-4.

and Kootenay Lake. He believed that gravel from a mountain stream and landslides had combined to block the river's channel and he proposed a two-pronged, simultaneous remedy.[36] First, dig a half mile long canal through the low ground that separated the Kootenay River and Columbia Lake to divert part of the Kootenay's spring freshet north into the Columbia River. At same time, blast and remove the offending 'blockage' on the upper Kootenay to increase the rate of discharge from Kootenay Lake into the Columbia River.[37] Baillie-Grohman believed that together the alterations would serve to "subdue the Kootenay waters...."[38]

The early 1880s was an auspicious time for the undertaking of such a project. Smithe's government was eager to attract capital and non-Native farmers and ranchers to the interior of the province, and believed Baillie-Grohman's scheme for reclaiming the floodplain of the upper Kootenay River and founding a colony dominated by British army officers was the very type of enterprise the province wanted to encourage. Access to the region was also improving quickly.[39] The Northern Pacific Railroad's depot at Sandpoint, Idaho, approximately 80 kilometres south of the international boundary had created a relatively easy access point from

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[36] Baillie-Grohman, "The Kootenay Country," 46.
[37] For a description of Baillie-Grohman's scheme see, Mabel E. Jordon, "The Kootenay Reclamation and Colonization Scheme and William Adolph Baillie-Grohman," British Columbia Historical Quarterly 20 (1956) 187-220.
[38] Victoria Colonist, 11 July 1883: 3.
[39] Cole Harris, "Moving Amid the Mountains, 1870-1930," BC Studies 58 (1983) 3-39.

the south and the construction of the Canadian Pacific Railway through Roger's Pass in 1885, with a station at Golden on the upper Columbia River, provided access into the upper region from the north. With the backing of friends in London, Baillie-Grohman formed the Kootenay Lake Syndicate, and in 1885 signed an agreement with the provincial government granting to his company 73,000 acres in southeast British Columbia in return for reclamation of the upper Kootenay River valley and the establishment of a permanent agricultural colony.[40]

As part of his promotional activities Baillie-Grohman dispatched engineers to the Kootenays in 1885 and 1886 to report on the feasibility of his diversion scheme. Leslie C. Hill reported that the proposed site at Canal Flats was ideal for the planned diversion, and in fact, that "a more suitable location for building a dam, cutting a canal, and turning a river could hardly be found."[41] Likewise, Ashdown H. Green reported in 1886 that the site chosen for the diversion canal was ideal; he knew of "no spot where the nature of the ground and all the surroundings combine in a more favourable manner."[42] Baillie-Grohman also penned his own glowing report for potential investors. Realizing that some would suspect him of bias, he decided to "quote the opinions and descriptions collected

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[40] Jordon, "Kootenay Reclamation," 194.
[41] Leslie C. Hill, "Report on Upper and Lower Kootenay Valleys," 3 March 1885, Glenbow Archives, Baillie-Grohman Papers, M-302.
[42] Ashdown H. Green, "Report on the Upper and Lower Kootenay Valleys," 27 August 1886, Glenbow Archives, Baillie-Grohman Papers, M-302.

from official and other reliable sources." He proceeded to include favourable quotations from the "official opinions of Government officers, and also those men of science and travellers of distinction...." Baillie-Grohman quoted heavily from Palliser's Blue Book, especially his description of travel through the Kootenays being "'like riding through the open glades of a deer park,'" and from Father De Smet who had called the country a "'terrestrial Paradise'." As for the Ktunaxa, Baillie-Grohman described them as an important human resource, likely to be employed as hop pickers once the valley was developed for agriculture.[43] The crowning evidence of the agricultural promise of the Kootenay valley was the map developed by Baillie-Grohman and the British Columbia Department of Lands and Works in 1885.

[43] W.A. Baillie-Grohman, "Report on the Government Concession...." n.d., Glenbow Archives, Baillie-Grohman Papers, M-302. See also, Prospectus, The Kootenay Company, Limited, 1887, Glenbow Archives, Baillie-Grohman Papers, M-2371.

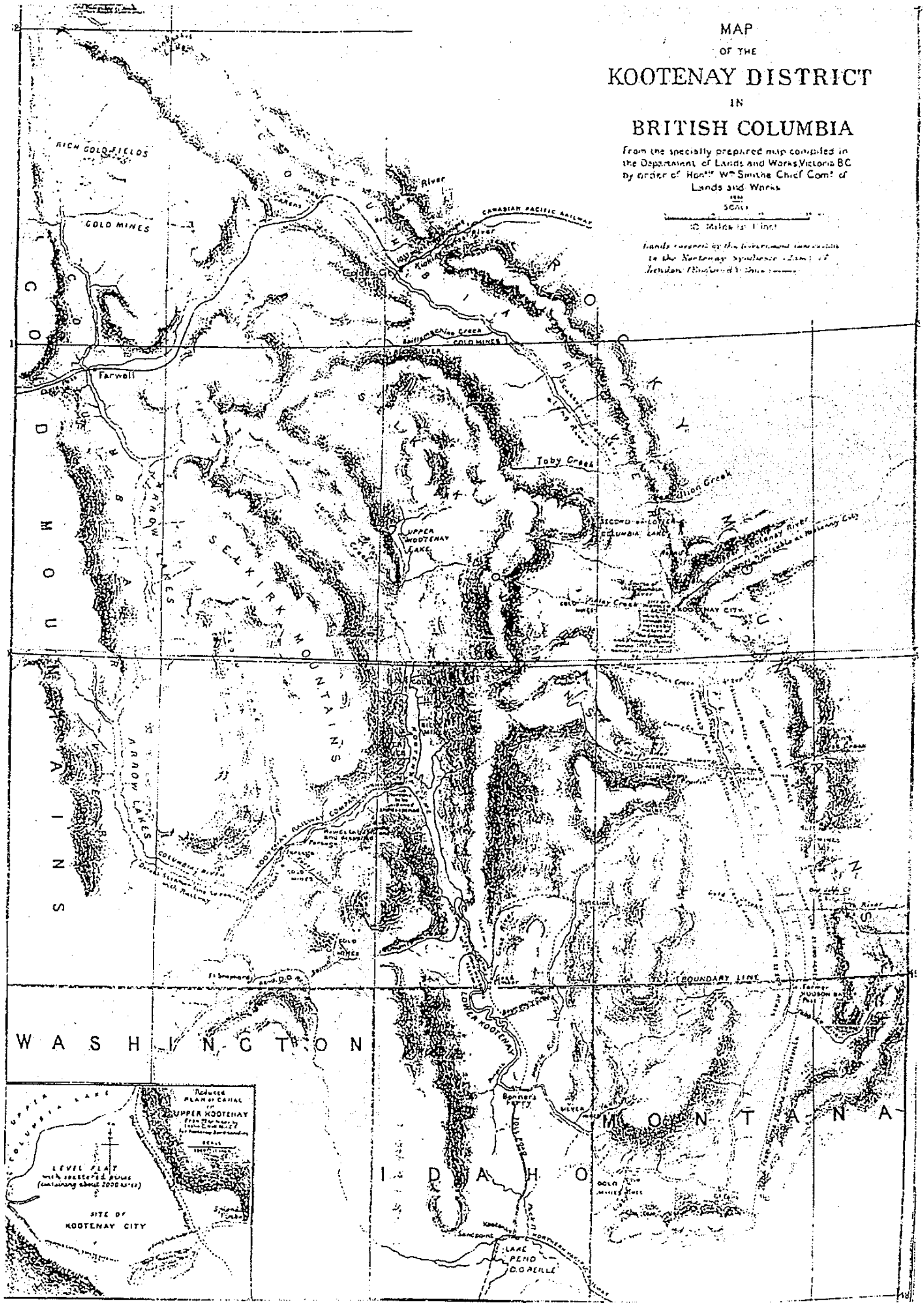

Figure 3.3. "Agricultural Space"

Source: "Map of the Kootenay District in British Columbia," B.C. Department of Lands and Works, 1885, BCA, GR 1440.

Maps are powerful tools in the production of space. They are spatial representations intended to support and solidify claims to contested space. By demarcating boundaries and ordering activities they seek to discipline space and people.[44] Maps sanction new productive practices and circumscribe or obliterate older ones. They define new relations within space and between people. Baillie-Grohman's 1885 map of the Kootenays was a not a reality, it was a vision. It represented capital's and the state's ideal conception of the Kootenay valley before the advent of the hydroelectric industry and after the marginalization of Natives. It was a space in which the Sinixt and the Ktunaxa had vanished, replaced by two primary industries which existed in a stratified non-Native space. Hard-rock mining was confined to the mountains and placer mining took place in the river beds. Agriculture, including farming and ranching, was pursued in the valley bottoms and surrounding hills. Railways, roads and rivers provided transportation within the region and railway stations on transcontinental lines in the north and the south transported commodities into and out of the valley. Finally, engineering work on the lower Kootenay River and between Columbia Lake and the Kootenay River, provided regulation of both the level of Kootenay Lake and the water flow on the Kootenay River. In this way the "splendid meadows" of the upper Kootenay Valley were spared the river's annual flooding and 'reclaimed' for agriculture.

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[44] See for example, Daniel Clayton, "Circumscribing Vancouver Island," BC Studies 122 (1999) 7-22.

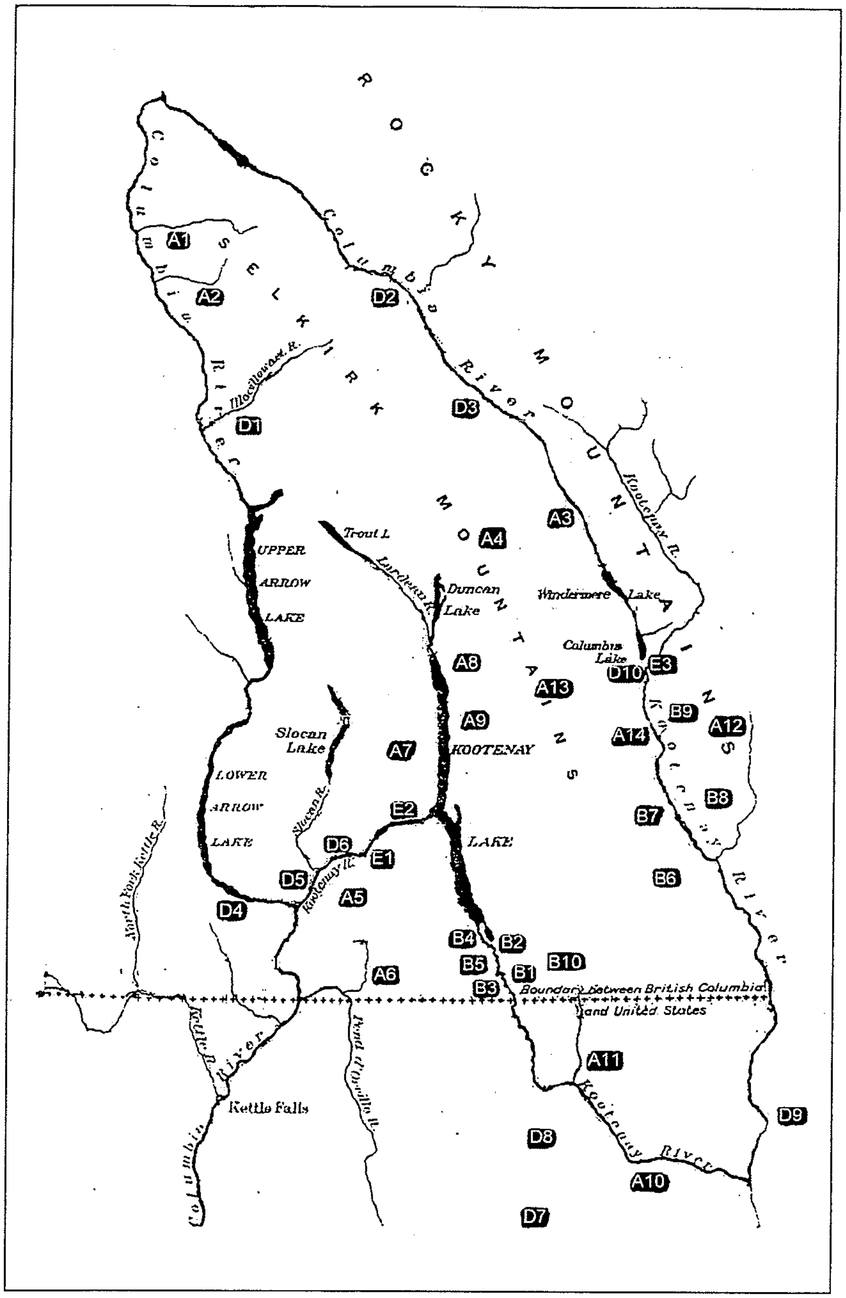

Figure 3.4. The state's and Baillie-Grohman's vision for the Kootenay Valley, 1885

Source: Data from "Map of the Kootenay District in British Columbia," B.C. Department of Lands and Works, 1885. Base map revised from Baillie-Grohman, "The Kootenay Country," 45.

Table for Figure 3.4

Mines
A1 "Rich Gold Fields"
A2 "Gold Mines"
A3 "Gold Mines"
A4 "Rich Silver Quartz"
A5 "Gold Mines"
A6 "Gold Mines"
A7 "Silver Mines"
A8 "Gold Mines"
A9 "Silver Mines"
A10 "Gold Mines"
A11 "Silver Mines"
A12 "Gold Mines"
A13 "Gold Mines"

Agriculture
B1 "Flat No. 1"
B2 "Flat No. 2"
B3 "Flat No. 3"
B4 "Flat No. 4"
B5 "Splendid Meadows"
B6 "Bunch Grass Range"
B7 22,500 Acres of "Bottom Lands"
B8 "Bunch Grass Range"
B9 "Bunch Grass Range"
B10 "Good Timber"

Transportation
D1 Farwell (Railway Station)
D2 Donald (Railway Station)
D3 Golden City (Railway Station)
D4 Steamer Connection with Railway
D5 Kootenay Railway (proposed)
D6 Portage
D7 Sandpoint (Railway station)
D8 Toll Road
D9 Road
D10 "Kootenay City"

Engineering
E1 Widen and deepen rapids
E2 Widen and deepen narrows
E3 Diversion Canal

Baillie-Grohman's expectation that the Ktunaxa would willingly become wage workers in the new hop fields did not fit with their own plans. With the loss of the bison, the Ktunaxa of the upper Kootenay were willing to add agriculture to their subsistence cycle. They were especially interested in ranching and were well aware which lands in their territory were best suited for raising cattle and horses. These were the same lands that Baillie-Grohman identified as "bunch grass range" on his 1885 map. When non-Native farmers and ranchers began acquiring these lands in the early 1880s without the Ktunaxa's consent, the Natives offered vigorous resistance.

In 1883 Indian Superintendent Powell reported that the Ktunaxa were determined to protect their land against non-Native encroachment and would cause great difficulties if their demands were not addressed.[45] The provincial government decided that the best policy was to despatch two representatives to the district to investigate both the Ktunaxa's complaints and the valley's prospects. A.S. Farwell and Gilbert Sproat left Victoria in the summer of 1883 and travelled to Sandpoint on the Northern Pacific where they rendezvoused with Baillie-Grohman, who had agreed to give them a tour of the district.[46] Farwell was instructed to report on the number of Natives, "if any," who resided in the district and what their claims for land were. He found that there indeed were Natives in the area, and estimated there numbers at 150 on the upper Kootenay river and three hundred on the lower river. The Ktunaxa were aware of the treaties that had been signed on the neighbouring Canadian prairies and in the American border states and were extremely dissatisfied with the lack of government attention to their demands for reserves that would protect the land they valued most from non-Native settlement. Given the level of their anger, Farwell deemed it unadvisable to question them in person, but did

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[45] Powell to Smithe, 5 July 1883, BCA, GR 1440, f. 1098/83.
[46] Baillie-Grohman, "The Kootenay Lake District," 399.

suggest that they would pose a serious barrier to settlement if they were not properly treated.[47]

Faced with Ktunaxa resistance, the provincial government dispatched Peter O'Reilly in the summer of 1884 to establish reserves in the Kootenay valley. O'Reilly created five separate reserves in the upper Kootenay Valley, ranging in size from sixteen to eighteen thousand acres. These reserves were large by provincial standards. The reserves were intended to provide the Ktunaxa with sufficient land for ranching, though they were described as ill suited for farming.[48] O'Reilly's reserves failed to please anyone. The provincial government believed the allocations to be all-too generous, while Chief Isadore refused to accept the allotments. The province understood that Isadore was dissatisfied with O'Reilly's failure to include certain Ktunaxa campsites within reserve boundaries.[49] It is likely these campsites were important locations in the Ktunaxa subsistence cycle and that Isadore was attempting to maintain Ktunaxa access to these resources. Isadore ignored the reserves and continued to build fences and graze his cattle on land outside of reserve

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[47] A.S. Farwell, "Report on the Kootenay Indians," B.C. Sessional Papers, 1883-84, 325-26.
[48] Vowell to Smithe, 17 February 1885, BCA, GR 1440, f. 356/85; ? to lands commissioner, 25 November 1884, BCA, GR 1440, f. 3086/84.
[49] Robin Fisher, Contact and Conflict: Indian European Relations in British Columbia, 1774-1890 2 ed. (Vancouver: UBC Press, 1992) 203.

boundaries.[50]

Non-Natives were also opposed to the reclamation scheme. By building a canal between the Kootenay River and Columbia Lake Baillie-Grohman was intending to direct a portion of the Kootenay River spring freshet north into the Columbia River; the spring flooding could not be avoided but Baillie-Grohman imagined that its location could be changed. In November 1885 the provincial government issued a public notice warning prospective settlers on the upper Columbia River that due to the decision to reclaim land in the upper Kootenay valley their own lands would soon be subject to flooding. Anyone "intending to preempt or preempting land in the vicinity of the Columbia river will therefore do so upon the above understanding and at their own risk."[51] The non-Native residents of the upper Columbia River valley, although few in number, were not pleased. In March 1886, 30 farmers, ranchers, miners, and merchants petitioned both the British Columbia Lieutenant-Governor and the federal Minister of Interior opposing the proposed diversion. They warned that if the scheme was allowed not only would their lands be

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[50] James Baker to attorney general, April 27 1887, BCA, GR 996, f. 5, 238/87. Cole Harris describes this episode as an example of non-Natives, including ranchers such as James Baker, supporting large reserves for Natives; Cole Harris, Making Native Space: Colonialism, Resistance, and Reserves in British Columbia (Vancouver: UBC Press, 2002) 191, 210-11. In fact, the confrontation was more about what land was reserved, than simply how much land. Non-Natives, especially Baker, had pre-empted land the Ktunaxa deemed valuable, and the Ktunaxa wanted it back.

[51] The Kootenay Valley. A report on land reclamation in the valley presented before the International Joint Commission, 1935 (Ottawa: King's Printer, 1936) 32.

flooded, but the Americans would also seek compensation for damages.[52]

The Canadian Pacific Railway (CPR) also opposed the reclamation scheme. The CPR had recently built a bridge across the upper Columbia for its transcontinental line and was experiencing problems with the Columbia River spring high-water levels. The company reportedly "heard with horror" reports of Baillie-Grohman's plans to send even more water into the Columbia from the Kootenay River. The CPR petitioned the federal government to force the province to stop work on the proposed canal.[53] The federal government decided that British Columbia's agreement with the Kootenay Valley Syndicate was ultra vires because both the Kootenay and Columbia Rivers were navigable waterways and liable to federal regulation.[54] Work on the canal stopped. Baillie-Grohman entered into new negotiations with both the federal and provincial governments, and although he argued that the canal would have no detrimental effect on land in the upper Columbia valley, a new agreement was reached that called for a system of locks in the canal and for strict regulation of the water flow.[55] The canal was completed in 1889 and its title transferred to the provincial government, but it never served its

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[52] Petition of Golden City and the Upper Columbia Valley, 6 March 1886, rpt. in Jordon, "Kootenay Reclamation," 218-20.
[53] Letter of Mrs. Baillie-Grohman to the Victoria Daily Times, 1922, rpt. in The Kootenay Valley, 30.
[54] Nelson Daily News, 15 January 1954: 4.
[55] Victoria Colonist, 8 August 1886: 3; "Report of the Privy Council," rpt. in The Kootenay Valley, 32-33.

purpose of diverting the Kootenay River. The provincial government quietly abandoned it and silt from the annual floods soon reclaimed it.

In the face of local and corporate opposition to his diversion scheme and plagued with financial problems, Baillie-Grohman reorganized his capital and launched the Kootenay Valleys Company in 1887. This time the company concentrated on widening the channel at the outlet of Kootenay Lake, in the hope that the increased flow would stem the annual flooding. The reclamation work coincided with a dramatic increase in non-Native settlement in the region.[56] Baillie-Grohman soon discovered that many local non-Natives had already established themselves and their farms in the lower Kootenay valley and were not pleased with his reclamation plans.[57] But hostile farmers were not the only problem facing Baillie-Grohman. Internal squabbling and legal action paralysed his company, finally resulting in Baillie-Grohman abandoning the project in 1891 and returning to England. A new company was formed, the Alberta and British Columbia Exploration Company, again with British financing, and the project was renewed, but this time as an exercise in building dykes along the banks of the upper Kootenay

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[56] The number of preemptions in the Kootenays jumped from 15 in 1889 to 150 in 1892. Likewise, certificates of purchase increased from 11 in 1888 to 183 in 1890, while crown grants rose from 9 in 1887 to 102 in 1889. See Robert E. Cail, Land, Man and the Law: The Disposal of Crown Lands in British Columbia, 1871-1913 (Vancouver: University of British Columbia Press, 1974) 266-68.

[57] Baillie-Grohman to Lands, 13 September 1890 and Baillie-Grohman to Lands, 22 November 1890, Glenbow Museum and Archives, Baillie-Grohman Papers, M-302.

in the hope of containing the spring flooding.[58]

The new company soon discovered that, like its predecessor, it would face resistance. When Henry B. Smith, a surveyor in the company's employ, started surveying between the international boundary and Kootenay Lake in the summer of 1892, he was accosted by the local Ktunaxa who reportedly threatened him, damaged his survey equipment, and destroyed his survey stakes.[59] In September the trouble escalated when the company's dredger reached the site of the Kootenay potato patches. The Ktunaxa man who had planted the potatoes asked for compensation, but was greeted with ridicule and derision by the company's workers. He responded by arming himself with his rifle and threatening violence.[60] By the time reports had reached the local newspaper in Nelson, the incident was described as involving a dozen mounted and armed Ktunaxa threatening the company's workers and refusing to allow the dyking to continue until they were compensated for the destruction of their potato gardens.[61] F.G. Little, the company's foreman, telegraphed an urgent message to his supervisor on 3 September: "The Indians forbid dyke through garden.

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[58] For a description of the financial disagreements and arrangements see Jordon, "Kootenay Reclamation," 200-05.
[59] Henry B. Smith to Vowell, 30 June 1892, enclosed in Keefer & Smith to lands commissioner, 16 September 1892, BCA, GR 1440, f. 3879/92. See also, T.C.N. Norbury to Norbury, 5 August 1892, BCA, Norbury Family Papers, MS-0877.
[60] Michael Phillips to Vowell, 11 February 1893, NAC, RG 10, vol. 3738, f. 28013-2.
[61] Nelson Daily Miner, 3 September 1892: 1.

Expect trouble. Dredge will shut down tomorrow."[62] The local provincial government agent, Capt. Fitzstubbs, hurried to the site of the dispute from his office in Nelson and reportedly easily settled the dispute, promising the Ktunaxa compensation for their losses.[63] Evidently, the Ktunaxa were not satisfied, because barely a month later they were again disrupting the dyking work and demanding compensation.[64] The company's supervisor, George Alexander described the Natives as a "notoriously lawless" group who had "no right whatever upon the land,"[65] although the acting Indian Agent, T.C.N. Norbury, confided to his father that it was a "mixed up affair and the Indians are in the right...."[66]

The reclamation company demanded increased government supervision of the Ktunaxa to prevent them from interfering with the dyking. The province supported the company and in the fall of 1892 asked the federal minister of justice to send more government agents to the Kootenay valley to confine the Ktunaxa to the two Indian reserves which had been created near the south end of Kootenay Lake.[67] The federal government viewed the request as impractical, speculating that it would

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[62] Little to Smith, 5 September 1892, enclosed in Keefer & Smith to lands commissioner, 16 September 1892, BCA, GR 1440, f. 3879/92.
[63] Nelson Daily Miner, 10 September 1892: 1.
[64] Alexander to Vernon, 14 November 1892, BCA, GR 1440, f. 4427/92.
[65] Alexander to Vernon, 17(?) November 1892, BCA, GR 1440, f. 4410/92.
[66] Norbury to Norbury, 18 October 1892, BCA, MS-0877.
[67] Alexander to Vernon, 31 October 1892 and Alexander to Vernon, 14 November 1892, BCA, GR 1440, f. 4427/92; Theodore Davie, premier, to John Thompson, minister of justice, 18 November 1892, NAC, RG 10, vol. 3728, f. 28013-2.

likely require a large contingent of armed North West Mounted Police officers to restrict the movements of the Ktunaxa. Moreover, confining the Ktunaxa to their reserves would prevent them from pursuing their seasonal subsistence activities. The federal government believed that the Alberta and British Columbia Exploration Company was at fault for not coming to an agreement with the Ktunaxa before proceeding with the dyking, and suggested that if a similar action had been taken against non-Native settlers, they would have shown similar resistance.[68] By the spring of 1893 the Department of Indian Affairs was confident that the entire incident had been exaggerated and that there was no need to increase its presence in the region.[69]

During the winter of 1893-1894 record amounts of snow fell in the Kootenays. When the warm temperatures of spring arrived a freshet of unprecedented volume was unleashed down the mountain sides causing flood levels that have never since been approached. In the low lands of the upper Kootenay Valley water levels reportedly reached 29 feet above the river's low water level.[70] The newly built dykes gave way and the bottom lands were once again the site of a

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[68] Vankoughnet, deputy superintendent of Indian Affairs, to T. Mayne Daly, superintendent general Indian affairs, 28 December 1892, NAC, RG 10, vol. 3738, f. 28013-2.

[69] Vankoughnet to T. Mayne Daly, 7 March 1893, NAC, RG 10, vol. 3738, f. 28013-2.

[70] IJC, Hearings re Application of Creston Reclamation Company, Limited, 29 November, 1927, NAC, RG 89, Vol. 589, file 1161.

lake which extended south across the international boundary.[71] In the spring of 1895 the company was back at work on the dykes but again encountered armed resistance from the Ktunaxa. Alberta and British Columbia Exploration Company workers sent an urgent telegraph to Victoria: "Armed Kootenay indians[sic] have attacked workmen reclamation works and stopped work claiming ownership of land, shots fired at men, bloodshed and possibly loss of life imminent unless prompt steps taken by Government. Respectfully suggest few mounted police from Northwest."[72] The Ktunaxa were reportedly claiming the entire valley. When the workers reached a traditional Ktunaxa camping ground the conflict escalated, blows were thrown, and the company's men scurried into the dredger to hide from the enraged Ktunaxa who proceeded to once again destroy the surrounding survey stakes.[73] George Keefer, the company's engineer, hurried to Nelson and contacted the provincial government in Victoria. When Indian Superintendent Vowell learned of the incident he urged the provincial attorney general to arrest and punish the offending Indians so they would finally learn that the law had to be respected.[74] Keefer returned three days later with government agent Fitzstubbs, George Alexander, and three special constables, and

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[71] For a description of the effect of the flood on the Sinixt on the Columbia River see Mourning Dove and Jay Miller, Mourning Dove: A Salishan Autobiography (Lincoln: University of Nebraska Press, 1990) 157-66.
[72] Alexander and Keefer to attorney general, 8 April 1895, BCA, GR 429, box 3, file 3, 647/95.
[73] Nelson Daily Miner, 13 April 1895: 1.
[74] Vowell to Ebert, 9 April 1895, BCA, GR 429, box 3, file 3, 652/95.

found that all the Ktunaxa had left, except for a man named Nicholas and his family who had remained camped on the disputed land. Vowell's suggestion was acted upon; Nicholas was arrested, brought back to Nelson, and sentenced to 30 days for disturbing the peace.[75]

High-water, ineffective dykes and resistance from the Ktunaxa, farmers and the CPR had thwarted Baillie-Grohman's attempts and those of his successors to control the Kootenay's spring flood, but the vision of an agricultural paradise would not die. Within a few years renewed interest in reclamation developed both south and north of the international boundary. In 1905 private interests in the United States employed C.C. Reeder of Spokane to investigate the feasibility of preventing the annual flooding on the upper Kootenay. Reeder hired Otto Veile, an engineer from Spokane to conduct a survey. Veile recommended widening the Kootenay Lake outlet and dyking the south end of Kootenay Lake to prevent the spring freshet from flooding the valley south of the lake.[76] Similar surveys were conducted by British Columbia interests. In 1912 the provincial government expended twenty thousand

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[75] Nelson Daily Miner, 20 April 1895: 1. The timing of the incident could not have been worse for the company. Two Norwegians were in the region to investigate the possibilities of founding a settlement, and although the Nelson Daily Miner reported that they had been favourably impressed with the valley, the confrontation had dissuaded them from travelling to the lowlands on the upper Kootenay River. See, Nelson Daily Miner ,11 May 1895: 3; Alexander to Ebert, 20 April 1895, BCA, GR 429, box 3, file 3, 752/95.
[76] The Kootenay Valley. A report on land reclamation in the valley presented before the International Joint Commission, Ottawa and Washington, 1935, (Ottawa, King's Printer, 1936) 34-5.

dollars on a survey of the problem, with the hope of developing a new reclamation scheme, and in 1915-16 the United States Department of Agriculture surveyed the Kootenay valley in northern Idaho for similar reasons. It became increasingly evident to agricultural interests and their supporters in government in both Canada and the United States that any effective solution to the problem would require international cooperation. The first serious attempt to cooperate occurred in 1917 when an International Drainage Conference was convened in Creston with representatives from the Idaho and British Columbia governments.[77] As a result the state and provincial governments approached their respective federal counterparts in 1919 and requested that they enter into negotiations for an international land reclamation project. The two federal governments began talks in September 1919 and in 1920 the directors of the two countries' reclamation services were authorized to confer on the topic, resulting in more studies by engineers.[78] With agricultural interests on both sides of the international boundary finally cooperating and with their respective governments on side, it appeared that it was only a matter of time before the Kootenay River's annual flooding was halted and the flood plain land reclaimed for farming. But before farmers in Canada and the United States could celebrate their

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[77] Guy Constable, Reclamation: Creation of an Inland Empire (Creston, B.C.: Creston Board of Trade, c. 1918), presented to the special committee of the British Columbia Legislature on Drainage, March 1918.
[78] International Joint Commission Waterways Problems, 17 September, 1923, NAC, RG 51, Vol. 1.

success, they would have to deal with a new presence in the valley.

Electric Space

After winding a 780 kilometre course and draining over 45,000 square kilometres, the Kootenay River plunges eighty-two metres during its sixteen kilometre passage from the outlet of Kootenay Lake to the mouth of the Slocan River. For the electric industry this was a unique opportunity. This section of the Kootenay River had plenty of both water flow and head and it also had Kootenay Lake and its flood plain downstream to act as a natural reservoir. By 1920 the short stretch of river had become one of the most important locations for hydroelectric generation in Canada. West Kootenay Power & Light's plant at Bonnington Falls had been superseded by new plants with greater generating capacity and with the support of one of Canada's most powerful corporations.

After pushing its transcontinental railway through the upper Columbia River valley in 1885 the CPR launched a vigorous acquisitions and building campaign in an attempt to gain control of the transportation of ore from mines in the region. Spur lines were built and small steam-boat transportation companies were purchased, but J.J. Hill's Great Northern Railway continued to siphon off much of the rail traffic to the United States. In 1898 the CPR moved to secure its control of transportation in the Kootenays. With a subsidy from the federal government, the CPR built a rail line from southern Alberta through the Crowsnest Pass to Kootenay Lake. It also moved directly into the smelting business by taking control of a smelter in Trail, British Columbia which had been processing ores from the nearby Rossland mines. The CPR quickly began to expand and modernize the smelter in order to process silver lead ores from mines in the Slocan Valley and the upper Kootenay River area. The retooled smelter, complete with a powerful new blast furnace, required a large and steady flow of inexpensive energy and the company looked to Bonnington Falls to supply it. The CPR entered into an agreement with the West Kootenay Power & Light Company (West Kootenay Power) to supply the Trail smelter with electricity from its Bonnington Falls plant which began generating in September 1898.[79] The new smelter required more energy than the plant could supply. In 1899 a third generator was added, increasing the plant's total capacity to over five thousand kilowatts.[80]

In 1902, in the wake of concentrated pressure to support the Canadian mining industry, the federal government began paying a five-dollar bounty for each ton of lead mined, smelted and refined in Canada. The CPR responded by again expanding its operations at Trail, this time adding a new lead refinery which used the Betts

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[79] Jeremy Mouat, The Business of Power: Hydro-Electricity in Southeastern British Columbia, 1897-1997 (Victoria: Sono Nis Press, 1997) 40-41, 59-60.
[80] "Power Development on the Kootenay River," Engineer (April 26, 1929) 469-70.

process of electrolytic refining and required large amounts of electricity.[81] In 1905 the CPR purchased control of West Kootenay Power and raised new capital to allow the electric company to embark on ambitious plans to expand both its generation and transmission system. In the summer of 1905 work began on a dam and hydroelectric generating facility approximately one mile upriver from the original Bonnington Falls plant, at a site called Upper Bonnington Falls or Plant #2. The new facility, equipped with turbines instead of waterwheels, began operation in late 1906.[82]

The Upper Bonnington Falls plant was capable of generating 43,000 kilowatts, more energy than the CPR's Trail smelter required, so West Kootenay Power looked to expand its area of operations. Eighty miles southwest of Bonnington Falls and across the Monashee Mountains was another mining and smelting district that had developed near the American border. The mining operations were supplied with electricity by the Cascade Water, Power and Light Company which had constructed a run-of-river hydroelectric facility at Cascade Falls on the Kettle River. The company was unable to supply a constant and reliable supply of electricity to its customers because the water flow on the Kettle River

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[81] Jeremy Mouat, Roaring Days: Rossland's Mines and the History of British Columbia (Vancouver: University of British Columbia Press, 1995) 134-6.
[82] "Hydro-Electric Plant in British Columbia," Engineer (November 6, 1908) 481-85. Generating capacity was expanded in 1919; "Power Development on the Kootenay River," Engineer (April 26, 1929) 469-70. It was again expanded in 1938 to take advantage of the artificial storage on Kootenay Lake allowed by the IJC.

fluctuated dramatically between summer extremes and winter lows, a problem compounded by deforestation in the area which accelerated the spring freshet.[83] In 1905 West Kootenay Power proposed to build a transmission line into the region to supply the mines and smelters with electricity from its Kootenay River generators. Because the company's provincial charter disallowed it from distributing electricity outside of a 50 mile radius of Rossland, it was forced to apply to the provincial government for an amendment to its charter. Cascade Water, Power and Light successfully lobbied the provincial government to reject West Kootenay Power's application, but West Kootenay circumvented the government's opposition by purchasing the charter of another fledgling hydro-electric company authorized to operate in the Kettle River region.

By the summer of 1906 electricity generated on the Kootenay River was being transmitted over the Monashee Mountains into the Kettle River valley.[84] This was an important step in the advancement of electric space. West Kootenay Power had successfully evaded the restrictions in its corporate charter which had been intended to limit its sphere of operations. It also demonstrated that electricity could be transmitted over what was at the time a remarkable distance.[85] It had succeeded in

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[83] G.W. Taylor, Builders of British Columbia: An Industrial History (Victoria: Morriss Publishing, 1982) 177.
[84] Mouat, The Business of Power, 64-69.
[85] B.C. Department of Lands, Water Powers of British Columbia Canada, 1924, BCA, GR884, box 1, file 1, 84.

compressing time and space between Bonnington Falls and mines and smelters in the Kettle Valley. Instead of ore being shipped to Bonnington Falls, the Kootenay River's energy was put to work at the site where it was required.

In 1906 the CPR reorganized its mining and smelting interests as the Consolidated Mining & Smelting Company of Canada (Cominco). In 1910 Cominco acquired control of the Sullivan mine in the East Kootenays, the site of a huge deposit of low grade lead-zinc ore, which, while immensely valuable, could not be refined with the metallurgical process available at the time. Efforts had been made to solve the so-called "zinc problem," but it eventually drove the local mining industry into the economic doldrums. By 1910 a new company was working on an experimental method to process lead-zinc ore that required large amounts of electrical energy. The experiments were conducted in Nelson with the city providing use of its old Cottonwood Creek powerhouse to supply the electricity. In 1911 the company declared that its electrolytic zinc refining process was a success and promptly sold the rights to Cominco which built a new zinc plant at Trail powered with energy from the Kootenay River. With funding from the federal government, the plant was expanded in 1915 to supply zinc for war-time munitions. The expansion necessitated the addition of another generator to the Upper Bonnington plant and eventually led to the CPR transferring control of West Kootenay Power to Cominco in 1916. By 1925 seventy percent of Cominco's electricity requirements was going to the electrolytic zinc plant and still more power was required. To meet the demand the original Bonnington Falls hydroelectric facility was demolished and replaced with a new plant in 1925 with a generating capacity of over eighty thousand kilowatts, a fifteen-fold increase. The extra capacity was achieved in part by lowering the bottom of the Kootenay River under the plant to more than double the head of water to seventy feet. But even this was not enough to satisfy Cominco's escalating demand for electricity. In the fall of 1926 work began on a third hydroelectric facility on the Kootenay River to be situated less than a mile downriver from the Bonnington Falls #1 plant. The South Slocan facility (Plant #3) came online in 1926 and was fully operational by 1929 with a total generating capacity of over 100,000 kilowatts.[86]

The rapid expansion of hydroelectric generation on the Kootenay River eventually led the electric industry into conflict with agricultural interests who wanted to control the annual flooding on the Kootenay River. West Kootenay Power's plants continued to function as run-of-river facilities; their ability to store water was limited to the small pond created behind each dam. These ponds were not able or intended to control and moderate the Kootenay River's seasonal fluctuations. Instead West Kootenay Power relied not only on Kootenay Lake, but also on the flooding caused by the spring freshet, to operate as a natural reservoir to supply

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[86] Mouat, Roaring Days, 144-50 and Mouat, Business of Power, 74-85, 100-04.

water to its turbines. Although the arrangement was far from perfect (the plants often ran below capacity due to low winter water levels) it was integral to West Kootenay Power's operations.

The Canadian—American agreement in 1920 to jointly investigate plans to reclaim the Kootenay River floodplain in British Columbia and Idaho posed a serious threat to West Kootenay Power. The problem was explained in a 1922 Dominion Water Power Branch report. R.G. Swan warned that the newly revived scheme to reclaim the upper Kootenay River floodplain was "in direct conflict with the use of Kootenay Lake as a storage reservoir in connection with power developed and undeveloped on the Lower Kootenay River...." Swan reported that the Kootenay River had one of the greatest potentials for hydroelectric production in the entire province. He also suggested that, though the plants which harnessed its waters supplied electricity to the most important industry in the region (the Cominco smelter), West Kootenay Power was currently handicapped due to a lack of storage capacity, and that if Kootenay Lake was utilized as an artificial reservoir hydroelectric generation could be greatly increased. He recommended "that Kootenay Lake be utilized as a storage reservoir to as great a degree as is economically feasible" and that no "final decision should, therefore, be made as to the scope of the reclamation project without giving full consideration to the power interests which will be affected on the Kootenay River by any curtailment of power storage in Kootenay Lake."[87]

The growing tension between agriculture and hydroelectric industries came to a head in 1927 when the Creston Reclamation Company filed an application with the International Joint Commission (IJC) to dyke the Kootenay River near Creston. Under the Boundary Waters Treaty of 1909, the IJC was entrusted with the responsibility of reviewing schemes from either side of the boundary which affected the flow of international rivers. The new dyking plan brought the IJC commissioners west of the Rockies for the first time when they convened in Nelson in the fall of 1927. The Canadian dyking proponents portrayed themselves as a group of individual farmers who had joined together and pooled their meagre capital resources to organize the reclamation company. Earlier dyking attempts begun by Baillie-Grohman had failed, but dyking the Kootenay River south of the border in Idaho had proven relatively successful and the Canadian farmers wanted approval to do the same in British Columbia. They proposed to construct a dyke on the east side of the river with a height of twenty-nine feet above the low water level. This was lower than the thirty-two foot water level reached during the massive flood of 1894, but five feet higher than the second-highest recorded level.[88]

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[87] R.G. Swan, "Report on the Relationship of Storage in Kootenay Lake to Power on Kootenay River and to Kootenay Flats Reclamation Project," report to Dominion Water Power Branch, April, 1922, NAC, RG 89, Vol. 565, file. 601.
[88] IJC, Hearings re Application of Creston Reclamation Company, Limited, 29 November, 1927, NAC, RG 89, Vol. 589, file 1161.

The IJC also heard West Kootenay Power's position on the proposed reclamation scheme. The company explained that the reclamation work in both Idaho and British Columbia was threatening its ability to provide Cominco with electricity by depriving the hydroelectric company of its 'natural reservoirs.'

> Every acre that is reclaimed, in the manner in which it is being reclaimed here, will deprive the river of its natural reservoirs to that extent. The 30,000 acres reclaimed in Idaho have deprived the river of its natural reservoirs with the result that at the time of freshets the water goes down the river quickly; instead of flooding the land and staying there for several months, it passes off in a week or two. We have found in recent years from actual gauge readings that there is a difference approaching two feet of extra flood crest that we would have to contend with at the plant which had not been found in the flood figures of previous years.

West Kootenay requested that the commissioners postpone any decision on the reclamation project until the company was able to submit its own proposal. It was planning to adopt Baillie-Grohman's earlier plan to widen the outlet of Kootenay Lake to allow for a higher rate of discharge during the annual spring freshet. But West Kootenay Power also wanted to build a new dam at the outlet to store extra water on Kootenay Lake. With West Kootenay Power at the controls, the discharge on the Kootenay River would be higher during the spring and then drop during the summer in order to capture a portion of the annual freshet and store it on Kootenay Lake to generate more electricity over the winter.[89]

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[89] IJC, Hearings re Application of Creston Reclamation Company, Limited, 29 November, 1927, NAC, RG 89, Vol. 589, file 1161; L.M. Bloomfield and Gerald

Despite West Kootenay Power's concerns, after waiting a few months for American authorities to collect more information on the effect the Canadian reclamation scheme might have on Idaho farmers, the IJC approved the dyking application in April, 1928. West Kootenay Power reacted by complaining to the provincial government and finalizing its own application to store water on Kootenay Lake.[90] With its plants on the Kootenay River often running far below capacity due to low winter water levels and with a clear need to solidify control of its 'natural reservoirs,' West Kootenay Power moved quickly. In June 1929 it announced that it would seek approval from the provincial government to build a new dam on the Kootenay River and in September it filed its application with the IJC.[91] West Kootenay's application adhered to its earlier proposal. It requested to be allowed to construct a dam at the outlet of Kootenay Lake (Granite Dam) and store six feet of water on the lake. This meant that through the operation of the dam the water level on Kootenay Lake would be artificially maintained six feet above its normal low-water level. The plan was opposed by the United States and Idaho whose farmers feared a new round of flooding. The IJC delayed making a decision on the proposal until further investigations could be made into its effect on the upper Kootenay

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F. Fitzgerald, Boundary Waters Problems of Canada and the United States (Toronto: Carswell, 1958) 123-24.

[90] "Reclamation Project to be Opposed," Vancouver Province, 19 December 1928: 7.

[91] "West Kootenay Planning Great Power Project," Vancouver Province, 24 June 1929: 1.

River. West Kootenay Power was unwilling to wait. Cominco's increasing demand for electricity necessitated that West Kootenay Power improve its regulation of the Kootenay River's water flow as soon as possible. Consequently, it revised its plans and proceeded with construction of the Corra Linn Dam seven miles downriver from the outlet of Kootenay Lake but upriver from its current plants. The dam would provide increased water flow regulation for all of its Kootenay River hydroelectric facilities. Its powerhouse would have a combined generator capacity of over 76,000 kilowatts and it would not require approval by the IJC because, at least initially, it would not be used to store water on Kootenay Lake. If the IJC was later persuaded to grant approval the Corra Linn Dam was capable of storing over six feet of water on the lake.[92]

The Corra Linn Dam and powerhouse were completed in 1932 and West Kootenay Power immediately proceeded to amend its application to the IJC, this time requesting that it be allowed to store water on Kootenay Lake using the new Corra Linn Dam. Facing renewed opposition from Idaho farmers and sensing little chance that the IJC would grant approval, West Kootenay Power withdrew its application in October, 1934.[93] Farmers in Idaho subsequently had a change of heart. Dyking the Kootenay River was an unreliable method to control the freshet. During

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[92] Bloomfield and Fitzgerald, 125-28; Mouat, The Business of Power, 108-09, 188-89.
[93] Bloomfield and Fitzgerald, 125-28.

high water the dykes could be breached and crops and investments lost.[94] Continued spring flooding finally convinced the farmers that they were better off working with the electric industry than against it. They now believed that if properly built and regulated, hydroelectric works could serve their purposes. With the farmers' support West Kootenay Power revived its application in September 1938.

On 11 November, 1938 the IJC granted its approval citing the need to reclaim the low lands along the upper Kootenay River "which in a state of nature were incapable, and some of which are still incapable, of cultivation by reason of lack of drainage therefrom to the said river, and also by reason of the lands being overflowed from the river during periods of high water...." The IJC's order adhered to West Kootenay Power's initial scheme. Since the Corra Linn Dam had already been built, the only substantial additional work required was to widen the outlet of Kootenay Lake at Grohman Rapids, the site of Baillie-Grohman's earlier efforts, and the formation of a new International Kootenay Lake Board of Control. The Board, answerable to the IJC, would ensure that Kootenay Lake would be regulated to provide for a faster rate of discharge during the spring freshet in order to lessen flooding down river. West Kootenay Power would be allowed to maintain the lake level six feet above its normal lower water level to provide additional storage over the winter. It would also assume a limited liability for damages to farms in Idaho

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[94] For a Canadian example see, C.W. Webb, "Report on Breach of Dyke around Kootenay Reclamation Farm, June 11th, 1930," NAC, RG 89, Vol. 601, file. 1432.

caused by its regulation of Kootenay Lake.[95] The 670,000 acre feet of new water storage would allow West Kootenay Power to generate considerably more electricity at its Kootenay River facilities.

Figure 3.5 compares the monthly median water levels on Kootenay Lake for the periods preceding and following the 1938 IJC decision (the latter period culminates with the completion of the Libby Dam on the Kootenay River in Montana in 1973). The comparison illustrates how the decision affected natural seasonal fluctuations. The high water levels of May to June were lowered while the water level was increased over the fall and winter months. Low water levels which had occurred from December through to March were now restricted to a short, one-month period from March to April. The electric industry had inscribed a new hydrologic cycle in the Kootenay valley, one which better suited its requirements for the generation of hydro-electricity.

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[95] IJC Order of Approval, 11 November, 1938, NAC, MG 30 E133, Vol. 327, Interim Vol. 6, File, Kootenay Lake; Bloomfield and Fitzgerald, 130-31.

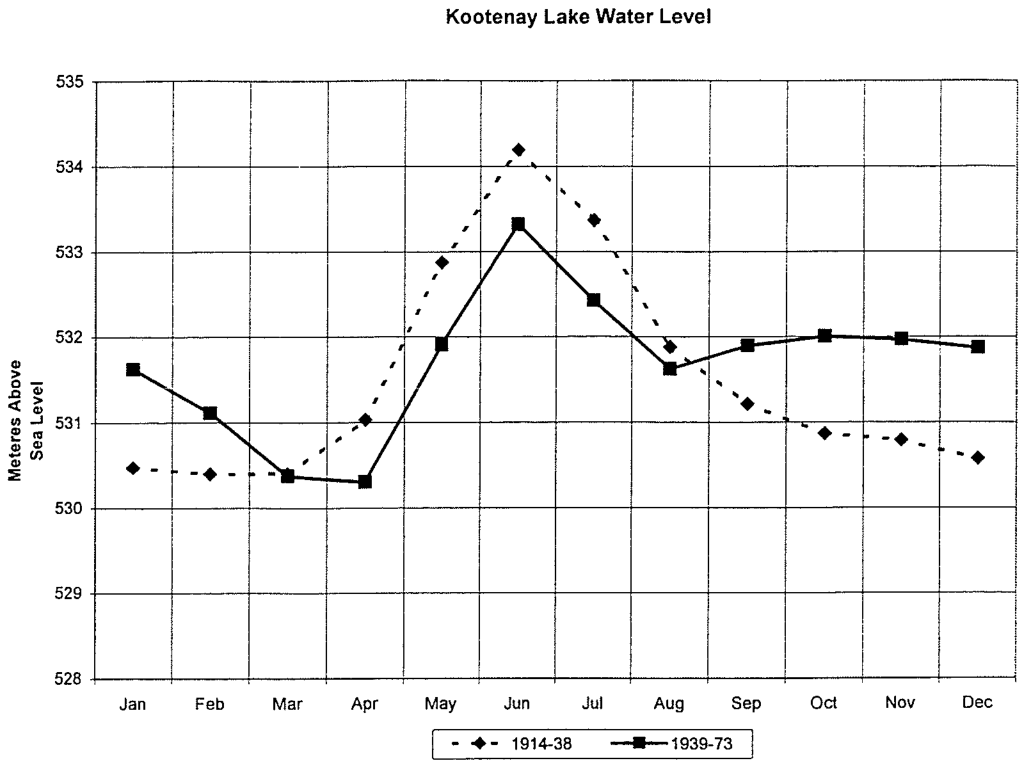

Figure 3.5. Historical water levels on Kootenay Lake.

Source: Derived from data found in Canada Inland Waters Directorate, Historical Streamflow Summary: British Columbia, cd rom, (Ottawa: Information Canada, 1999).

West Kootenay Power justified its application to store water on Kootenay Lake as being necessary to the survival of the region's largest employer, Cominco. But the increased storage allowed West Kootenay Power to generate more electricity than Cominco required. It arranged to sell this excess power to the Washington Water Power Company across the international boundary in Washington State. Washington Water Power also agreed to reimburse West Kootenay Power for any damages it might be liable for if farms in Idaho were flooded.[96]

Conclusion

The 1938 IJC decision opened the door on a new era of hydroelectric development in British Columbia and the American Pacific Northwest. For the first time an international, multi-purpose approach had been implemented for watershed development and regulation, an approach which was to be elaborated on over the next twenty years and confirmed with the signing of the Columbia River Treaty protocol in 1964. Multi-purpose river regulation in the Columbia River watershed was intended to provide for irrigation, flood control and the generation of hydroelectricity. Of these three purposes hydroelectric generation reigned supreme in British Columbia from 1938 onward.

By 1938 the electric industry, led by the CPR's subsidiary West Kootenay Power, had imposed its control on the Kootenay valley. The Sinixt and the Ktunaxa had lost control of their territory and been confined to reserves where they were monitored and supervised by the state. Farmers and ranchers, who had worked through the provincial and federal governments to dispossess the Natives of their lands, found themselves in a precarious position. Farmers on the upper Kootenay in both Idaho and British Columbia felt secure with West Kootenay Power now

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[96] Neil A. Swainson, Conflict over the Columbia: The Canadian Background to an Historic Treaty (Montreal: McGill-Queen's University Press, 1979) 39-40 & fn.

regulating Kootenay Lake to provide partial relief from spring flooding, but their local victory was unrepresentative of the new power relations in the region. The electric industry was interested in controlling and regulating the spring freshet, not eliminating it. Baillie-Grohman's earlier attempt to divert the Kootenay River into the upper Columbia River valley, which had been approved by the provincial government, had established the precedent for re-locating water. The 1938 approval to store water on Kootenay Lake led to further schemes to create reservoirs for hydro-electric generation, culminating in the creation of the Duncan, Koocanusa, Arrow and Williston Reservoirs through the building of the Columbia River Treaty dams. These reservoirs flooded thousands of acres of agricultural land. Baillie-Grohman's dream of controlling the waters of the Kootenay River may have been achieved, but any localized victory for individual farmers and ranchers was incidental to the wider triumph of the electric industry. Native and Agricultural space continued to exist in the Kootenays, but they were spaces framed and disciplined by the hydroelectricity interests.

The decision to transform Kootenay Lake into a regulated storage reservoir affected the physical space of the upper Kootenay valley. The floodplain was no longer flooded and water levels on Kootenay Lake changed. But the history of space is about more than geographical descriptions; it is also about the transformation of natural rhythms. Through work, industrial society modifies natural rhythms and inscribes new rhythms in space.[97] The electric industry's development of the Kootenay valley exemplified this process. The interconnection of West Kootenay Power and Washington Water Power's transmission grids was a significant step in the expansion of electric space. From its initial corporate charter which had limited its transmission radius to 50 miles around Rossland, West Kootenay Power had first expanded west into the Boundary mining and smelting district. In the 1920s it expanded further west to supply electricity to the Okanagan Valley and also east to send electricity to the mines and towns on the other side of Kootenay Lake. Its 1938 agreement with Washington Power marked its entry into a North American power grid, the ultimate representation of productive space for the British Columbia electric industry.[98]

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[97] Henri Lefebvre, The Production of Space trans. Donald Nicholson-Smith (Oxford: Basil Blackwell, 1991) 117.
[98] Electrical Power Generation and Transmission Map of the United States and Canada (Tulsa, Oklahoma: Pennwell Publishing, 1996).

Chapter 4

Consumer Space: B.C. Electric's Promotion of Electricity

Introduction

It may appear nonsensical to refer to the consumption of electricity. In the original meaning of the word, consumption indicated that something was completely used up, that it was wasted or destroyed. The first law of thermodynamics stipulates that energy can never be destroyed and, in this sense, electrical energy is not consumed. Instead it is converted into other forms of energy. But the development of capitalist markets led to a redefinition of 'consumption' and the introduction of the word 'consumer' as a substitute for customer. By the twentieth century 'consume' and 'consumer' had lost their negative connotations of waste and destruction and came to represent the abstract corollary to production. This change represented the abstraction of goods and services and the loss of an awareness of the relationship between customers and suppliers of goods and services.[1] In this sense 'consumption' is a term well suited to describing the utilization of electrical energy, the ultimate abstraction of nature's work.

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[1] Raymond Williams, Keywords: A Vocabulary of Culture and Society (London: Fontana Press, 1983) 78-79.

The question of how corporations worked to create consumer demand in the twentieth century and how consumers responded to and influenced these efforts has received a great deal of attention,[2] especially under the rubrics of the introduction and spread of electrical appliances.[3] A primary concern of most of these studies is the question of consumer choice; were consumers simply manipulated by big business into buying and using new goods, or by making

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[2] See, for example, Roland Marchand, Advertising and the American Dream: Making Way for Modernity, 1920-1940 (Berkeley: University of California Press, 1985) William Leach, Land of Desire: Merchants, Power, and the Rise of a New American Culture (New York: Pantheon Books, 1993); Stuart Ewen, Captains of Consciousness: Advertising and the Social Roots of the Consumer Culture (New York: McGraw-Hill Book Co., 1976); Stuart Ewen, All Consuming Images: The Politics of Style in Contemporary Culture (New York: Basic Books, Inc., 1988).

[3] For examples of Canadian studies see; Blair E. Tothill, "Living Electrically: The British Columbia Electric Railway Company and the Development of the Domestic Electric Appliance Market in Victoria, 1919-1939," M.A. Thesis (University of Ottawa, 1997); Dianne Dodd, "Delivering Electrical Technology to the Ontario Housewife, 1920-1939: An Alliance of Professional Women, Advertisers and the Electrical Industry," Ph.D. Thesis (Carleton University, 1988); Margaret Hobbs and Ruth Roach Pierson "'A Kitchen That Wastes No Steps...' Gender, Glass and the Home Improvement Plan, 1936-40," Histoire Sociale--Social History 21.41 (1988) 9-37; Joy Parr, Domestic Goods: The Material, the Moral and the Economic in the Postwar Years (Toronto: University of Toronto Press, 1999); The classic American work is Ruth Schwartz Cowan, More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave (New York: BasicBooks, 1983). Two of the best case studies are Harold L. Platt, The Electric City: Energy and the Growth of the Chicago Area, 1880-1930 (Chicago: University of Chicago, 1991) and Mark H. Rose, Cities of Light and Heat: Domesticating Gas and Electricity in Urban America (University Park: Pennsylvania State University Press, 1995). See also, Gregory B. Field, "'Electricity for All': The Electric Home and Farm Authority and the Politics of Mass Consumption, 1932-1935," Business History Review 64 (Spring, 1990) 32-60; Christina Hardyment, From Mangle to Microwave: The Mechanization of Household Work (Cambridge: Polity Press, 1988).

discerning choices did they influence the development of the market and the design and function of electric appliances. The electric industry certainly believed that it held the power to mould and shape consumer demand. As an electric industry pioneer remarked, "'Customers did not exist; they had to be created.'"[4] But customers were not easily created. It was often difficult to convince people to abandon their established methods for cooking, cleaning and lighting the home. Undoubtedly, many of the industry's advertising campaigns fell on unreceptive ears. As with any attempt by business to 'engineer consent', the electric industry's efforts were often incomplete or were subverted.[5]

The question of consumer choice is not the only way to conceptualize the effect of the development of demand for electricity. The electric industry's efforts to create consumers did more than produce a demand for electricity; such campaigns also produced space, both public and private, that reinforced and explained new relations within society and between society and nature. These

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[4] John Winthrop Hammond, Men and Volts: The Story of General Electric (New York: J.B. Lippincott Company, 1941) 89.

[5] See, Keith Walden, Becoming Modern in Toronto: The Industrial Exhibition and the Shaping of a Late Victorian Culture (Toronto: University of Toronto Press, 1997) 310-11. Nonetheless, David Nye's argument that the specific manner in which electricity was adopted was solely based on consumer autonomy or on values and ideals which pre-dated the electric age does not appear credible. See David E. Nye, Electrifying America: Social Meanings of a New Technology, 1880-1940 (Cambridge, Mass.: The MIT Press, 1990) 238-39 and David E. Nye, Consuming Power: A Social History of American Energies (Cambridge, Mass.: MIT Press, 1998) 157-58.

relations, often represented as efficiency projects, were based on the reification of energy as a consumer good, created and marketed by business, and brought to the city to emancipate, entertain and comfort new middle-class consumers.

Ideal Electric Space

Creating a market for electricity included the creation of an imagined ideal space of electric production and consumption. This space was intended to explain new relations within society and between society and nature. One of the earliest forums for this ideal electric space was the industrial exhibition. Throughout the late nineteenth and early twentieth centuries corporations participated in and helped to construct elaborate exhibitions and fairs which introduced new technologies and new relations of production and consumption. Members of the electric industry had various reasons for their participation. Many central generating stations were also in the transportation business and viewed fairs and exhibitions (which were usually held on the outskirts of towns and cities) as a guaranteed method to increase traffic on their streetcar lines. For those with real estate interests, the daily transportation of thousands of fair-goers across their undeveloped lands on the city's fringe provided an ideal opportunity to interest them in the possibility of owning a home in the suburbs.[6] Fairs and exhibitions also became important gathering places for the different facets of the electric industry and provided opportunities for the building of relationships and a cooperative spirit.[7]

The electric industry played an indispensable part in the mounting of industrial exhibitions. It provided the motive power and lighting for its own displays and those of other industries. An excess of electric lighting was the defining feature of late nineteenth century exhibitions and for most patrons it was the hallmark of modernity. Chicago's 1893 Columbian Exhibition set the standard and its use of alternating-current to illuminate the fair grounds was one of the exhibition's unique achievements. With seven thousand arc lights and 120,000 incandescent lamps, at night the exhibition's White City became a glowing monument to the triumph of the artificial over the natural.[8] It was an example of

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[6] Henry Ewert, The Story of the B.C. Electric Railway Company (North Vancouver: Whitecap Books, 1986) 85

[7] Roland Marchand, Creating the Corporate Soul: The Rise of Public Relations and Corporate Imagery in American Big Business (Berkeley: University of California Press, 1998) 251.

[8] For descriptions of electricity and the "White City" see Alan Trachtenberg, The Incorporation of America (New York: Hill and Wang, 1982) 208-34 and William Cronon, Nature's Metropolis: Chicago and the Great West (New York: W.W. Norton & Company, 1991) 341-42.

what Nye has termed the 'electrical landscape', a space of spectacle, illusion and desire.[9]

B.C. Electric's role in local exhibitions epitomized the importance of exhibitions to the electric industry. The first Vancouver Industrial Exhibition was held in 1910 with B.C. Electric providing motive power for many of the displays. It also lighted the interiors of the exhibition buildings (taking especial pride in the absence of shadows) and draped the exterior of the buildings in hundreds of lights, making them shine like Christmas trees at night.[10] B.C. Electric even provided free electric lighting for some early agricultural exhibitions.[11] B.C. Electric also participated in the production of examples of ideal electric space as part of industrial exhibitions, home product fairs and dedicated electrical exhibitions.[12] Fairs and exhibitions were opportunities for B.C. Electric to display and demonstrate a host of electrical appliances as well as lighting products for the home, stores, offices and factories. They were also opportunities to create a space which represented the promise and potential of electricity.

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[9] David E. Nye, American Technological Sublime (Cambridge, Mass.: The MIT Press, 1994) 143-72.

[10] "A Short Account of the Plant and Operations of the British Columbia Electric Railway Company, Ltd.,"1910, BCA, NW 971.91 B862.

[11] Embleton to General Manager, 6 November, 1910, UBCSC, BCER Records, Box 30, file 30-B809.

[12] "Electricity Points the way to Economy," Victoria Colonist, 22 September 1917; "Electric Light and Gas Home Products," Victoria Daily Times, 22 September 1917; "The B.C. Electric Exhibit," BCEEM 3.7 (1920) 26; "B.C. Electric Exhibit Attracted Thousands," BCEEM 4.6 (1921) 31;.

B.C. Electric's first opportunity to participate in the production of a complete electrical space came in 1920 with Vancouver's first Electrical Show, sponsored by the B.C. Electrical Cooperative Association. The Electrical Show included exhibits depicting the use of electricity in industry and in the home. B.C. Electric's domestic science experts demonstrated electric cooking, washing and ironing. Electric lighting flooded the outside of the Drill Hall at night while a powerful search light pierced the night sky. According to B.C. Electric, ten to twelve thousand people attended the show, including school children who received first-hand education in the emerging electrical world of lights and appliances.[13] Inside the exhibition halls the electric industry created elaborate displays to showcase a growing selection of electric appliances. These types of exhibition displays did more than simply promote the individual components of the electric industry. They represented corporate capitalism's ideal of how "space might be ordered and life organized."[14] Corporate exhibits explained the modern relationship between people and things. Natural resources were the product of capitalism and people were consumers of capitalism's products. Furthermore, the

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[13] "Electrical Show is an Assured Success," Vancouver Sun, n.d.; "Wind Up Preparations for Electrical Show," n.d.; "Electric Show to be Opened Tomorrow," n.d., UBCSC, BCER Newspaper Clippings, Reel #1; "Electric Show at Drill Hall," Vancouver Sun, 24 November 1920; "Finest Electric Show in History," Vancouver Sun, 23 November 1920; "Electrical Show is Blaze of Light," Vancouver Province, 22 November 1920; "Electrical Show," BCEEM 3.8 (1920) 30.

[14] Trachtenberg, The Incorporation of America, 212.

world was a spectacle produced by capitalism and people became spectators. Behind it all was a central, benign, controlling power, the modern corporation.[15]

B.C. Electric did not hide the role of nature and its hydroelectric generating stations in supplying electricity for lights, appliances and machinery. It regularly depicted its dams, reservoirs and powerhouses as part of its exhibits. B.C. Electric spent nearly two thousand dollars to build models of its Jordan River and Buntzen/Coquitlam developments for display in Canada's water power exhibit in the Canadian Pavilion at the 1915 Panama-Pacific International Exposition in San Francisco.[16] Similarly, one of the exhibits at the 1920 Electrical Show was a complete model of a B.C. Electric sub-station and hydroelectric power plant At the 1925 Victoria Home Products Fair a B.C. Electric exhibit explained how water-power became electricity used in the home and the factory.[17] For the 1925 Vancouver Exhibition B.C. Electric created a revolving set of four displays depicting its varied interests entitled "Servants of the People." The electricity scene depicted a picturesque mountain lake under a banner which read "Man's Greatest Servant."[18] These types of displays served a dual purpose. First, they

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[15] Trachtenberg, The Incorporation of America, 211-15 and Cronon, Nature's Metropolis, 341-69.
[16] Extracts from Minutes of Management Meeting, 11 and 12 December, 1913 and Secretary to Sperling, 30 January, 1914, UBCSC, BCER Records, Box 45, file B-1368.
[17] "Exhibit at the Victoria Home Products Fair," BCEEM 8.3 (1925) 11.
[18] "Display at Vancouver Exhibition," BCEEM 8.7 (1925) 14-15.

justified the growing corporate domination of modern life. The attacks of anti-monopolistic critics, for which central generating stations such as B.C. Electric were a prime target, were deflected by exhibition models and dioramas which depicted the corporation as a public servant, supporting and fostering production by transforming the raw material of nature into useful products. Second, they explained the relationship between society, corporations and nature. Whereas the technology of electric generation and distribution tended to sever the tangible links between production and consumption, displays such as these attempted to reconnect consumers with the natural world in a specific way. Nature, as depicted by B.C. Electric, was not simply the ghost in the electric machine; it was capitalism's willing and obedient servant in the production of goods and the powering of those goods once they reached the home. This portrayal of the relationship also redefined the goods themselves. They were made from 'natural resources' and so were part of the natural world and yet they were 'created' or 'man-made' as well. In short, they were both artificial and natural. And behind it all stood B.C. Electric, the public servant, the modern demiurge working with nature to produce the new necessities of modern life.[19]

[19] See Marchand's analysis of the Ford car company's exhibit at the 1934 Century of Progress Exhibition, Creating the Corporate Soul, 270-75.

Co-operation

At its basis the ideal space imagined and promoted by the electric industry was intended to increase the consumption of electricity. The intensive promotion of electricity in North America began in the years preceding World War I, escalated during the 1920s and reached its maturity during the 1930s. It was based on industry-wide cooperation involving manufacturers, central generating stations, retailers, local electricians and building contractors. At the forefront were General Electric and Westinghouse, two multinational corporations which created a duopoly in the electrical equipment industry. After World War I General Electric and Westinghouse became increasingly active in promoting the use and sale of electrical appliances. Their efforts were directed at consumers as well as other members of the electric industry. Their partners in the electric industry were educated on the newest equipment and sales methods through industry trade shows. For example, in 1921 General Electric organized a series of "Better Merchandising" conferences across the United States which showcased new electrical equipment and appliances. Experts from General Electric answered technical questions and offered advice on selling electric appliances to consumers.

When the road show reached Seattle representatives from B.C. Electric as well as Vancouver electrical appliance retailers and electrical contractors attended.[20]

Local trade shows were also important venues for the development of the electric industry. Vancouver hosted its first annual Electric Convention in 1919 with representatives from General Electric and Westinghouse in attendance. The theme of the convention was cooperation. B.C. Electric's W.G. Murrin presented a talk entitled "Merchandising from a Central Station's Point of View" in which he emphasized that B.C. Electric's chief concern was selling electricity. To accomplish this goal established customers had to be retained, new ones attracted, and the overall consumption of electricity increased. B.C. Electric recognized that while finding new customers was important, it was equally important to encourage established customers to increase their use of electricity.[21] This approach was common to all central generating stations.[22] Murrin committed B.C. Electric to promoting the sale and use of electric appliances and asked local electrical contractors and retailers to cooperate with the central generating station in an

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[20] "Electrical Men Leave for Seattle Meeting," Vancouver Province, 19 April 1921: 22.

[21] There are several American studies of campaigns by central generating stations to develop demand for electricity. See, James C. Williams, Energy and the Making of Modern California (Akron, Ohio: University of Akron Press, 1997); John S. McCormick, "The Beginning of Modern Electric Power Service in Utah, 1912-22," Utah Historical Quarterly 56.1 (1988) 4-22; Platt, The Electric City; and Rose, Cities of Light and Heat.

[22] For example see S.M. Kennedy, "The Man in the Street," BCEEM 2.12 (1920) 2-6.

advertising campaign that would benefit them all. The delegates also listened to a presentation from Samuel Adams Chase of Westinghouse. According to the local newspaper, Chase stated that any plan "of reconstructing the method of selling electrical merchandising appliances through the co-operation and close alliance between the manufacturer, jobber, central station and contracting dealer, distributing through natural and legitimate channels, would place the electrical industry in a better relation to the trade than ever before."[23] Through their participation in trade shows the disparate parts of the electric industry learned to cooperate to achieve their mutual goal of increasing the use of electricity.[24]

Industry trade journals were also an important tool in focusing the interests of the electric industry. They were especially important for the industry's leading corporations. Trade journals disseminated General Electric and Westinghouse's product news, promotions and sales advice to retailers, contractors and central generating stations. Canada's foremost trade journal was the Electrical Retailer, which began publishing in Toronto in 1925.[25] The journal styled itself as "The Canadian Magazine of Merchandising" and was subscribed to by Canadian electrical retailers, contractors and electricians. Its pages were filled with

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[23] "Problems of Electrical Men," Vancouver Province, 27 May 1919.
[24] The second annual convention was also considered a resounding success. See "Electrical Convention," BCEEM 3.3 (1920) 19; "Vancouver Electric Convention Great Success," BCEEM 3.4 (1920) 12.
[25] Other prominent trade journals were Electrical Merchandising and Canadian Electrical News.

instructional articles on how to market and promote the newest electrical appliances. Trade journals constantly reinforced the need to cooperate, emphasized common goals and explicitly made the connection between production and consumption. In early 1926 the Electrical Retailer published a federal government report on advances in the Canadian hydroelectric industry. The journal explained to its readers the relevance of the report:

> While at first sight it may appear that electrical contractors and electrical merchants are not particularly interested in a hydro-electric development, this phase of the industry is, in reality, the basis of our success. It is worth while being assured that the supply of hydro-electric energy will be kept up to the demand and it is an inspiration to those who sell appliances and equipment that consume electric power to know that large financial companies are backing the industry and are prepared to invest their financial resources in the development of as much power as the country will absorb....[26]

A few months later The Canadian Magazine, one of Canada's popular 'women's' magazines, placed an advertisement in the Electrical Retailer drawing the attention of the journal's subscribers to a recent article published in The Canadian Magazine entitled "The Emancipation of Household Slaves." The article had assured Canadian women that electrical appliances would unburden them of the drudgery of cooking and cleaning. Electrical Retailer readers were informed that "By our policy of telling our readers about modern conveniences we are helping you sell

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[26] "Among Ourselves," Electrical Retailer 2.2 (1926) 33-34.

more electricity. Up-to-date products should be advertised in an up-to-the-minute way: USE The Canadian Magazine."[27]

The collective goals of the electric industry were also expressed through industry associations. One of the first, the National Electric Light Association, was organized in Chicago in 1885. Although it initially included electrical engineers, it was predominantly a commercial association dedicated to promoting the use of electricity.[28] Various other national associations followed, including the Society for Electric Development and the National Electrical Manufacturers Association. Early associations, including the Canadian Electrical Light Association and the Canadian Street Railway Association, were primarily clearinghouses for technical and engineering information. As the influence and interests of the electric industry grew, industry members recognized that they also needed a strong national organization to lobby various levels of government. The Canadian Electrical Association, which was organized in 1891, evolved to fill this role.[29] National associations were augmented by numerous local electric associations which

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[27] Advertisement entitled "Emancipation of Household Slaves," Electrical Retailer 1926 (2.6) 57; W.R. Carr, "The Emancipation of Household Slaves," The Canadian Magazine, 65 (June, 1926) 27, 32-3.
[28] Nye, Electrifying America, 173.
[29] John Negru, The Electric Century: An Illustrated History of Electricity in Canada: The Canadian Electrical Association, 1891-1991 (Montréal: Canadian Electrical Association, 1990) 96; Sperling Diary, Entry for October 1, 1910, UBCSC, BCER Records, Box 30, file 30-B816; Nicholls to Sperling, 7 September, 1910, UBCSC, BCER Records, Box 30, file 30-B816.

proliferated across North America in the 1910s and 1920s. In 1919 the Vancouver Electric Club was founded as a counterpart to the recently formed Toronto Electric Club. The makeup of the local club's executive set a precedent for similar clubs and associations that followed. They were dominated by General Electric and Westinghouse and the local central generating station, B.C. Electric.[30]

The Vancouver Electric Club was soon joined by the British Columbia Electric Co-operative Association. The association was formed by nearly two hundred members of Vancouver's electric industry in the fall of 1920 following another call for cooperation at Vancouver's 1920 Electric Convention. The first association of its kind in Canada, it was modeled on a similar association in California. The B.C. Electric Co-operative Association was led by B.C. Electric and its members included the Western Canada Power Company as well as local electric manufacturers, contractors, jobbers and merchandisers.[31] Its mandate was to improve the public's opinion of central generating stations and to increase the sale of electrical merchandise. Its members believed that "Vancouver was woefully undersold on the electric appliance idea" and that they had a responsibility to 'educate' the public through increased advertising and enhanced

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[30] Dan Anderson, A History of the Vancouver Electric Club, 1919-1979 : The First 60 Cycles (Vancouver: The Vancouver Electric Club, 1979); "Electric Club Holds its Annual Election," Vancouver Province, 12 May 1921, p. 14 and "H. Pim is New Head of the Electric Club," Vancouver Province 12 May 1922, p. 12.

[31] "B.C. Electric Men Plan Co-operation," Vancouver Sun, 22 September 1920: 12 and "Pays Tribute to Electrical Men," Vancouver World, 6 April 1921: 9.

displays of electrical merchandise.[32] The association's motto for 1921 was short on subtlety but effectively captured the organization's *raison d'être*: "Make two appliances work where one worked before."[33]

In 1921 the association changed its name to the Electrical Service League in an attempt to deflect criticism that it was simply a promotional arm of the electric industry.[34] Nonetheless, promoting the use of electricity continued to be its primary concern. The League's offices were in B.C. Electric's Vancouver headquarters and its executive included employees of B.C. Electric, General Electric and Westinghouse. In 1925 the League joined a campaign for greater factory lighting organized by the National Light Association and the Society for Electrical Development. The League mailed out nearly 6,500 circulars with titles such as "Better Factory Lighting Pays," and "Equipping the Home Electrically." Pamphlets were sent to permit takers for new construction, including homes, factories, churches, office buildings, and apartment buildings. The League also targeted master builders and contractors, members of the property owners' association and school boards. Their successes for the year included up-to-date wiring and lighting in schools, apartment buildings, new homes, churches, cafes

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[32] "B.C. Electrical Co-operative Association," BCEEM 3.6 (1920) 5-7.
[33] "Co-operative Association Successfully Launched," BCEEM 3.7 (1920) 3-4.
[34] "The Electrical Service League," Vancouver Province, 10 November 1921: 13.

and new flood lighting for a city park.[35] By 1928 the flood of 'informational' material had increased to nine thousand circulars and a total of forty thousand pieces of 'literature' with a greater emphasis on increased lighting in the city's office buildings.[36]

The promotional efforts of the electric industry, whether through trade shows, magazines, or local and national associations, served its members' specific goals. General Electric and Westinghouse had an interest in the sale of a wide range of electric equipment, from generators to light bulbs to washing machines. National electric equipment manufactures, such as Northern Electric in Canada, were primarily concerned with selling electric appliances and equipment through local retailers. Electricians and construction businesses saw opportunities in adding electric wiring and lighting to new and refurbished homes, offices and factories. While many central generating stations marketed electric appliances it was only a means to an end; their primary goal was to increase the load factor.

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[35] "The Electrical Service League of British Columbia," Electrical Retailer 2.5 (1926) 33-35.

[36] "Electric Service Leagues are Doing a Magnificent Work," Electrical Retailer 1928 (4.5) 48-50; R. Hall, "Modern Business Demands Proper Lighting," BCEEM 11.12 (1929) 5; "Eighth Year of the Electric Service League Reviewed," BCEEM 11.13 (1929) 5-6. The Electrical Service League regularly sent out 'store letters' with titles that included "Light—'The Smile on the Face of Your Store'" and "Good Lighting Turns Lookers into Buyers." See, UBCSC, BCER Records, Box 52, file B1514, "Electrical Service League."

A central generating station's load factor is a calculation of the difference between supply and demand; it measures the actual demand for electricity in comparison to a company's maximum generating capacity. Every central generating station seeks to increase its load factor short of risking an inability to meet demand which would create service failures, often referred to as 'brown outs' or 'black outs'. In the generation of electricity there are two basic sets of costs; one is ongoing fuel and wages and the other is the initial capital costs for generation and transmission. Capital costs are usually the most significant expenditure, especially for hydroelectricity where water may be 'cheap' but dams are not. Furthermore, capital costs are fixed; they remain the same no matter how much electricity is generated. The lower a central generating station's load factor the higher its generating costs and the more expensive its electricity. The higher the load factor the greater the return on capital investment.

Load factor management involves time and space as well as supply and demand. The operations of every hydroelectric company are embedded in and subject to natural time. In simple terms, the more water available the more electricity that can be generated. Water availability varies through the seasons. In the cold interior of British Columbia winter brings snow to the mountains, which the warmer weather of spring and summer melts, filling hydroelectric reservoirs. On the coast the summers are dry and the rains arrive in the fall and continue throughout the winter, filling reservoirs and providing an excess of electric generation capacity. Although hydroelectric companies strive to offset and lessen seasonal differences through the creation of storage reservoirs, their water (fuel) supply is nonetheless subject to natural rhythms.

In addition to the natural time of supply-side management, hydroelectric companies must also consider changing demands for electricity rooted in social and work time. Central generating stations track changes in their load factor throughout the day.[37] While there is a seasonal element to demand (heating and lighting during the winter, cooling and refrigeration during the summer) of more importance are the daily and weekly rhythms of work and rest. For B.C. Electric in the 1920s the early hours of the morning were typically the period of lowest demand. On workdays a sharp increase was experienced between 6 and 8 a.m. when people awoke and prepared for work. Demand dipped during the lunch hour when many machines sat idle, increased again during the afternoon, peaked between four and five p.m. and began to slacken following the supper hour.[38] B.C. Electric had to ensure that it had enough generating capacity to meet demand during the peak load hours when it experienced its greatest demand and highest load factor. During the rest of the day it was saddled with excess generating

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[37] One of the Samuel Insull's innovations was the introduction of the 'demand meter' which allowed for tracking the time of day electricity was consumed by individual customers and two tier pricing. See Platt, The Electric City.
[38] A. Vilstrup, "Set of Load Charts Provide Unique Record," BCEEM 11.2 (1928) 18; "Hills and Valleys of the Power Load," BCEEM 12.8 (1928) 14-15.

capacity. Its goal in promoting the electric industry was not simply to increase the use of electricity, but to increase its use at specific times of the day in order to fill-up the 'valleys' in its load factor chart. Most electric appliances were ideally suited for this purpose because they either used electricity throughout the entire twenty-four hour day (e.g. refrigerators) or used electricity mostly during off-peak periods (e.g. irons, vacuum cleaners).[39] From B.C. Electric's perspective, electrical appliances "were sold to fill up the valleys on the load chart, and incidentally, help Madam Vancouver do her housework easily and quickly."[40]

Promoting Electricity

Most people's first experience with electricity was through electric lighting, part of a system that was both old and new. It was old in the sense that it had been consciously modeled on the well established gas lighting systems that had been developed in the early nineteenth century and by the mid-1850s had been installed in many North American and European cities. Edison developed his electric lighting system in imitation of the gas system, with transmission lines, meter and generating stations substituting for gas lines, meter and retort; for Edison the

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[39] Frank B. Jr. Rae, "Is Electrical Merchandising Making Sufficient Progress?," BCEEM 9.5 (1926) 12.
[40] J. Priestman, "Increase in Appliance Sales Shown in 1924," BCEEM 7.10 (1925) 10-11.

major difference was the replacement of gas lights with electric lights.[41] Electric lighting systems also imitated their gas predecessors in that they introduced new relations between consumers, technology and nature itself. In comparison to the relative autonomy of candles and oil and paraffin lamps, a home or business with gas lighting was inextricably connected to the gas works and the company that controlled it. The adoption of gas lighting entailed a loss of self-sufficiency and independence. Paradoxically, it also introduced a new distance to society's relations with its lighting sources. Candles and oil lamps were knowable, tactile technologies with which users developed confident and intimate relations. Gas lighting was controlled by experts from outside the home, it could be adjusted from a distance and its unprecedented brightness meant that it could not be looked at directly.[42]

During B.C. Electric's early years increasing the company's load factor and leveling out the valleys meant selling more lighting. Electric lighting was new, expensive and considered a luxury, even by the most well-heeled urban family. B.C. Electric allowed families to avoid the cost of purchasing light fixtures by

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[41] G. Basalla, The Evolution of Technology (Cambridge: Cambridge University Press, 1988) 46-49 and Wolfgang Schivelbusch, Disenchanted Night: The Industrialisation of Light in the Nineteenth Century, trans. Angela Davies (Berkeley: University of California Press, 1988) 64-65.
[42] Schivelbusch, Disenchanted Night, 28 and 44.

installing fixtures and maintaining ownership of them.[43] While central generating stations appreciated the added electric load, especially since it occurred mainly in the relatively slow evening hours, it was obvious that electric lighting was not the answer to their load factor problems. Most customers had the regrettable habit (at least in the opinion of central generating stations) of turning their lights off when they left a room. Furthermore, electric lights did little to build the electric load during the daylight hours. Central generating stations soon recognized that the emerging electrical appliance market represented far greater and more lucrative potential for increasing load factors.

The introduction of electric appliances into the home represented an energy transition. Homes which had relied on wood, coal and human power were gradually integrated into the growing network of the electric energy regime. Older energy sources were replaced with electrical energy.[44] The transition was gradual. It relied on earlier technologies and required the refinement and adaptation of electrical technology. The most important technological development was the alternating-current electric motor developed by Nicola Tesla in the 1880s and later manufactured and marketed by Westinghouse. The alternating-current electric motor was small, efficient, silent, required little maintenance and proved to be "the

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[43] British Columbia Railway Co., "Circular Letter," 1897, BCA, NWP 621.326 B862.
[44] Cowan, More Work for Mother.

most adaptable of prime movers. It meant to the mechanization of the household what the invention of the wheel meant to moving loads. It set everything rolling."[45] A major advantage of the electric motor was that it could be simply added to already established and accepted household technology—to the foot treadles of a sewing machine or the hand crank of a washing machine—an invaluable asset in overcoming resistance to new and alien devices.[46] The first popular electric appliance was the electric fan, an obvious and simple machine which began to find its way into in urban homes, offices and factories in the 1880s. The electric fan was soon followed by the electric sewing machine, first displayed at the Paris Exhibition of 1881, and the electric washing machine. The popular Thor model of washing machine was introduced in 1907 and heavily marketed to central generating stations.[47] Although the earliest electric sewing machines simply substituted electric energy for human energy, they were soon re-engineered as unique electrical appliances and extensively marketed by the Singer

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[45] Siegfried Giedion, Mechanization Takes Command (New York: Oxford University Press, 1948) 556.
[46] Cowan, More Work for Mother, 93. Central generating stations sold alternating-current electric motors for customers to attach to their old, pre-electric household tools. For example in 1916 B.C. Electric advertised electric motors suitable for attaching to old or new sewing machines; BCER Newspaper Advertisement, November 1915, UBCSC, BCE Newspaper Clippings, Reel #38.
[47] Fred E.H. Schroeder, "More 'Small Things Forgotten': Domestic Electrical Plugs and Receptacles, 1881-1931," Technology and Culture 27.3 (1986) 525-43; David P. Handlin, The American Home: Architecture and Society, 1815-1915 (Boston: Little, Brown and Company, 1979) 421.

Sewing Machine Company. They illustrated the role electrical appliances played in creating a new relationship between the home and the factory. It was one of the first popular household machines which could not be manufactured within the home. It had to be bought from an electric appliance retailer or manufacturer.[48]

The second major technological advancement was the electric resistance coil which allowed the application of electricity to heat-generating appliances. This development was particularly welcomed by central generating stations because the use of electricity to generate heat required far more electricity than alternating-current motors. The electric resistance coil led to the development of the electric iron, one of the most popular early electric appliances. Manufacturers had been trying to find a replacement for cumbersome 'sad irons' since the mid-nineteenth century. Not only were sad irons heavy, but they also required a hot stove to heat them, which was particularly unwelcome during summer months. In the 1850s steam and gas irons were developed, but proved impractical. Electric irons were introduced shortly after the turn of the century. When Westinghouse began manufacturing and marketing them in 1909 it promised that they would relieve housewives of overheated kitchens and laundry rooms.[49]

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[48] David O. Whitten, The Emergence of Giant Enterprise, 1860-1914 : American Commercial Enterprise and Extractive Industries (Westport, Conn.: Greenwood Press, 1983) 79.
[49] Schroeder, "More 'Small Things Forgotten'," and Giedion, Mechanization Takes Command, 571-76.

The electric iron was an instant success. Because they were such an obvious improvement and because they helped to spread out the electric load over the day, electric irons became the first major electric appliance promotion for most central generating stations.[50] Samuel Insull's Commonwealth Edison Company ran a hugely successful electric iron promotion in 1908 in Chicago when it offered ten thousand irons on a free trial basis.[51] Insull was the North American leader in refining and developing methods to address the dual problems of supply and demand. Beginning in 1898 he began to preach his 'gospel of consumption' which he promised would lead to greater consumption and lower prices for electricity and electrical appliances.[52] The popularity of the electric iron also awakened B.C. Electric to the potential for electric appliances to increase its load factor. Shortly after Insull's successful electric iron campaign in Chicago, B.C. Electric ran a similar campaign in Vancouver. As a member of B.C. Electric's promotional department later remarked,

> Our company was one of the first to appreciate the advantage of the use of these in the home from a revenue-producing point of view, especially as

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[50] For an example a central generating station's early electrical appliance promotions see John S. McCormick, "The Beginning of Modern Electric Power Service in Utah, 1912-22," Utah Historical Quarterly 56.1 (1988) 4-22.
[51] Platt, The Electric City, 154-55.
[52] Harold L. Platt, "City Lights: The Electrification of the Chicago Region, 1880-1930," Technology and the Rise of the Networked City in Europe and America eds. Joel A. Tarr and Gabriel Dupuy (Philadelphia: Temple University Press, 1988) 248-49.

> this would be essentially an 'off peak' load, whilst at the same time a benefit was conferred on the housewife who bought one....[53]

B.C. Electric's promotion "'flooded'" Vancouver with electric irons. The city was divided into sections and salesmen with horses and buggies were dispatched. A new electric iron was left at every house on B.C. Electric's electric system. No initial payment was requested. Housewives were encouraged to use the iron for four days. If they decided to keep it they were charged $1 cash and a further $4 at one dollar a month on their electricity bill. According to B.C. Electric, less then ten percent were returned.[54]

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[53] W.E. Dawson, "Why a Showroom?," BCEEM 6.4 (1923) 4.
[54] In April 1916 B.C. Electric mounted another successful electric iron promotion. See, E.E. Walker, "Merchandising Electrical Appliances," BCEEM 3.8 (1920) 4-7.

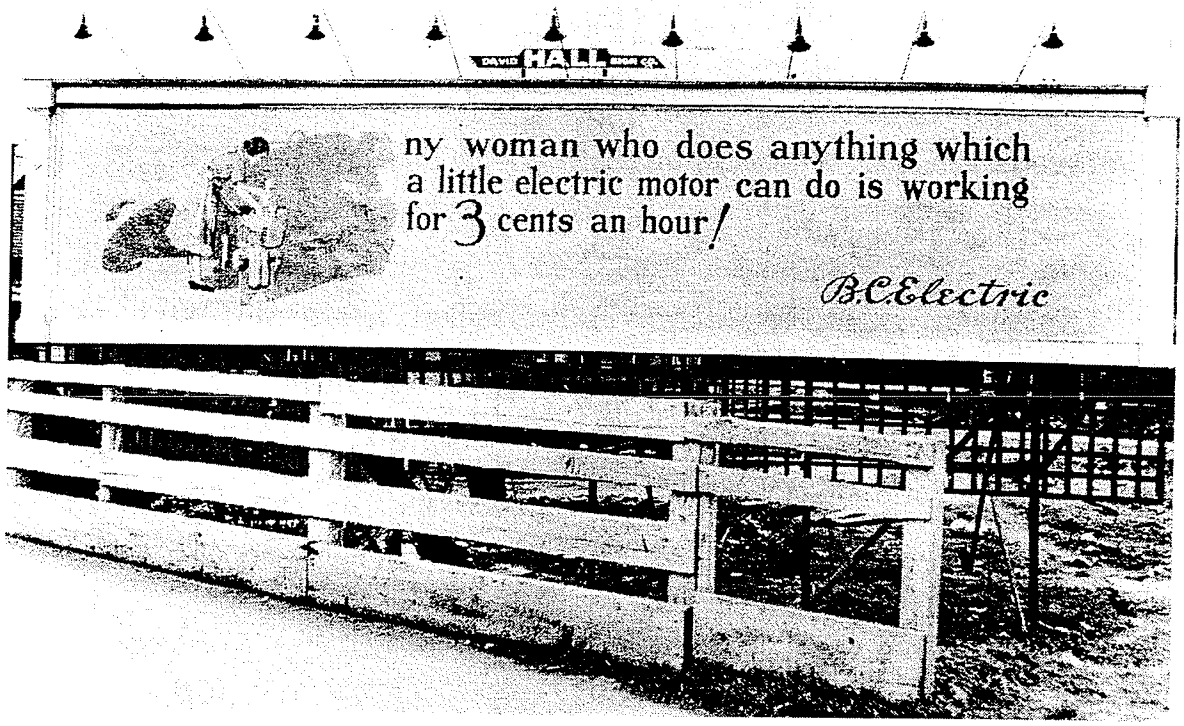

Figure 4.1. B.C. Electric Vancouver area billboard, circa 1928. The 'Any Woman Campaign' was created by General Electric's Bruce Barton in 1926.[55] It ridiculed women who did not use electricity as having strong backs but weak minds.

Source. BC Hydro.

Although B.C. Electric was pleased with its successful promotion of electric irons, housewives did not simply abandon their old 'sad irons'. During the summer months electric irons were a welcome replacement for sad irons and the requisite hot stove. But across Canada and the United States electric irons were often put away during cold winter months in favour of sad irons when a hot stove

[55] Marchand, Creating the Corporate Soul, 157-59.

was welcomed in most homes.[56] Electric irons soon begat electric ironers, which were first directed at the home market in the mid-1920s. They were descendants of industrial ironers used in commercial laundries beginning in the 1880s which had relied on steam heat had and been operated by a system of belts and pulleys.[57] The electric ironer was an example of the electric industry redesigning industrial equipment for home use, part of electricity's role in transforming domestic space into an imitation of industrial space, a space that was mechanized and relied on an external and centralized energy regime.

The electric industry's promotion of various appliances also had potential repercussions on dietary habits. In June 1923 B.C. Electric organized an electric toaster campaign similar to its earlier electric iron campaign. Calculating that each newly installed electric toaster represented an additional three dollars per year in added revenue, B.C. Electric joined forces with a Vancouver bakery to distribute toasters throughout its local market. B.C. Electric placed billboards on the sides of its streetcars and the bakery's delivery-wagon drivers were armed with toasters and instructed to offer them for sale to every household on their route. The slogan for the campaign was simple: "Make Toast Your Breakfast Food."[58] Similar cooperation between B.C. Electric and local retailers and national brands in

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[56] Platt, The Electric City, 240-45.
[57] Giedion, Mechanization Takes Command, 576.
[58] "Electric Toaster Campaign," BCEEM 6.5 (1923) 7.

promoting electrical appliances and accompanying products was widespread. In 1914 and 1915 B.C. Electric participated in "Coffee Week" which entailed the cooperation of local grocers, department stores, and electrical appliance retailers as well as Hotpoint (owned by General Electric), the Nabob coffee company and B.C. Electric in the display, demonstration and sale of electric coffee percolators.[59]

A serious obstacle to the introduction of early electrical appliances, including the iron, toaster and coffee percolator, was the electric industry's slowness in developing a standard and convenient method to connect appliances to the electric network. Electric lighting introduced electric wiring into homes, but it was a wiring system designed for electric lights, not electric appliances. Consequently, the first electric appliances were designed with adaptors that screwed into light sockets. This system created numerous shortcomings including putting the customer in the dark when the light bulb was removed, falls from chairs when removing light bulbs, the twisting of the cord, and possible short circuit or shock if the appliance, such as an electric iron, was dropped. Electric extension cords and wall receptacles partly alleviated these problems and electrical adaptors were sold that allowed irons and lights to be used simultaneously, but it was not until the introduction in 1917 of the now standard electric wall outlet that

[59] BCER Newspaper Advertisement, August 1914 and October 1915, UBCSC, BCER Newspaper Clippings, Reel #38.

electric appliances began to approach an acceptable level of convenience.[60] Central generating stations quickly began promoting the installation of electric outlets, one of their first forays into a growing movement to actively redesign the home for the increased consumption of electricity.[61]

Central generating stations adopted numerous methods to promote the domestic use of electricity. One of the simplest and cheapest was to encourage their employees to engage in conspicuous consumption. Beginning with its promotion of electric lighting, B.C. Electric continually urged its employees to use electricity at home in order to set an example for their neighbours and friends. Before World War I, B.C. Electric employees paid a flat rate of fifty cents per month for un-metered electric lighting in their homes.[62] As part of B.C. Electric's 1921 campaign to increase the use of porch lights in Vancouver, the company instructed its employees to leave their porch lights on at night and to speak to their neighbours about the many benefits of porch lights, including how they "brighten the locality" and discourage burglars. "One lighted porch leads to another. The example of our employees in a thousand homes in our territory will lead to many

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[60] "Utility Topics #1," BCER Newspaper Advertisement, February 1917, UBCSC, BCE Newspaper Clippings, Reel #38; Schroeder, "More 'Small Things Forgotten'," 540. The first outlets were two prong.

[61] See for example, "Electric Outlets in Homes Make for Convenience," Vancouver Sun, 19 December, 1925(?), UBCSC, BCER Newspaper Clippings, Reel #39.

[62] BC Hydro Power Pioneers, Gaslights to Gigawatts: A Human History of BC Hydro and Its Predecessors (Vancouver: Hurricane Press, 1998) 16.

thousands of others lighting up their porches."[63] With its growing emphasis on electrical appliances in the 1920s, B.C. Electric again turned to its employees to lead the way. "The use of electric appliances, like charity, should begin at home."[64] In 1923 B.C. Electric asked its employees to complete a detailed questionnaire on the extent of their domestic electricity usage. Points were awarded for various electric appliances, numbers of outlets, lights and other electric equipment. If the employee's total score was high enough, he or she became an official member of the 'Electrify Club'.[65]

The ostentatious use of electricity and electric appliances by company employees was a cheap form of advertising, but central generating stations realized that professional and elaborate sales techniques were required to thoroughly integrate homes into the electric network. B.C. Electric, perhaps more than most central generating stations, had also to address an extremely poor public image fostered by its monopoly and what many considered excessive rates. In 1911 the company established a publicity department, headquartered in Vancouver, under the direction of a former newspaper man.[66] The publicity department assumed responsibility for company advertising and also endeavoured

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[63] "A Porch Light at Night," BCEEM 3.12 (1921) 8.
[64] "Electric Appliance Use Should Begin at Home," BCEEM 3.4 (1920) 17.
[65] "Are You a Member of the Electrify Club?," BCEEM 6.6 (1923) 8-9.
[66] no title, Victoria Colonist, 14 June 1911, UBCSC, BCER Newspaper Scrapbooks, 1909-1911.

to place editorial content in local newspapers as well as Canadian, American and British trade journals. By 1928 it was sending out monthly 'news bulletins' and photographs to approximately fifty daily and weekly local newspapers. The department estimated that in one week alone 121 of its stories had been published by local newspapers. The stories (seemingly written by the newspaper's staff) and photographs often notified the public of good fishing and hunting locations or extolled the beauty of local parks or scenic locations. B.C. Electric viewed them as an effective method for increasing traffic on its streetcar lines.[67]

Cooperation throughout the electric industry was at the core of many advertising and promotional efforts. In 1917 members of the electric industry in California organized the California Electrical Cooperative campaign which sought to coordinate promotions and relieve tension and competition between central generating stations and electric retailers and contractors.[68] B.C. Electric monitored the California campaign's success and advocated similar cooperative campaigns in Canada, especially because they served to rehabilitate the reputation of central generating stations. Optimistic reports on the state and future of the electric industry were written for newspapers and popular magazines and published to coincide with the advertising campaigns of electric manufacturers and central

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[67] "Some Publicity Department Duties Explained," BCEEM 11.3 (1928) 3-5.
[68] Williams, Energy and the Making of Modern California, 211.

generating stations.[69] National and local advertising campaigns were fully integrated. Manufacturers including General Electric and Westinghouse coordinated their sales campaigns with local electric industry associations and central generating stations, often supplying the latter with complete newspaper advertisements with space left for the insertion of the central generating station's name, logo and address. Advertisements in popular magazines such as Saturday Evening Post, Collier's Weekly, The Canadian Magazine and Chatelaine coincided with local newspaper advertisements, direct mailings, billboards and visits from B.C. Electric's door-to-door salesmen. For B.C. Electric the goal was to increase the use of "load-building appliances" which served to ensure that "transformers are kept busy and the money invested in equipment is earning a greater return."[70]

During the early years of the development of the electric appliance market in North America the electric industry recognized that advertising, whether in newspapers, popular magazines, on billboards or the sides of streetcars was insufficient to introduce properly the new technology. Central generating stations decided they needed a sales staff of door-to-door salesmen trained to promote the

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[69] J. Priestman, "The Period of Suspicion," BCEEM 3.4 (1920) 11-12. See also electric industry 'news' items written by the Society for Electrical Development and offered to electric retailers for insertion into local newspapers; "Co-operative Christmas Material," Electrical Retailer 2.11 (1926) 46.
[70] "Increased Load Obtained Through Sale of Electric Appliances," BCEEM 9.3 (1926) 14.

'gospel of consumption.' Southern California Edison dispatched its first salesmen in 1907 and Insull had created a similar group of employees by 1909.[71] B.C. Electric soon followed suit. By 1920 B.C. Electric had six door-to-door salesmen in Vancouver promoting lights as well as electric appliances.[72] B.C. Electric salesmen often specialized in specific electric appliances. When they visited Vancouver homes they took careful note of the level of usage of electricity including the specific type of lights and electric appliances present. Records for each home were maintained by the company's sales department and helped it target the promotion of specific items.[73] By 1927 B.C. Electric door-to-door sales staff had increased to thirty-five.[74]

B.C. Electric presented its efforts to increase the use of electric appliances as a public service intended to modernize homes and ease the domestic burden of the average housewife. In 1917 it established a Home Service Department which soon began distributing two regular publications aimed at housewives in Vancouver and Victoria, Utility Topics and Home Service News.[75] The Home

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[71] Williams, Energy and the Making of Modern California, 207-08; Gregory B. Field, "'Electricity for All': The Electric Home and Farm Authority and the Politics of Mass Consumption, 1932-1935." Business History Review 64 (1990) 32-60.

[72] "Vancouver Sales Department," BCEEM 3.6 (1920) 24-25.

[73] E.E. Walker, "Merchandising Electrical Appliances," BCEEM 3.8 (1920) 4-7.

[74] J. Priestman, "Electrical Servants are in Demand," BCEEM 9.12 (1927) 9-10.

[75] Utility Topics, first published in 1925, also served B.C. Electric's gas customers; BC Hydro Pioneers, 32-33 and "Company Issues New Magazine,"

Service Department promoted a wide assortment of electric appliances for the home but its greatest effort was aimed at the introduction of electric cooking. The prospects of thousands of households preparing their meals with electricity appealed to B.C. Electric. Not only did the electric generation of heat require large amounts of electricity but electric cooking would occur throughout the day and serve to increase B.C. Electric's load factor. B.C. Electric and the rest of the electric industry portrayed electric cooking as the apotheosis of modernity. A series of articles distributed by the Women's Public Information Committee of the National Electric Light Association in 1922 captured the electric industry's standard arguments for electric cooking; it was progressive, liberating, clean, efficient and economical.[76]

The electric industry had been fascinated with the promise of 'electric cooking' from its beginnings. Initially the focus was on small cooking appliances. In 1887 a Canadian inventor connected a battery to a sauce pan to produce one of the earliest electric meals. Electric cooking displays (featuring electric grills, toasters, heating plates, percolators, samovars, egg cookers, waffle irons and

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BCEEM 7.2 (1925) 15. In 1931 B.C. Electric also began broadcasting "Homemakers," an hour-long radio program to promote its products; see Cecil Maiden, Lighted Journey: The Story of B.C. Electric (Vancouver: British Columbia Electric Company Ltd., 1948) 127.

76 "Cooking the Electric Way," BCEEM 5.6 (1922) 6-8.

chafing dishes) soon became a staple of major technological exhibitions.[77] The possibility of a complete meal prepared with electricity proved especially intriguing. In 1891 the Franklin Experimental Club demonstrated its position among the technological avant-garde by having its annual dinner cooked entirely with electrical energy.[78] Similarly, in 1920 the Vancouver Electric Club held an 'electric lunch' with electricity used to prepare every dish. "Even the milk will be taken from cows by electric milkers, separated by an electric device, and will be brought to the city over B.C. Electric lines."[79] Small electric appliances introduced the possibility of 'electric meals' but for central generating stations the ultimate goal was an electric stove in every home. Convincing housewives to 'cook electrically' proved to be a serious challenge. Not only did it represent a dramatically new method of food preparation, but electricity was relatively expensive and early electric stoves were costly and unreliable.[80] In addition,

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[77] Giedion, Mechanization Takes Command, 542-44; Platt, The Electric City, 109; Susan Strasser, Never Done: A History of American Housework (New York: Pantheon, 1982) 72-73.
[78] Nye, Electrifying America, 159.
[79] "Dine on Kilowatts, Volts and Amperes," Vancouver Sun, 26 November, 1920.
[80] In 1923 B.C. Electric sold a typical Westinghouse for $160-$170 and charged an additional $60-$65 for wiring; J. Priestman, "How an Electric Range is Sold," BCEEM (1923).2) 6-7

traditional cooking utensils, pots and pans were not designed for electric stoves and their inefficiency increased the cost of electric cooking.[81]

To overcome opposition the electric industry drew on the experiences of the domestic gas industry which had encountered similar resistance to gas stoves, first introduced in the 1850s. The gas industry had responded by holding gas cooking demonstrations to promote its product and teach housewives how to cook safely and efficiently with gas. Many electric companies, including B.C. Electric, supplied both electricity and gas to their local markets. It was a simple matter for them to adapt these established sales techniques to the promotion of electric stoves. The electric industry refined and elaborated on earlier gas cooking demonstrations by allying itself with the growing 'domestic science' movement. The result was the proliferation of electric cooking schools across North America.

North American cooking schools, long the bastion of urban reformers and those concerned with the 'servant problem', had existed since the 1870s.[82] The electric industry co-opted the schools and melded them with the 'gospel of efficiency' and the 'gospel of consumption' to create a market for electric stoves. In May 1926 Canada's first free cooking school was held in the large ballroom of

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[81] Carolyn M. Goldstein, "Part of the Package: Home Economists in the Consumer Products Industries, 1920-1940," eds. Sarah Stage and Virginia B. Vincenti, Rethinking Home Economics: Women and the History of a Profession (Ithaca: Cornell University Press, 1997) 273-4.
[82] Strasser, Never Done, 204.

the Hotel Vancouver. It was sponsored by B.C. Electric, Westinghouse and the Vancouver Sun newspaper. Miss A.M. Reed, B.C. Electric's cooking expert, conducted lessons in domestic cooking on Westinghouse ranges and demonstrated the new Servel electric refrigerators before crowds of thousands. Special sessions were held for students in Vancouver's domestic science classes and for single working women. Attendance prizes included a Westinghouse Range, a Thor washing-machine, a Royal electric vacuum-cleaner and a Thor electric ironer.[83] The cooking school was a resounding success. It filled to capacity during each two-hour afternoon session and drew approximately 10,500 in total. B.C. Electric used the door-prize entry forms—the prize was a Westinghouse electric stove—to create a direct marketing campaign for a special sale of Westinghouse stoves which was augmented by newspaper advertisements.[84]

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[83] "Vancouver Held a Cooking School," Electrical Retailer 2.6 (1926) 33-35; "Cooking School Contests Open to Company Employees," BCEEM 9.2 (1926) 15.

[84] "Cooking School Meets with Remarkable Success," BCEEM 9.3 (1926) 4-6.

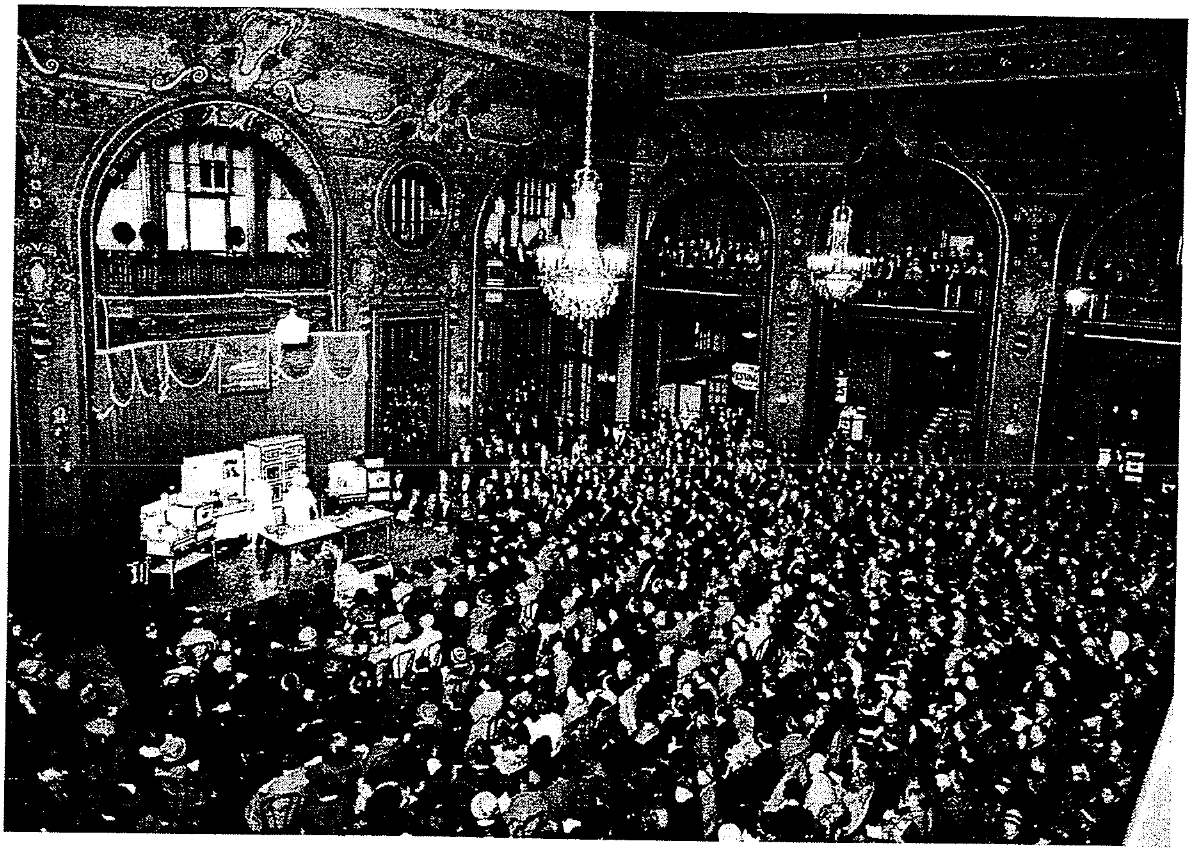

Figure 4.2. Vancouver electric cooking school, 1927.

Source. BC Hydro.

Similar free cooking schools, again sponsored by B.C. Electric, Westinghouse and the Vancouver Sun, were held in Vancouver 1927 and 1928, as well as in surrounding communities.[85] The 1927 Vancouver school was held at the Orpheum Theatre and drew approximately ten thousand people (see Figure 4.2). Electricity's potential for transforming the housewife into a domestic

[85] "Chilliwack Cooking School," BCEEM 10.7 (1927) 6; "The North Vancouver Cooking School," BCEEM 11.4 (1928) 20.

businesswoman was emphasized. "Housekeeping could be as cleancut, as businesslike, as efficient as the most highly developed undertaking downtown...."[86] Proceeds from the sale of the 'electric meals' were donated to the University of British Columbia to help fund a Chair in Domestic Science. Of special interest was the new automatic Westinghouse electric range which allowed a housewife to place a meal in the oven, leave her home to shop and return to a cooked meal.[87] The introduction of the automatic timer was especially welcomed by B.C. Electric. In theory it allowed for the doubling up of electric consumption; while a woman rode the electric streetcar to and from downtown to shop, her electric stove could be cooking the family's dinner.[88] Cooking schools were promoted as public services intended to train women to cook electrically but the electric industry was conscious that it was selling more than stoves, hot plates and refrigerators; it was selling "something intangible, an idea, the idea of electric cooking."[89]

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[86] "No! This is Not a 'Movie' Entertainment," Electrical Retailer 3.6 (1927) 34.
[87] J. Priestman, "Cooking School Again Very Popular," BCEEM 10.3 (1927) 11-12.
[88] "Hills and Valleys of the Power Load," BCEEM 12.8 (1929) 14-15; "1800 Learn Cooking Tips at Sun School," Vancouver Sun, 28 April 1928, p. 22.
[89] "Co-operative Effort Sells Electric Ranges," BCEEM 11.5 (1928) 6-7.

Commercial Space

In the pre-World War II period the electric industry played an important role in the production of commercial space that would explain and encourage the consumption of electricity. It was especially involved in the development of business districts, showrooms and window displays. Electric lighting was promoted for business districts to illuminate streets for safety and also to create a distinct commercial location dedicated to consumption. The result was the creation of space that defined people as consumers. They became the audience for a "disembodied spectacle and an alluring promise of personal transformation."[90]

The electric industry's involvement in the creation of commercial space had begun with its promotion of electric street lighting. Electric lighting faced stiff competition from well established gas lighting systems. The gas lighting business in Victoria had almost a twenty-five year head-start on the electric light industry, since the Victoria Gas Company had incorporated in 1860 and initiated its service in October 1862.[91] Coal gas was supplied for the illumination of the city's businesses and well heeled families. In 1878 Victoria had contemplated adopting electric street lighting during a dispute with the local gas company, but it was not

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[90] Nye, American Technological Sublime, 198.
[91] Patricia Roy, "The Illumination of Victoria: Late Nineteenth-Century Technology and Municipal Enterprise," BC Studies 32 (1976-77) 81.

until 1883 that a contract was signed for a new street arc lighting system. Arc lights were simply too powerful to be placed along streets in the modern manner. They caused a great amount of glare and were too bright to be looked at directly. In response, cities and towns tended to place them on poles from fifty to 150 meters in height, often with only a few or even one light pole lighting an entire town. These light towers were the first example of monumental technological space produced through the development of electricity.[92] Their dominance was short lived and eventually they were supplanted—and dwarfed—by the awe inspiring hydroelectric dams of the twentieth century.

Victoria contracted for high-powered arc lights mounted on three 150 foot poles erected at strategic locations in the city. Victoria city council insisted that the company supply sufficient light to allow for a newspaper to be read at night, a standard of illumination popular throughout North America and Europe during the 1880s. The electricity was generated by a steam engine at the local iron works. There was soon dissatisfaction with the system, in part due to the company's policy of switching-off the lights during a full moon. This policy was common among street lighting companies throughout the nineteenth century. In contrast to modern usage, from its inception in the late seventeenth century street to the

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[92] Schivelbusch refers to the towers as examples of "technical monumentalism" with Paris's "Sun Tower" circa 1885 as the ultimate example; see Disenchanted Night, 127-28.

beginning of the twentieth century street light operation was intertwined with the natural rhythms of the day, the month and the seasons. During the long summer months street lighting was usually restricted to only a few hours per day. With autumn and fewer daylight hours, street light service was lengthened. As in Victoria, during a full moon the service was discontinued. In many cities detailed lighting schedules were developed to correlate service with the movement of the sun and moon. The introduction of gas street lighting did little to alter this relationship. Gas companies were keen to conserve their resources and regularly decreased service when natural lighting was deemed sufficient. Early electric street lighting companies did likewise.[93] Frustrated with unreliable service, Victoria purchased the company in 1885 and expanded the system with three more towers and lights at busy intersections.[94] It soon became apparent that high-powered arc street lights were inefficient in comparison to electric incandescent lights. As a result, in January 1887 the Victoria Electric Illuminating began installing an incandescent street lighting system to replace the arc lights, making Victoria the first city in Canada with such a system.[95] After a debate over gas or electricity, Vancouver became Canada's second city to adopt incandescent street

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[93] For the natural rhythms of early public lighting systems, see Schivelbusch, Disenchanted Night, 90-91.

[94] Roy, "The Illumination of Victoria": 86-88 and BC Hydro Power Pioneers, Gaslights to Gigawatts: A Human History of BC Hydro and Its Predecessors (Vancouver: Hurricane Press, 1998) 10-11.

[95] Roy, "The British Columbia Electric Railway Company," 1.

lights when the Vancouver Illuminating Company's system came into operation in August, 1887.

The adoption of street lighting was complemented by electric signs. By 1914 B.C. Electric was encouraging local merchants to install electric signs in order to promote their goods and services at night. "The only class you can't reach with an electric sign is the blind."[96] While B.C. Electric did not manufacture electric signs, it cooperated with local sign makers to develop a market and it offered its customers the services of an illumination expert, skilled in designing effective signs for all types of businesses. Electric signs were appealing to B.C. Electric because they consumed electricity at night during off-peak hours and so helped to build the company's load factor.[97] The electric sign was complemented by the window display. Independent commercial window displays had begun to appear in Europe in the mid-eighteenth century, but it was not until the mid-nineteenth century that it was possible to produce large sheets of glass which, when combined with electric lighting, produced the modern window display. The electric industry seized on the window displays as an opportunity to promote electricity and electrical appliances and to increase the consumption of electricity during off-peak hours. Lighting and merchandising experts from General Electric

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[96] BCER Newspaper Advertisement, 26 August 1914, UBCSC, BCER Newspaper Clippings, Reel #38.
[97] J. Priestman, "Electric Signs," BCEEM 3.12 (1921) 2-3.

made presentations at trade conventions on the basic design elements of effective window displays while electric trade magazines published how-to articles.[98] The development and adoption of window displays was also promoted through industry competitions, with electric manufacturers offering prizes to retailers who created the best window displays featuring their products.[99]

The popularity of window displays precipitated the emergence of window display experts. One of the first and most influential was L. Frank Baum, best known for The Wonderful Wizard of Oz. In 1897 Baum began publishing a new trade magazine, Show Window, and in 1898 he founded the National Association of Window Trimmers. By 1920 B.C. Electric had its own window display specialist and in 1928 Vancouver hosted the Fifth Annual Pacific Coast Association of Displaymen's Convention.[100] The allure of window displays, especially at night when flooded with electric light, was soon recognized and criticized by those who opposed the new culture of consumerism. According to

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[98] "Electrical Convention," BCEEM 3.3 (1920) 19; "Electrical Men Leave for Seattle Meeting," Vancouver Province, 19 April 1921: 22; R.B. Alexander, "Demonstrating the Value of the Show Window," How I-Did-It 2.2 (October 1917) 11-13; A.E. Edgar, "Magnetize Your Store Windows," Electrical Retailer 1.6 (1925) 32-33; J. A. Hoeveler, "High Cost of Poor Window Lighting," Electrical Retailer 2.6 (1926) 28-30.

[99] "Manufacturers' Window-Dressing Competition," Industrial Progress & Commercial Record 1.4 (Sept. 1913) 5; "Granville Street Echoes," BCEEM 4.9 (1921) 21.

[100] "Vancouver Sales Department," BCEEM 3.6 (1920) 24-25; W.E. Parnum, "Displaymen's Annual Convention Held," BCEEM 11.8 (11.1928) 14-15.

their critics, the displays created an insatiable desire for modern goods, what novelist Edna Ferber referred to as the "'a second feast of Tantalus'"[101] Window displays, similar to exhibition displays, also defined and explained new relationships within society and between society and nature. They presented the natural world as a series of new and always improving consumer goods, as desirable commodities, brought to the city and made available by modern corporations.[102]

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[101] William Leach, Land of Desire: Merchants, Power, and the Rise of a New American Culture (New York: Pantheon Books, 1993) 40.
[102] Keith Walden, "Speaking Modern: Language, Culture, and Hegemony in Grocery Window Displays, 1887-1920," Canadian Historical Review 70.3 (1989) 302-03.

Figure 4.3: B.C. Electric and Vancouver Gas Window Display, circa 1920.

Source: B.C. Hydro.

Domestic Space

The creation of a public commercial space of consumption was complemented by the transformation of space within buildings. The promotion of the consumption of electricity affected buildings in two basic ways. First, they had to be redesigned to accommodate electric equipment and electricity's infrastructure. Electrical appliances required electrical wiring, fuse boxes and electrical outlets. Second, the adoption of electricity also created the possibility of new designs for building interiors, designs which appeared to exclude the outside natural world while implicitly accepting and reinforcing the rationale of electric space. The effect of electric equipment was often dramatic. The most obvious electric transformation was brought about through the introduction of electric lighting which allowed for windowless buildings, transcended the natural rhythms of day and night, and altered established working and sleeping patterns. By the mid-1890s architects were producing new interior spaces with electric lighting.[103] Electric fans also had immediate effects. In the nineteenth century enclosed buildings, often with over-heated, smoking machines, led to demands for improved ventilation, demands which were partly answered by electric fans outfitted with Tesla's alternating-current electric motors.[104] The electric air-conditioner further enhanced the control of interior environments. First developed on a large-scale for factories, in the late 1940s General Electric began marketing air-conditioning units which could be easily installed in walls and windows and connected to electric outlets. The small self-contained air-conditioner marked the end of the last environmental restraint on temperature and humidity. With air-

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[103] Kern, Culture of Time and Space, 155.

[104] Reyner Banham, The Architecture of the Well-Tempered Environment (Chicago and London: The Architectural Press, London and University of Chicago Press, 1969) 53-54.

conditioning and electric power the structure and form of buildings could be completely divorced from the surrounding environment.[105]

Many of the most influential architectural movements of the twentieth century were inspired, influenced and underpinned by new technologies and new energy sources. In America the pre-eminent proponent of the new architecture was Frank Lloyd Wright. In the early twentieth century most North American architects attempted to disguise the role of new technologies in their buildings by adhering to the accepted fundamentals of space, order and structure. Wright employed new technologies to overthrow the old order. He realized that with new machines and new energy sources, interior space could be transformed and new relations introduced both within buildings and between interiors and exteriors. The use of gas in homes had encouraged designs with many separate rooms, closed-off from each other with doors. Wright utilized electricity and central heating to eliminate doors and to design floor plans that flowed from open space to open space; the result was an "organic architecture" for the middle-class suburban home.[106]

While Wright opened up the interiors of buildings, he worked to close the buildings off from the outside world. Wright's Larkin Building (1906) epitomized

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[105] Banham, Architecture of the Well-Tempered Environment, 187.
[106] James Marston Fitch, Architecture and the Esthetics of Plenty (New York: Columbia University Press, 1961) 129.

the hermetically-sealed office building of the twentieth century with a self-regulated internal environment seemingly unaffected by its surroundings. The suburban homes Wright popularized, which relied on central heating and air-conditioning, perfected the creation of insular, self-contained and self-controlled environments. Paradoxically, while Wright worked to create interior space independent of the natural world, he also created the illusion that barriers between interior space and exterior nature had been dissolved. Wright's use of large sheets of glass appeared to open the hermetically sealed interiors of his homes onto the natural landscape outside. The new relationship between natural and artificial created by the open vistas of Wright's homes was illusory. While Wright sought to bring the internal and external together, he also embraced the technologies which separated them and reconnected them through new relationships. Wright employed new technologies to produce spaces which simultaneously rejected and embraced the natural environment. His buildings also rested on the unstated assumption of a bountiful natural world with inexhaustible and affordable energy sources which could heat and cool buildings without regard for monetary or environmental costs or the increasingly powerful and centralized corporate and political structures required to support them.

Where Wright seized on new technologies and energy sources to transform interior space, other architects went further and trumpeted a completely new way of living. In the 1920s Le Corbusier echoed Mumford's passion and optimism for the machine. He exhorted architects to immerse themselves in modern science and technology in order to fully comprehend the logic and promise of the new machine age. For Le Corbusier the house was to be reconstituted as a "'machine for living.'" Similarly, Walter Gropius recognized the possibility of redesigning buildings to create "'an architecture adapted for our world of machines'...."[107] The transformative qualities of modern energy sources was also acknowledged. The Futurists, led by Paul Scheerbart, confidently predicted that a new culture would emerge from a new architecture founded on new energy sources.[108] More than any others, members of the Gropius-inspired Bauhaus embraced the full possibilities represented by the modern machine to produce the new space and the new relationships of modern capitalism. Members of the Bauhaus not only enlisted modern technology, they emphasized the interchange and creative relationship between the modern factory and the modern home, between spaces for working and spaces for living. They worked to produce space based on the logic of corporate capitalism. Their architecture represented a world of integration,

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[107] Fitch, Architecture and the Esthetics of Plenty, 140-41.
[108] Banahm, Architecture of the Well-Tempered Environment,120-30 and Jeffrey L. Meikle, Twentieth Century Limited: Industrial Design in America, 1925-1939 (Philadelphia: Temple University Press, 1979) 28-32.

domination and oppression; a world of machines, systems, networks, centralization, rationalization, efficiency, spectacle and detached consumption.[109]

While architects assimilated and drew inspiration from new technologies, the electric industry worked to encourage architects to design homes that would facilitate and encourage the consumption of electricity.[110] The industry's appreciation of the role of architecture in creating domestic space conducive to the use of electricity was exemplified by General Electric's sponsorship of "The House of Modern Living" contest in Architectural Forum in 1935. According to the contest's organizers, the architectural challenge was to design a home with the "utmost efficiency in space utilization, in arrangement, in furniture, in equipment, and in mechanical and electrical plant" through the use of "the latest developments in step-saving, labor-saving and time-saving equipment." The winning design would be a "properly planned and equipped home, utilizing to the fullest the contributions of the "'power age'...."[111] The competition's organizers evoked Wright, Gropius and Le Corbusier as the sources of inspiration for the modern, efficient electrical homes they envisaged. Over two thousand entries were submitted for homes of different sizes to house the ideal American suburban

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[109] Henri Lefebvre, The Production of Space trans. Donald Nicholson-Smith. (Oxford: Basil Blackwell, 1991 (1974)) 123-26.
[110] Dolores Hayden, Redesigning the American Dream: The Future of Housing, Work, and Family Life (New York: W.W. Norton, 1984) 104-05.
[111] "Forum of Events," Architectural Forum 62.1 (January, 1935) 18.

family, an engineer husband who cherished efficiency and his wife, educated in home economics, who insisted "'on doing the housework efficiently by using the best labor and time-saving equipment. Electricity is her servant.'"[112] Each winning entry included a list of the General Electric equipment integral to the home's efficient functioning. One of the winners listed thirty-two separate electrical appliances distributed throughout the house, ranging from a toaster, to a stove, to an air conditioner.

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[112] "The House of Modern Living," Architectural Forum 62.4 (April, 1935) 276.

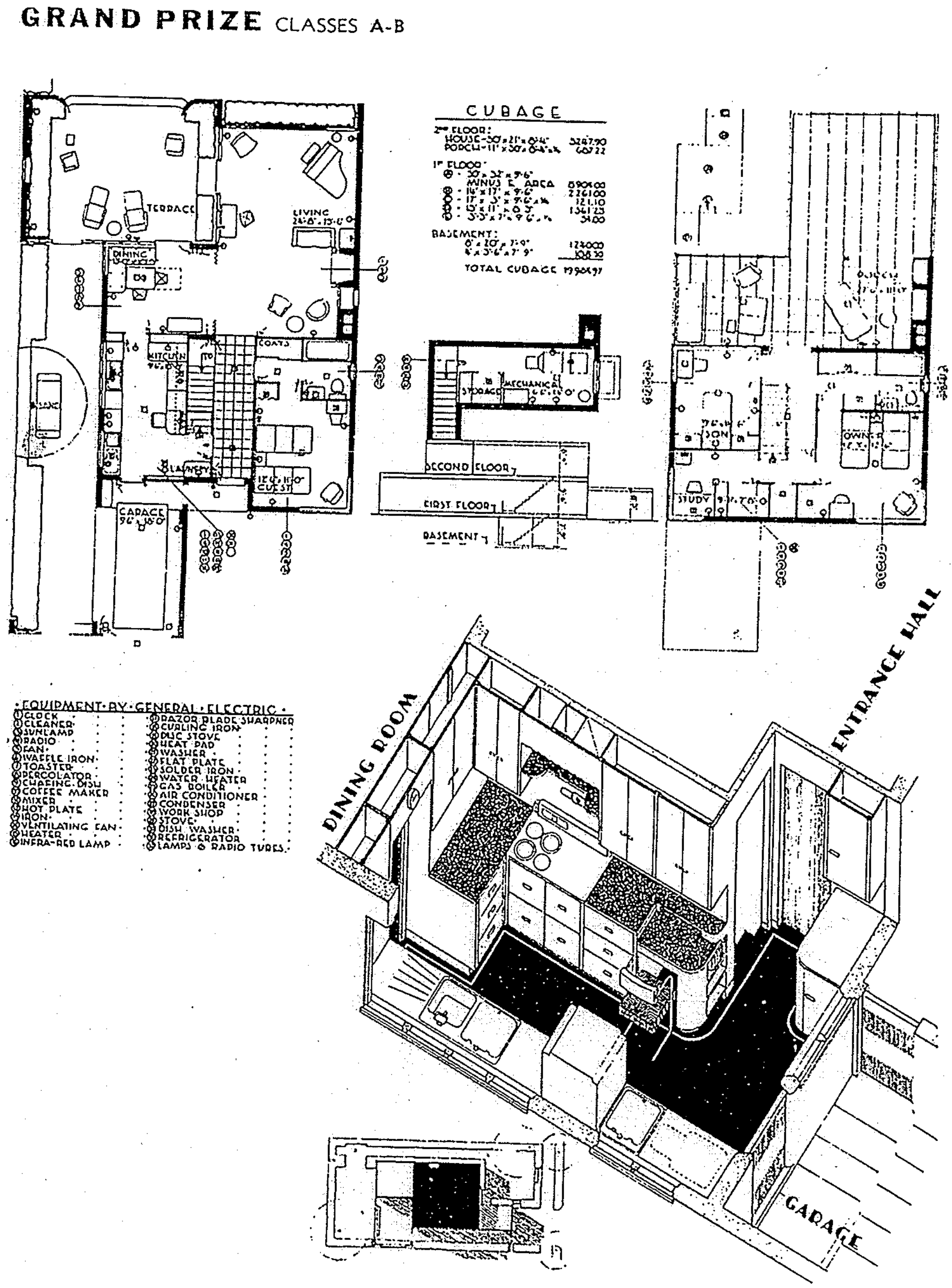

Figure 4.4. Early prize winning design for an 'Electric Home'

Source: Architectural Forum 62.4 (April, 1935): 284.

British Columbia electric industry representatives also worked to encourage architects to design homes that would increase the consumption of electricity.

Beginning with its inaugural meeting in 1920 the British Columbia Electric Service League targeted their promotional and 'educational' efforts at local architects.[113] In 1921 the League and the Vancouver Electric Club joined forces to inform Vancouver architects of the latest possibilities and requirements in designing electrical homes. Through a series of lantern slides, the electric industry representatives demonstrated the right and wrong way to design a house for electric consumption.[114] Well into the 1930s the Electrical Service League continued its efforts to influence building designs by 'educating' architects. In 1931 League members were informed that:

> Progress continues to be made with the architectural profession through the Central Station. The principal members are called on regularly throughout the year, and on each visit, literature and bulletins pertaining to wiring and lighting have been left with them. This contact has resulted in our being called in to check over plans before they are submitted to the owners for approval.[115]

One of the electric industry's most successful efforts to influence home designs was the 'Red Seal Campaign.' The campaign, created by the Electric Service League of Toronto in the early 1920s and promoted across Canada and the United States by the National Society for Electrical Development, was intended to impress on architects and builders the need to include proper electric outlets and

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[113] "B.C. Electrical Co-operative Association," BCEEM 3.6 (1920) 5-7.
[114] "Electrical Men Feast; Talk Shop," Vancouver Sun, 23 June 1921: 3.
[115] "Eleventh Annual Report of the Electrical Service League of British Columbia," 1 January, 1932, UBCSC, BCER Records, Box 52, file B1514.

sufficient electric wiring in their homes.[116] In Vancouver the Red Seal Campaign was implemented by the Electrical Service League, but the bulk of its funding came from B.C. Electric.[117] Local architects and builders were sent information on modern electrical wiring standards which, if met, would result in their building being awarded the Red Seal of approval (see Figure 4.5).[118] Through an agreement with local building inspectors, the Electrical Service League was informed of all those taking building permits for new houses. Permit takers were sent information on the Red Seal standards and were offered advice on wiring standards.[119] Vancouver's Red Seal Campaign began in 1926 and was aimed at modest middle-class home-owners. Instead of rooms with single drop lights and lone electrical outlets, architects and builders were encouraged to build homes with modern wiring, light fixtures, and numerous outlets and electrical switches.[120] In 1927 the League expanded the programme to include apartment buildings under the assumption that renters were future home-owners and should be educated in

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[116] Williams, Energy and the Making of Modern California, 216; "Originator of 'Red Seal Plan' Honored," Electrical Retailer 1.6 (1925) 37; "The 'Red Seal' Plan of House Wiring Has Made History," Electrical Retailer 2.5 (1926) 32.

[117] "Eleventh Annual Report of the Electrical Service League of British Columbia," 1 January, 1932, UBCSC, BCER Records, Box 52, file B1514.

[118] "League Holds Annual Rally," BCEEM 9.2 (1926) 30.

[119] "Red Seal Campaign of Electrical Service League Under Way," BCEEM 9.3 (1926) 8-10; "Electric Service Leagues are Doing a Magnificent Work," Electrical Retailer 4.5 (1928) 48-50.

[120] J. Hart, "Red Seal Wiring Plan for Small Homes," BCEEM 9.10 (1927) 7-9. The initial 1926 campaign led to the certification of 130 Red Seal Homes. By 1927 the total had risen to 414 and to 932 by 1928.

modern electrical standards.[121] The apartments were outfitted with electric ranges, fire-places and, occasionally, refrigerators.[122] By the 1930s the Red Seal Campaign was being promoted at home exhibitions.[123]

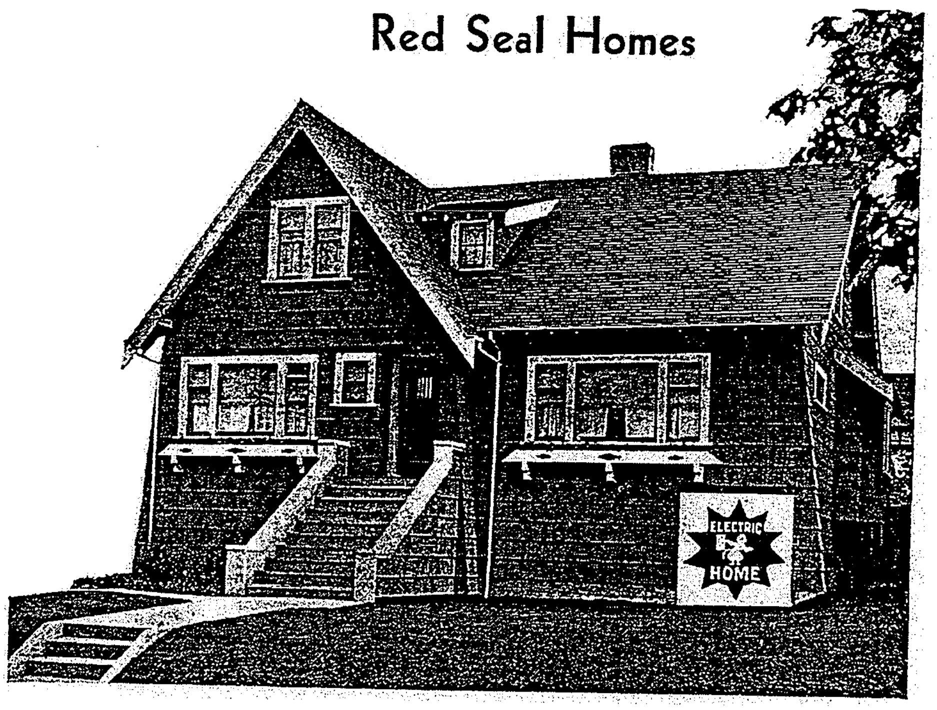

Figure 4.5. Vancouver area Red Seal Home, 1932

Source: BCEEM 15.6 (September, 1932): 11.

While effective, the Red Seal Campaign did not fulfill the electric industry's ultimate goal of demonstrating that electricity was not simply a useful addition to the home, but a new way of living which would completely transform

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[121] J. Hart, "Red Seal Homes in Vancouver," BCEEM 11.11 (1928) 5-6.
[122] "Red Seal Apartment Blocks Arrive," BCEEM 10.12 (1928) 14-16.
[123] Hall to Murrin, 26 February, 1932, UBCSC, BCER Records, Box 52, file B1514.

the home. To fulfill its vision the electric industry presented the public with the "Electrical Home," the ultimate house for modern living. The first demonstration of a complete electric home occurred at the Columbian Exposition in Chicago in 1893 where a model house with a wide-range of electric appliances including a stove, dishwasher, washing-machine, fans and an ironing machine was put on display.[124] The electric industry soon transported the electric home from the exhibition grounds to local city neighbourhoods. Shortly after the turn of the century, Insull introduced the "Electric Cottage" which was on wheels and could be moved to different neighbourhoods. Stationary demonstration electrical homes began appearing in the early 1900s. In the 1920s elaborate electric home campaigns were organized in cities across Canada and the United States.[125]

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[124] Strasser, Never Done,72-73.
[125] Platt, The Electric City 109; Schroeder, 537; Nye, Electrifying America 266.

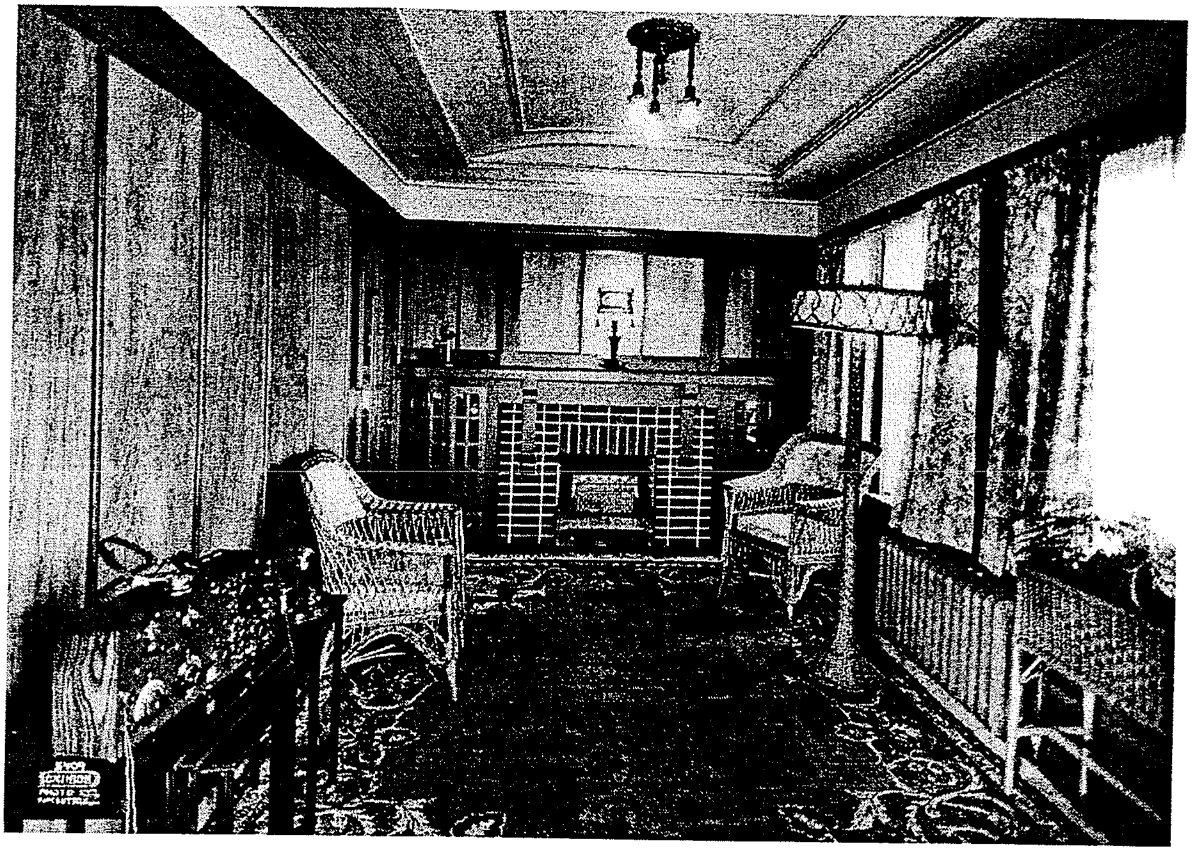

Figure 4.6: Interior of Vancouver's First 'Electric Home', 1922.
Source: B.C. Hydro.

Vancouver's first electrical home was a joint effort of the British Columbia Electrical Co-operative Association and the Vancouver Electric Club with the cooperation of B.C. Electric, General Electric, Westinghouse, Northern Electric, local building contractors, Vancouver's leading architects, and the local Council of Women.[126] It opened to the public in the fall of 1922 and attracted thousands of visitors over a three week period. The house was fitted with a wide range of

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[126] "Electrical Home Dinner," BCEEM 4.5 (1921) 12; "Electrical Home is Unique Exhibition," Vancouver Province, 14 October 1922: 13.

electric appliances, numerous lights, dozens of electric outlets, an electric fireplace, an intercom and radio outlets (see Figure 4.6).[127] The organizers sought to assure the public that while electrically complete, it was also practical and "within reach of anyone building a moderately priced home."[128] The theme of affordable excess was also sounded during promotion of Victoria's first electrical home in 1928. The home was described as being "well within the reach of the average individual."[129] The cost of the dream 'electric home' was an important question for the electric industry. Outfitting a new home with all the modern mechanical devices available could increase the overall cost of the house by as much as 25 percent. In order to accommodate these costs, the size of the average home shrank with overall floor space being sacrificed for new technologies. Single-purpose rooms common to the Victorian homes, including libraries, spare bedrooms and sewing rooms were increasingly absent from modern suburban bungalows. As rooms became smaller their social purposes were transformed. Bedrooms were solely for sleeping, not visiting. Kitchens were increasingly

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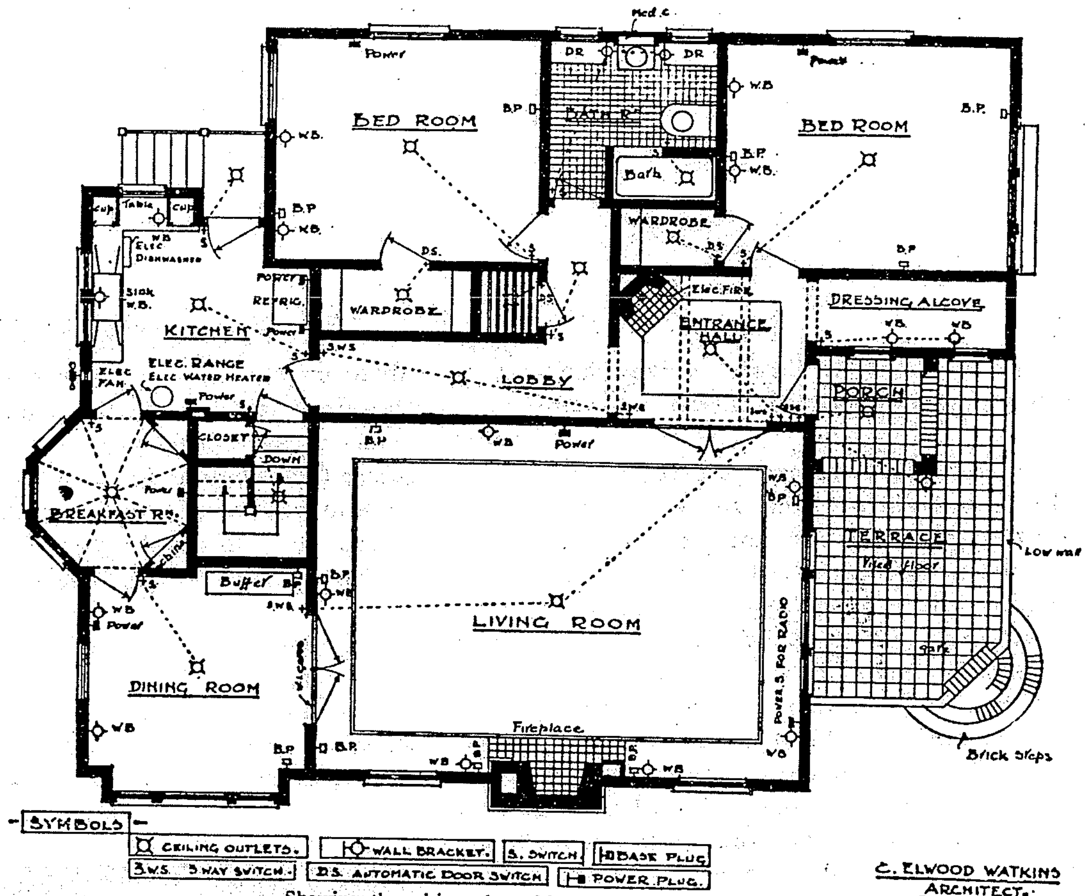
[127] "Model Electric Home is Unique Treat to Public," Vancouver Sun, 4 October 1922: 10.
[128] "Vancouver's Electrical Home," BCEEM 5.5 (1922) 13; "Thousands Visit First Electrical Home," BCEEM 5.8 (1922) 17.
[129] T.R. Myers, "Victoria Exhibits Model Electrical Home," BCEEM 10.12 (1928) 4-7.

efficient spaces of production and consumption, and used less for socializing or raising children.[130]



Showing the wiring plan of Victoria's Model Electric Home

Figure 4.7. Floor plan for Victoria 'Electric Home', 1928.

Source: Electrical Retailer 4.3 (March, 1928) 28.

[130] Nye, Electrifying America, 254-5; Gwendolyn Wright, Building the Dream, a Social History of Housing in America (New York: Pantheon Books, 1981) 171; W. Peter Ward, A History of Domestic Space: Privacy and the Canadian Home (Vancouver: UBC Press, 200) 77.

In designing and promoting new domestic space, the electric industry co-opted, encouraged and adhered to the established goals of domestic science. The electric industry was an ardent supporter of domestic science, often encouraging the establishment of courses in local schools and supporting displays and exhibits.[131] Well before the development of the electric industry, Catherine Beecher had envisioned the ideal domestic space that was later to be supported and encouraged by electricity. In the 1860s Beecher published radically new home designs which emphasized function and rational design. Beecher envisioned centralized services, free-flowing rooms, and specialized equipment and furniture, 'a true machine for living' long before it was extolled by Le Corbusier.[132] Later advocates for modern domestic science seized upon electricity as an instrument of transformation that would fulfill their dreams of a modern, efficient kitchen. At the forefront of this campaign were two influential Americans, Christine Frederick and Mary Pattison. Both Frederick and Pattison sought to marry new machines to a new set of ideals and values which would transform space and relationships within the home. Their spiritual guide was Taylor's The Principles of Scientific Management. For them the factory's 'one best way' was also the home's 'one best way.' In her Principles of Domestic Engineering (with an introduction by Taylor)

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[131] Williams, Energy and the Making of Modern California, 209-10.
[132] Banham, Architecture of the Well-Tempered Environment, 94-95; Fitch, Architecture and the Esthetics of Plenty, 65-81.

Pattison advocated the replacement of domestic servants by modern household machinery—the modern housewife was to become a household manager responsible for efficient and rational production and consumption. Frederick, whose articles first appeared in the Ladies' Home Journal, echoed Pattison's programme and emphasized the role of electrical appliances in transforming the home into a modern factory. Frederick went so far as to study the application of scientific management in modern factories. Her particular emphasis was on scheduling and planning for the most efficient use of time and space. Her study of modern industry led her to adopt the language of electrical engineers. She described the daily household meals as 'peak-load' times which, like the busiest hours of the day for central generating stations, had to be well planned in advance to ensure adequate supply when consumption was at its height.[133] Frederick created designs for 'Taylorized' kitchens, the new 'workshop of the home', which would facilitate the efficient use of space and modern electric appliances.[134] The centre of the domestic factory was the kitchen. Armed with the latest techniques in scientific management, including time and motion studies, as well as modern

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[133] Strasser, Never Done, 214.
[134] Ellen Lupton and J. Abbott Miller, The Bathroom, the Kitchen, and the Aesthetics of Waste (New York: Princeton Architectural Press, 1992) 43-7.

equipment, domestic engineers sought to produce an ideal space for production and consumption.[135]

Conclusion

Electricity did not sell itself. At one level the electric industry's efforts to develop a market for its products was part of what historian E.P. Thompson has termed the "remodeling of 'need,'" one of the most significant consequences of the industrial revolution.[136] The electric industry's influence went beyond simply convincing consumers to use more electricity. "If the advertisement aimed to make consumption of a particular product habitual, it also aimed to make habitual the identification of products with something else, with ideas, feelings, status."[137] This was part of a larger process of social and natural alienation. Consumer space obscured the role and importance of the natural world and thereby alienated people from the natural basis of their energy sources and the environmental and social consequences of the energy regime. The 'remodeling of need' was predicated on the remodeling of space to facilitate, encourage and explain new patterns of production and consumption and new relations within society and between society

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[135] Hobbs and Pierson, "'A Kitchen That Wastes No Steps...'," 25-7; Handlin, The American Home, 416-19; Lupton and Miller, The Bathroom, the Kitchen, and the Aesthetics of Waste, 41-7.
[136] E.P. Thompson, Customs in Common, (New York: The New Press, 1991) 14.
[137] Trachtenberg, The Incorporation of America,135.

and the natural world. In these spaces nature may have been depicted as the servant of the people, but it was controlled by the corporation. Natural resources, including energy, were the products of the corporation brought to the city to satisfy demand. The natural and social history of waterpower was lost.

Chapter 5

Hazardous Space: Hydroelectricity's Real and Perceived Dangers

Introduction

The production and consumption of hydroelectricity created new hazards, both real and perceived, as part of everyday life. The electric industry had a complex and often contradictory interest in these hazards. At one level the real hazards created by electricity posed a threat to the expansion and acceptance of the electric energy regime. At another level they were an opportunity to impose a new set of social and natural relations. The fear of perceived hazards was also an opportunity to extend the authority of the electric industry and combat opposition and competition.

Rural Space

Hydroelectricity is often viewed as a safe form of energy, especially in comparison to nuclear power, oil and coal. This confidence is based on most people's alienation from the dams and reservoirs that are used to generate electricity. Hydroelectric dams are built in rural locations, often hundreds of miles from the cities where most of the electricity is used. It is rural people, often aboriginals, not city dwellers, who are faced with the everyday dangers posed by hydroelectric dams. The dangers are numerous. They range from the obvious, dam failures, to the unexpected, including boats colliding with debris on lakes transformed into reservoirs and people falling through unseasonably thin ice created when reservoirs are drawn down for winter-time electricity generation.[1]

The first hydroelectric developments were modest affairs, but the industry's unique economies of scale soon led it to build larger and larger dams. Bigger dams can store more water, allowing for increased generating capacity. They also flatten out seasonal differences in water flows and thereby increase reliability. In 1908 B.C. Electric decided that its current and projected demands for electricity in the Vancouver area justified redeveloping its Buntzen-Coquitlam facility to generate more power. Its initial development had allowed it to capture only a small portion of the water flow in the Coquitlam River watershed. The dam at the south end of Coquitlam Lake was a modest structure, designed to raise the level of the lake by eleven feet. Excess water simply spilled over the top of the dam and flowed downriver. B.C. Electric planned to capture and store all the water flowing into Coquitlam Lake. With the increased water supply it could add a second

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[1] James B. Waldram As Long as the Rivers Run: Hydroelectric Development and Native Communities in Western Canada (Winnipeg: University of Manitoba Press, 1988) 7.

powerhouse to its Buntzen facility, more than tripling its generating capacity, and ensure an sufficient electricity supply during Vancouver's dry summers.

The expansion plan was opposed on several fronts.[2] The Western Canada Power Company, B.C. Electric's main competitor in the Vancouver area, was investing millions of dollars to develop Stave Falls on the Stave River and did not relish the prospects of B.C. Electric generating more and cheaper electricity. The federal government feared, correctly, that the new dam would destroy the Coquitlam River's salmon run. Local residents opposed the dam for safety reasons. Since 1892 the city of New Westminster had drawn its domestic water supply from Coquitlam Lake. The new dam would increase the area of the lake by approximately fifty percent and flood close to a thousand of acres of forest. New Westminster residents feared that rotting trees would pollute their water supply. Following protests to the provincial and federal governments, B.C. Electric was forced to agree to spend over half a million dollars to clear trees from the reservoir

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[2] Patricia E. Roy, "The British Columbia Electric Railway Company, 1897-1928: A British Company in British Columbia," (Ph.D. University of British Columbia, 1970) 177-8.

before it was allowed to store additional water. This marked the only time in the pre-World War II period that a hydroelectric reservoir was cleared of trees.[3]

Local residents were also sceptical of the planned design for the Coquitlam dam. There are two basic dam designs, structural dams and gravity dams. Structural dams impound water through their structural strength. Early structural dams were built of stones or bricks and, later, reinforced concrete was used. Structural dams must be built on bedrock and are often found in canyons where the weight of the impounded water is deflected to the canyon walls through the dam's convex shape. Hoover Dam on the Colorado River is a prime example. The strength of a gravity dam results solely from its mass. The weight of the material used to build the dam holds back the impounded water. At the site chosen for the new Coquitlam dam a structural dam was impracticable due to the absence of an adequate foundation of bedrock. Consequently, B.C. Electric decided to build Canada's first hydraulic, earth-filled gravity dam. Engineers of the day marvelled at its specifications, but local residents feared that it would fail. The new dam was a hundred feet high, 655 wide at its base, nearly a thousand feet long and contained 550,000 cubic yards of clay, gravel, sand and rocks. It raised the level of

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[3] B.C. Electric's negotiations with the federal government and the City of New Westminister over safety issues evolving out of the building of the Coquitlam Dam are detailed in UBCSC, BCER Records, box 48, files B-147 and B-1418.

Coquitlam Lake by an additional sixty feet and allowed for more than a thirteen fold increase in the amount of impounded water to a maximum of 180,500 acre feet.[4] In the fall of 1912, during construction of the dam, the level of the Coquitlam River suddenly rose by several feet in a few minutes and local residents feared that the dam had failed. They later learned that the flood had been caused by B.C. Electric opening the dam's sluice gates to clear away debris.[5]

This early experience with sudden high water exemplified one of the dangers associated with hydroelectric dams that is rarely considered by people who do not live near them. The electric industry promotes hydroelectric dams as being multi-purpose, as serving to generate electricity and prevent dangerous and destructive flooding. In this way a perceived natural hazard becomes a justification for building dams, storing water and generating electricity. But flood control and hydroelectric generation are contradictory purposes. The first demands the maintenance of low reservoir levels in order to provide space to capture high water flows, especially those created by an unexpected rainfall or a spring freshet. The latter requires a sufficient and reliable water supply to generate electricity when it is demanded. The amount of water that enters a reservoir is determined by rainfall,

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[4] G.R.G. Conway, "Coquitlam-Buntzen Hydro-Electric Development, British Columbia" Water Resources Paper No. 13 (Ottawa: Department of the Interior, Dominion Water Power Branch, 1915) 1-45.
[5] "River in Old Time Flood," Coquitlam Star, 30 October 1912.

snow pack depth and temperature. From the very beginnings of the electric industry considerable resources have been spent, first by private capital and later by the state, on quantifying these variables in an attempt to calculate the available quantity of water and to predict when it would be available. This is not an exact science. Despite all the rhetoric of dominating nature through technology, the reality is that the hydroelectric industry is embedded in a natural system that is often unpredictable. This fact is exemplified when an unexpected rainfall or period of warm weather leads to a sudden and unexpected rise in a reservoir's water level. The choice then is simple: either run the risk of a dam failure or release water through the spillway. Both choices pose significant danger for rural people living, working, fishing or playing downstream.[6] When the Western Canada Power Company was faced with an unexpectedly high water flow into Stave Lake in January 1921 it was forced to release a large amount of water through the spillway at the Stave Falls dam. The sudden rush of water washed away logging booms below the dam. The logging company sued, claiming "that water was stored above this dam in such quantities as to be of common danger to the

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[6] E. Goldsmith and N. Hildyard, The Social and Environmental Effects of Large Dams (Cornwall, England: Wadebridge Ecological Center, 1984) 119-133 and Patrick McCully, Silenced Rivers: The Ecology and Politics of Large Dams (London: Zed Books, 1996) 146-148.

community."[7] In 1925 another law suit was launched. A father and his sixteen year-old son had been fishing on the Stave River, three miles below the dam, when they were suddenly swept away by a wall of water. The boy drowned and the father sued for damages.[8] Accidents such as these represented a new discipline that was imposed by the electric industry on time, space and rural people. People who lived near a hydroelectric dam were forced to accept that what had once been a lake was now a hydroelectric reservoir, what was once a river was now the extension of a spillway. These new hazards were based on the transformation of natural rhythms. Local people had learned the seasonal fluctuations in a river's flow. They knew at what time of year a river ran high and fast and was dangerous. A river dammed for hydroelectric generation did not conform to these natural rhythms. Not only were there sudden releases of excess water but the normal operation of the generators also posed unexpected dangers.

The flow of a river dammed for hydroelectric power is linked to the demand for electricity. As the demand fluctuates throughout the day so does the amount of water required to generate power and therefore so does the water level on the river below the dam. From midnight to dawn the demand is low and the

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[7] "Logging Company Sues for Loss of Timber," Vancouver Sun, 18 November 1921: 2.
[8] "Stave Killed Boy; Claim is Settled," Vancouver Province, 19 November 1925: 11.

river will run at a low level. When people in the city wake, make their breakfasts and head for work the demand suddenly increases and so does the water flow on the river. Another peak in demand and in the river's flow occurs at supper time, after which both begin to recede. Local residents had to learn the river's new rhythms. Instead of a fairly constant flow over a twenty-four hour period, they had to be ready to cope with a sudden change in water level. This was especially true for hydro-electric 'peaking plants', such as the Ruskin dam, that were operated to meet peak loads throughout the day. Hydroelectric dams are well suited for this task because unlike steam plants, they can be thrown into operation in a matter of seconds. For most of the day peaking plants generate little or no electricity. The river below them is reduced to pools of stagnant water where people can walk and children can play. When thousands of city residents begin boiling water for their morning coffee demand for electricity peaks and water is suddenly released through the turbines: what was a dry river bed turns into a roaring river.[9] The electric industry's solution to this new hazard was to discipline local residents. Fences were built to keep people away from the river and signs were posted along the river banks below dams, warning people of "sudden floods" (see Figure 5.1).

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[9] T. E. Langford, Electricity Generation and the Ecology of Natural Waters (Liverpool: Liverpool University Press, 1983) 25-26.

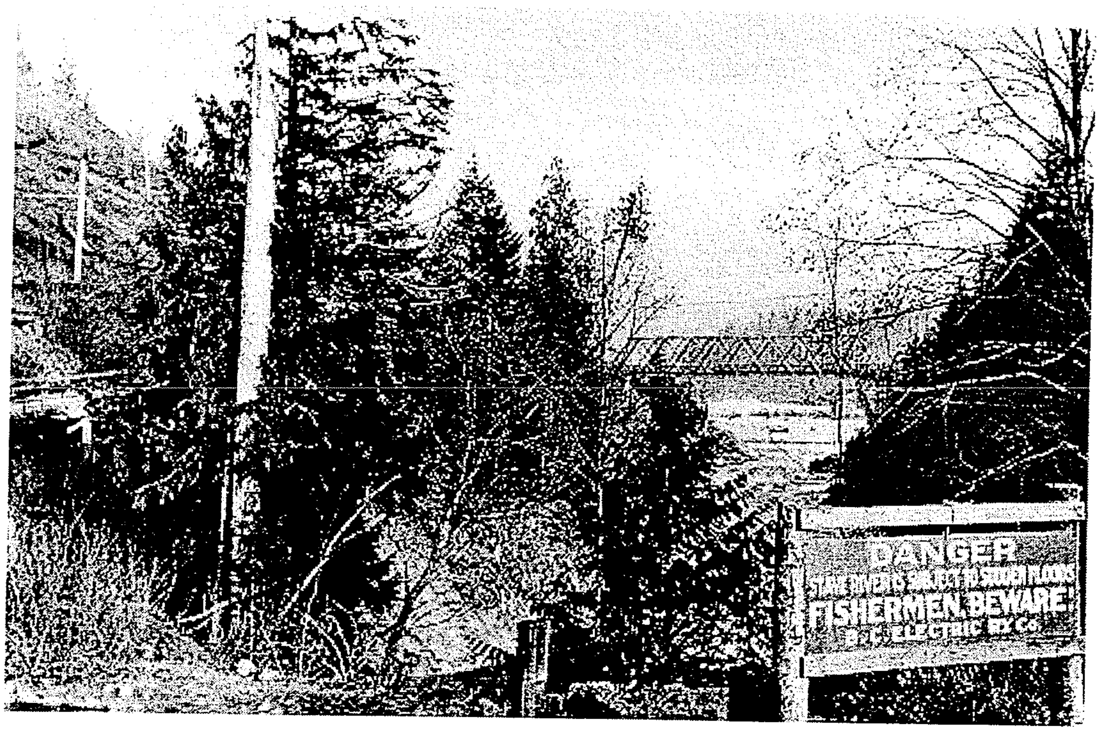

Figure 5.1. Sign warning fishermen of the dangers of fishing below the Stave Falls dam, 1928.

Source: BC Hydro, #B1060/3.

Interior Space

City residents did not have to cope with the new dangers created by hydroelectric dams but the electric industry created a different set of real and perceived hazards for them. Inside buildings the most obvious dangers were from fires and accidental electrocutions. Existing buildings had to be wired to utilize electricity. During the electric industry's early years both the materials and the trade skills for electric wiring were in their infancy. Consequently, newly wired buildings were susceptible to fires caused by crossed wires, poor insulators and exploding fuses.[10] Even when the cause of a fire was not directly attributable to faulty wiring, the presence of 'live' wires presented a new element of danger for both fire-fighters and bystanders.

In October 1910 Victoria experienced its worst fire to date. Starting in the David Spencer department store the fire ultimately consumed an entire city block. The local newspaper reported that the "flare of live wires as masonry and timbers fell gave sufficient warning to spectators to the danger of venturing too close to the lines."[11] The David Spencer fire also exemplified how electricity produced new hazardous space through its effect on architecture. Electricity supplied the motive power for elevators which were critical for taller buildings, especially spectacular new skyscrapers.[12] The David Spencer department store fire began in the men's department and "leaping up the elevator shaft spread rapidly through the top storey and burning downwards soon enveloped the entire Spencer building in a

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[10] "Fusion of Wires Apparently Causes Fire," New Westminster News, 24 August, 1911; "Crossed Wires Start Fire," Victoria Colonist, 22 March 1914.
[11] "Flames Sweep City's Business Section," Victoria Colonist, 27 October 1910.
[12] Reyner Banham, The Architecture of the Well-Tempered Environment (Chicago and London: The Architectural Press, London and University of Chicago Press, 1969) 72; John Ely Burchard and Albert Bush Brown, The Architecture of America 2nd ed (London, 1967) 156-157.

mass of flames."[13] The elevator shaft had acted as a large chimney, quickly spreading the fire throughout the building.[14]

Spectacular fires attributed to electricity heightened the public's reluctance to adopt the new energy source. Promoters of the electric industry relied on denial, education and electric millenarianism to combat these fears.[15] When the newly formed B.C. Electrical Co-operative Association began to plan its first Electric Show in 1920, Vancouver City Council expressed concerns that the combination of a large amount of electric current and the flimsy temporary exhibition stalls would lead to a conflagration.[16] The association, represented by management from B.C. Electric, scoffed at the suggestion that the organizers would tolerate the slightest hint of danger and noted that electricity was blamed far too often for fires for which it was not responsible.[17] As promised, the booths of the first Electric Show failed to ignite, but when rumours of electric fires persisted in later years the

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13 "Flames Sweep City's Business Section."

14 For a similar description of stairwells acting as chimneys in Los Angeles tenement fires see Mike Davis, The Ecology of Fear: Los Angeles and the Imagination of Disaster (New York: Metropolitan Books, 1998) 112-22. Elevators were dangerous in themselves and the proper safe method for stepping in and out of them became a subject for safety instruction programs. See "Safety Doctrine Will be Preached," Seattle Times, 4 April 1921.

15 Adrian Forty, Objects of Desire: Design and Society since 1750 (London: Thames and Hudson, 1995 (1986)) 189-91.

16 "Fire Risk is Snag for Electric Show," Vancouver Sun, 16 November 1920.

17 "No Fire Risk in Electric Show", Vancouver World, 17 November 1920.

electric industry evoked images of modernity and Greek mythology to dispel the slander.

> The sooner that every man in the electrical industry, in his contact with the public, spreads the information that, properly applied, electricity is the safest, least hazardous, most efficient and most convenient agency for the betterment of humanity, the sooner will the odious shadow of blame for fires be removed from over the head of fair Goddess Electra.[18]

The possible danger of faulty electric wiring followed the course of many electric hazards; what was first deemed a threat was later recognized as an opportunity. In the 1930s the electric industry hit on the idea of 're-inspection' to promote the increased use of electricity. A program was developed to convince the public that homes and businesses had to be re-inspected by qualified electricians to ensure that the building's electric wiring was safe and that electricity was being used safely. "The public is used to being sold safety measures. All that the public wants with its caution is the remedy, be it tire chains for wet pavement or reinspection for defective wiring."[19]

The purpose of wiring, and rewiring homes, was to allow for the use of new electric equipment. The operation of electric equipment also posed new hazards. Unlike a coal or wood fire which slowly burned out when left unattended, electric

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[18] "The Electric Fire Theory," BCEEM 6.8 (1923) 16. Reprinted excerpt from the Journal of Electricity.

[19] Secretary of the Vancouver Electrical Association to W.G. Murrin, 6 March, 1934. UBCSC, BCER Records, box 52, file B1514.

appliances had to be turned off. Children had to be taught not to play with appliances and outlets.[20] In factories electric motors eliminated belts and shafts which were responsible for maiming workers but electricity also disciplined workers through accidental shocks and electrocutions and created new hazards. With its introduction into the workplace a "generation of workers had to learn new survival skills."[21] One of the first well publicized industrial applications of hydroelectricity from the Kootenay River was the operation of a powerful electric hoist in a local mine. On 19 May, 1899 the hoist's hand-brake broke and four miners plunged to their deaths. The inquest found that the operator had been unfamiliar with the workings of an electric hoist. The accident instilled doubts about the safety of electricity in the workplace and West Kootenay Power feared that it might influence other mines to avoid electric power.[22]

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[20] David E. Nye, Electrifying America: Social Meanings of a New Technology, 1880-1940 (Cambridge, Mass.: The MIT Press, 1990) 279-80.
[21] Nye, Electrifying America, 210.
[22] Jeremy Mouat, The Business of Power: Hydro-Electricity in Southeastern British Columbia, 1897-1997 (Victoria: Sono Nis Press, 1997) 39-40.

Figure 5.2. Equipped with Electric Light. An early attempt by the electric industry to dispel the spectre of fear surrounding electricity.

Source: Dan Anderson, A History of the Vancouver Electric Club, 1919-1979 : the first 60 cycles (Vancouver: The Club, 1979).

The most unfamiliar hazard created by the electric industry was the threat of electrocution, a novel and little understood phenomenon. Initially the electric industry expected that the experience of being shocked would be enough to discipline people. Mike Crompton, a Victoria man apprenticing as an electrician, leaned his lesson in 1908 while sawing wood in the basement of his mother's house. The tip of his saw made contact with the electric wire connected to the room's light fixture. The resulting shock knocked him senseless and he later required skin grafts for his badly burnt arm. The newspaper account described the incident as revealing a "possible peril of which the average householder does not dream." Many electric light customers had become accustomed to a shock of the "slight kind, which is often received in handling electric lights", but they were ignorant of the extent of the danger posed by electric wires in their homes. In fact Crompton, prior to his serious accident, had received a slight shock when he had repositioned the electric light cord but had thought little of it and continued sawing. When Crompton sued B.C. Electric for damages the company argued that Crompton was at fault for not heeding the first warning shock.

The cause of Crompton's accident was traced to the high winds of a local storm which had bent the branches in the trees outside of Crompton's home and forced the 110 volt electric light wire leading to the home to come in contact with the city's two thousand volt line used for street lighting; the connection had sent over two thousand volts into Crompton's basement. In charging the jury the judge stated that "if electric light could not be supplied without the risk of injury to those supplied, it was the duty of the company to discontinue the service." The jury found B.C. Electric negligent for stringing its wires too close together where they passed through trees and awarded Crompton a thousand dollars.[23] Legal decisions such as Crompton's convinced the electric industry that the pain inflicted on consumers by occasional, small electrical shocks was not enough to correct their behaviour. To protect itself from costly legal decisions and sooth the public's fears the industry increased its efforts to change people's behaviour and convince them that electricity was a safe form of energy.

While the electric industry sought to dispel fears about the real hazards created by the introduction of electricity into buildings it simultaneously worked to promote the perception that buildings housed dangers which electricity could banish. These dangers included older and dirtier energy sources such as gas, kerosene, oil, coal and wood. In Victoria in the early twentieth century B.C. Electric circulated a little pamphlet entitled "A Chat on Electricity." By comparing tradition with modernity B.C. Electric hoped that people would abandon their old light sources and install electric lighting. The 'old way', illustrated with an elderly woman in a bonnet and shawl straining to light a coal-oil lamp, was described as dangerous because the lamp could explode if dropped and the smoke made the air

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[23] "Big Damages Given for Electric Shock," Victoria Colonist, 17 December 1908. In 1913 a similar accident resulted in the death of a Sumas barber. The coroner's jury found the local electric company negligent and described the barber as "a victim to the criminal indifference toward life of present day corporations...." See "Electric Company is Held to be Negligent," Sumas News, 5 December 1913.

in the home "unfit for human consumption." The 'new way', depicted as a young, smiling girl pressing a button to activate an electric light fixture, was so "safe that a child could use it...." According to B.C. Electric, incandescent lamps would not cause fires because they burned in a vacuum and were immediately extinguished once the glass was broken. Also, they did not emit noxious gases and smoke and therefore were perfectly healthy when used in any room of the house.[24]

The electric industry also insisted that inadequate interior lighting was a health hazard. In the mid-1920s Vancouver social reformers warned of the poor lighting in the city's schools and the local medical health officer for schools issued a report condemning the lack of adequate light.[25] In the suburb of Point Grey a lighting engineer inspected lighting in the local schools and recommended improvements to "correct whatever lighting evils may exist."[26] The B.C. Electric Service League advised schools on the dangers of inadequate light, set standards for sufficient lighting, and consulted on its installation, all in the name of saving the eyesight of the young and generating profits for the electric industry.[27]

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[24] British Columbia Electric Co., Ltd., "A Chat on Electricity," ca. 1904, BCA, NWP 971.91 B863c.
[25] "Good Light means Good Health," Vancouver Sun 14 March 1924: 4.
[26] "School Lights are Inspected," Vancouver Sun, 30 April 1926: 3.
[27] "The Electrical Service League of British Columbia," Electrical Retailer 2.5 (1926) 33-35; "Eighth Year of the Electric Service League Reviewed," BCEEM 11.13 (April 1929) 5-6.

The danger of poor lighting extended into the home. The electric industry relied on education and promotional campaigns to protect the eyesight of the young. B.C. Electric was the local organizer for these campaigns, which often originated with national electric associations in the United States. In 1924 the company spearheaded Vancouver's and Victoria's participation in the "Better Home-lighting Campaign," an 'educational' lighting contest for school children ten years of age and older. The campaign was developed by the Lighting Education Committee, a New York based electric industry association.[28] The committee sent local representatives a detailed plan book which described how to organize a successful home lighting campaign. It included sample billboards and advice on advertising and how to gain the co-operation of local schools and newspapers.[29] The electric industry presented the campaign to the public as a disinterested effort to protect the eyesight of the young from the dangers of either inadequate or overly bright illumination. The industry had been active for several years in educating factory owners about the benefits of proper industrial lighting in lowering accidents and increasing efficiency and it was proposed to apply the same formula to the home where the "human product" deserved the same careful

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[28] "The Better Home-lighting Campaign," BCEEM 7.5 (1924) 6-8
[29] "The Plan Book," n.d., BCA, Add. Mss 4, vol. 224, file 284.

attention.[30] The premise was that an older generation raised with coal-oil lamps did not appreciate the value of modern electric lighting. They were endangering their children's eyesight through the improper use of the few electric lights they did own. The electric industry invoked the expert opinion of the Eyesight Conservation Council of America which warned that "Poor Eyes Dull Child's Mind" and that "Defective Vision Retards Progress."[31]

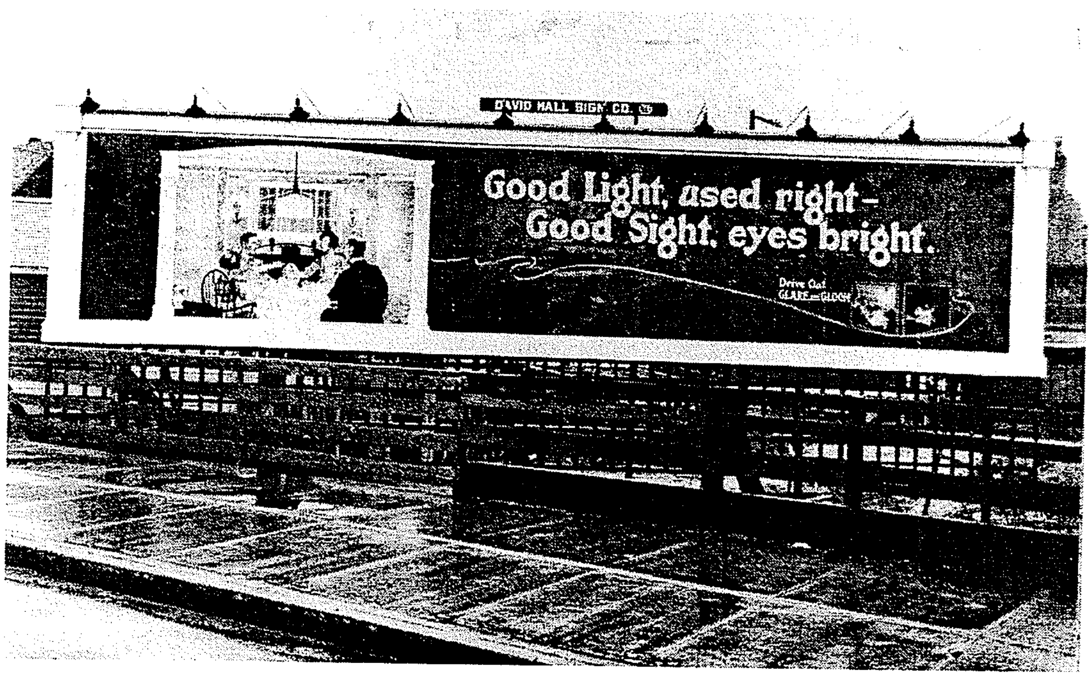

Figure 5.3. B.C. Electric Vancouver area billboard, circa 1925, part of the "Better Home-lighting Campaign, urging consumers to "drive out the glare and gloom" by using electric lighting correctly.

Source. BC Hydro

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[30] "Nation-wide Campaign for Better-lighted Homes to be Launched in Fall," BCEEM 7.4 (1924) 14-15.
[31] "Your Child May Win this $15,000 Home," BCEEM 7.6 (1924) 4-6.

Cities across Canada and the United States participated in the "Better Home-lighting Campaign" in 1924. First prize was obvious: a model electric home. Other prizes were university scholarships for the child entrants ranging in value from three hundred to twelve hundred dollars as well as numerous small local prizes.[32] The contest consisted of three components. After the children filled out registration cards, complete with their parents' names and address, they received a "Home-lighting Primer" which included the contest rules and lessons on proper home lighting. One of the lessons entailed clipping the drawings of proper light fixtures for each room of the home out of a catalogue and pasting them into drawings of the appropriate room. Next the children had to complete a questionnaire describing in detail the light fixtures in their home and the homes of two neighbours. Finally, there was the writing of a short essay on "good home lighting, telling what it is, how to get it, and any interesting experiences in connection with home lighting."[33] The electric industry's goal was to contact as many children as possible by enlisting the co-operation of local school boards. Not all school boards approved of the campaign. Some suspected that the industry was more concerned about increased sales and electric load factors than preserving children's eyesight. The industry circumvented this

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[32] "Your Child May Win this $15,000 Home," BCEEM 7.6 (1924) 4-6.
[33] "The Better Home-lighting Campaign," BCEEM 7.5 (1924) 7.

resistance by making the registration cards and primers available through electric retail stores and publishing the lessons in local newspapers.[34]

[34] T.R. Myers, "Keen Interest in Victoria's Home-lighting Campaign," BCEEM 7.9 (1924) 12.

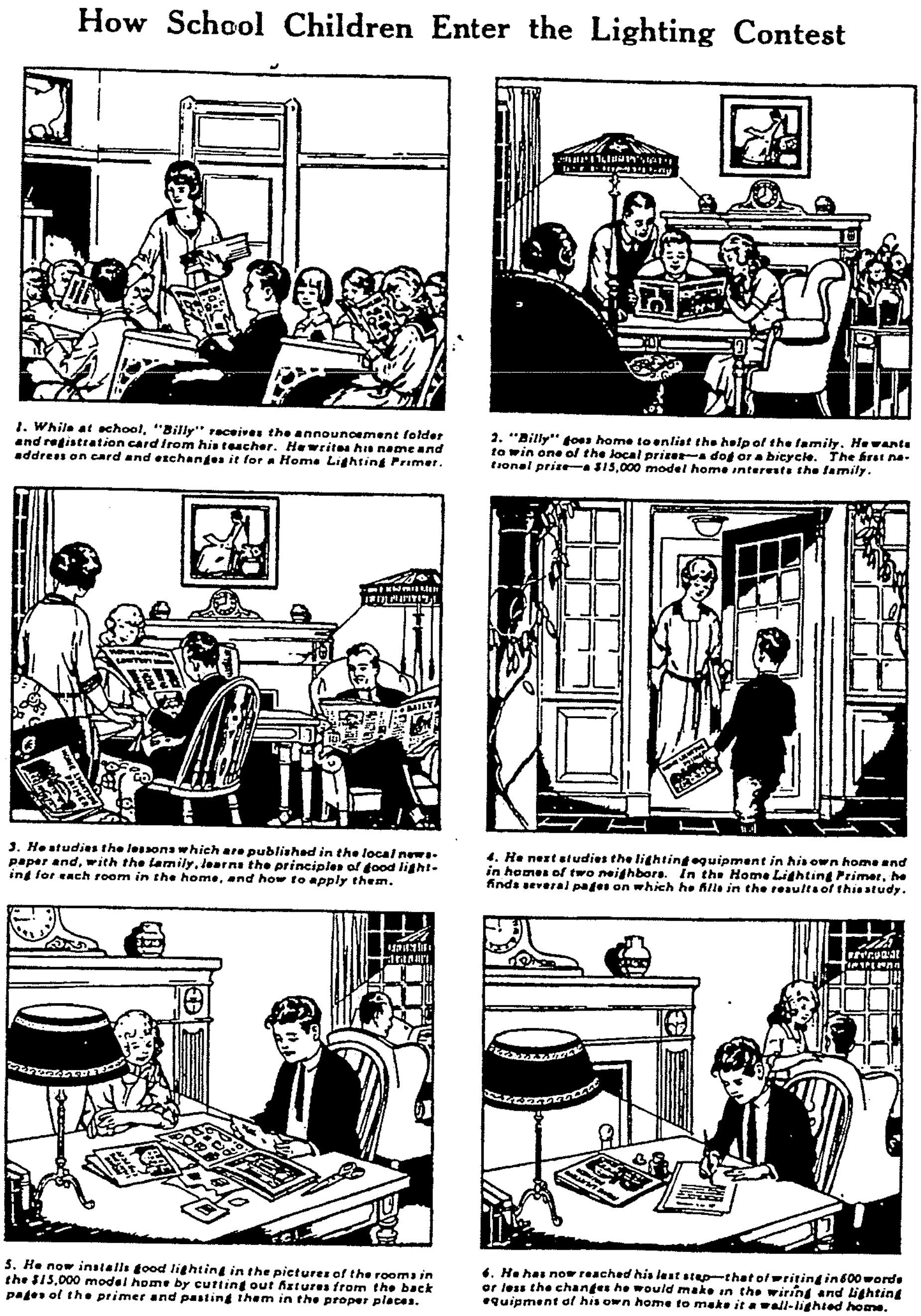

Figure 5.4. Advertisement for the "Better Home-lighting Campaign." The clothing and comfortable home reveal the middle-class theme of the contest.

Source: BCEEM 7.6 (1924) 5.

The national advertising campaign included advertisements in popular magazines as well as the development of posters, window displays, radio lectures, lantern slides and a one-reel motion picture. In British Columbia the Electric Service League worked hard to raise money to pay for advertising, but it was B.C. Electric that provided the bulk of the budget. The company reasoned that the campaign and contest would "bear fruit immediately in the higher degree of lighting in Vancouver and Victoria homes."[35] When the "Better Home-lighting Campaign" ended, B.C. Electric, working with the Electric Service League, immediately began to capitalize on the campaign. It took its lead from the National Electric Light Association which encouraged members of the electric industry in the United States and Canada to take advantage of the new standards in lighting that had been set by the campaign. The association advised them on how to win new sales and increase demand for electricity by exploiting the sense of dissatisfaction with existing lighting systems that had been engendered by the campaign.[36] The B.C. Electric Service League accepted the challenge, distributing close to 6,500 pamphlets in 1925 with titles such as ""Modernizing the Home," "Better Light for Less," and "Economics of Good Lighting." The advertising

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[35] "Lighting Contest Ends," BCEEM 7.9 (1924) 22. See also, "The Better Home-lighting Campaign," BCEEM 7.5 (1924) 6-8.
[36] "Following-up the Better Home Lighting Contest," NELA Bulletin, rpt. in Electrical Retailer 1.6 (1925) 36.

campaign was expanded beyond homeowners, with pamphlets mailed to anyone applying for a building permit for homes, factories, garages, warehouses, churches, office buildings and apartments. Architects, builders, contractors and school board officials were also favoured with informational material on how electric light could make their establishments safer for themselves, their children and their employees.[37] The "Better Home-lighting Campaign" fit the pattern of all electric industry domestic campaigns in the pre-World War II period in that it was part of the industry's efforts to create an urban middle-class dependent on electricity as the energy source of the twentieth century; the Vancouver winner was the daughter of a local accountant.[38] The spectre of fear was indispensable in achieving this goal of transforming interior space.

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[37] "The Electrical Service League of British Columbia," Electrical Retailer 2.5 (1926) 33-35.
[38] "Girl Who Almost Gave Up Contest Wins Scholarship," Vancouver Sun, 4 February 1925.

Figure 5.5. Advertisement for "Better Light, Better Sight" Campaign. Similar to the earlier "Better Home-lighting Campaign," B.C. Electric's "Better Light, Better Sight" advertisements of the 1930s helped create a fear of dangerous lighting in homes.

Source: BCEEM 17.1 (1934).

Street Space

During its early years the electric industry was active in the production of real and perceived hazards on city streets. Similar to its colonization of the natural space of rivers and lakes for the generation of hydroelectricity, the industry sought to occupy and possess street space to facilitate consumption. To achieve this goal it had to impose its distribution system of poles and wires on city space. This process created new hazards and angered city residents who resented what they perceived as an urban blight. The hazards were many. People standing or playing on sidewalks or in the street could be seriously hurt or killed by wires falling from poles, especially in high winds. The presence of several different overhead lines, including lines for trolleys, electric transmission and telephone service, posed their own danger. Electric transmission wires and streetcar wires were liable to contact telephone wires, sending thousands of volts of electricity down phone lines maiming or killing people speaking on the phone or accidentally touching phone lines.[39] The intersection of trees and poles and transmission wires also created new

[39] See for example: "Touched Live Wire with Fatal Result," Victoria Colonist, 25 April 1908; "Victoria Swept by Heavy Gale," Victoria Colonist, 23 November 1910; "Fusion of Wires Apparently Causes Fire," New Westminster News, 24 August, 1911; "Stepped on Live Wire in the Dark," Vancouver Province, 13 November 1912; "No Blame Attached in Fatal Accident," New Westminster News, 15 November 1912; "Crossed Wires Start Fire," Victoria Colonist, 22

dangers. Trees were liable to fall on transmission wires, bringing them down to the level of the street were they came in contact with pedestrians causing serious injuries or deaths.[40] Branches also grew up through transmission lines and, as in the case of Crompton's accident, the bending of branches during a storm could bring lines of different voltages together or connect a high voltage electric line with a telephone wire. The branches could also erode the insulation covering the electric lines and create significant losses in current for the central generating station. This wayward electric current was known to give pedestrians unexpected electric shocks when they retreated under a tree to shelter from the rain.[41] As early as 1905 in Vancouver B.C. Electric began a program of pruning trees in residential neighbourhoods to reduce their contact with the company's transmission wires. Residents regularly complained to the both the company and the city that the trees were being "butchered" but both justified the trimming as in the interest of "Public Safety."[42]

March 1914; "Hindu Killed By Live Wire," Vancouver Sun, 6 December 1923: 10. See also "6000-Volt Wire Burns Pedestrian," Vancouver Sun, 27 August 1925: 14; "Wire Shocks Two Children," Vancouver Sun, 9 September 1922: 3 and "Live Wire Knocks out Two Youths," Vancouver Sun, 5 September 1925: 1.

[40] See for example, Woodroofe to Sperling, 16 May, 1910, UBCSC, BCER Records, Box 25, file 25-B670.

[41] "Trees Rubbing on Wires Cause Shock," Vancouver Sun, 8 January 1921: 5.

[42] McEvoy to Sperling, 29 December, 1905 and Sperling to Clement, 27 May 1909, UBCSC, BCER Records, Box 6, file 6-B156. See various letters in UBCSC,

Residents of Vancouver and Victoria also grew dissatisfied with the maze of utility poles that had been erected on their streets to carry telephone and electric transmission wires. The poles and wires were described as "disfiguring the appearance of the city and a positive source of danger in more ways than one."[43] In 1910 B.C. Electric and the City of Vancouver entered into an agreement to begin relocating the poles to back lanes.[44] B.C. Electric, having never received official authorization to erect its poles and transmission wires on city property, initially believed that the agreement was a windfall.[45] The agreement formally acknowledged the company's right operate its transmission system within the city and B.C. Electric's local management also believed that "with this Agreement in force, it makes it a much more difficult matter for the Western Canada Power Company to install a distribution system in the City."[46] B.C. Electric had already begun to erect poles in back lanes without stringing wires in order to gain control

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BCER Records, Box 6, file 6-B156. See also: "Prune Trees Near Wires," Vancouver Sun, 9 December 1920; "Trees are Pruned Close for the Public Safety," Vancouver Province, 7 January 1921: 20.

[43] "Poleless Streets," Victoria Colonist, 29 July 1910.

[44] Woodroofe to McCrossan, 1March, 1910, UBCSC, BCER Records, Box 28, file 28-B752.

[45] ? to Sperling, 23 July, 1910, UBCSC, BCER Records, Box 28, file 28-B752.

[46] Sperling to Kidd, 29 July, 1910, UBCSC, BCER Records, Box 28, file 28-B752.

of the lanes and prevent Western Canada Power from installing its own transmission system.[47]

In Victoria the absence of back lanes led to the public's demand that the poles be completely removed and the transmission wires buried. The issue resulted in the drafting of a 1911 bylaw. In order to remind voters of what their streets were like before the advent of the telephone and electricity, the local newspaper ran contrasting photographs of the main business street, one as it currently appeared, and the other before the objectionable poles and wires had been installed.[48] The city's fire chief endorsed the proposed bylaw stating that the removal of the poles and wires would reduce the risk of fires. The local newspaper opined that the "poles are a menace to life every time a fire occurs. They are an eyesore. They are an obstruction to the streets. They are in every way a nuisance and objectionable."[49] The bylaw passed by a wide margin.[50] It marked the partial recovery of the city's streets from the increasing threat of electrocutions and

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[47] B.C. Electric's London officers were not as optimistic about the terms and effect of the agreement. See: Assistant Secretary to Sperling, 22 August, 1910, UBCSC, BCER Records, Box 28, file 28-B752; Linklater & Co. to Secretary, BCER, 1 September, 1910, UBCSC, BCER Records, Box 28, file 28-B752.
[48] "Majority Favour Telephone Measure," Victoria Colonist, 11 January 1911.
[49] "Fire Chief Endorses It," Victoria Colonist, 12 January 1911 and "The Telephone By-Law," Victoria Colonist, 12 January 1911.
[50] "Results in the Municipal Race," Victoria Colonist 13 January 1911.

electric fires. It was also an example of how social pressure could force changes to new technological systems.

Figure 5.6. Radio Aerials and Transmission Poles. Attempts to subvert B.C. Electric's transmission system for unintended purposes was classified as a dangerous practice by the electric industry.

Source: UBCSCD, B.C. Electric Newspaper Scrapbooks, Advertising 1928.

Concerns about the real dangers created by the electric industry's distribution system coexisted with the perceived dangers of inadequate street lighting. The power of street lights as a technology for the regulation, surveillance and domination of the street had been long recognized in Europe, where in the seventeenth century street lighting had been transformed into a police institution.[51] This tradition extended to North American cities.[52] When the Victoria Gas Company lobbied for a charter in 1860 it emphasized the assumed relation between dark streets and criminal behaviour. Local criminals were expected to cower and flee from the company's blazing street lights.[53] In Vancouver at the turn of the century the city's chief of police was responsible for the operation of street lights and his officers tended to malfunctioning street lights as they walked their beats.[54] As late as the 1920s street lighting was deemed a police matter by

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[51] Wolfgang Schivelbusch, Disenchanted Night: The Industrialisation of Light in the Nineteenth Century trans. Angela Davies (Berkeley: University of California Press, 1988) 97.
[52] Bryan D. Palmer, Cultures of Darkness: Night Travels in the Histories of Transgression (New York: Monthly Review Press, 2000).
[53] Douglas V. Parker, No Horsecars in Paradise: A History of the Street Railways and Public Utilities in Victoria, British Columbia before 1897 (Toronto; Vancouver: Railfare Enterprises; Whitecap Books, 1981) and Cecil Maiden, Lighted Journey: The Story of B.C. Electric (Vancouver: British Columbia Electric Company Ltd., 1948) 3.
[54] Minutes of the Light, Railway and Tramway Committee, 27 October 1898 and 7 May 1901, Vancouver City Archives (VCA), Vancouver City Council and Office of the Clerk Records, MCR-2-1.

Vancouver city officials and better lighting was prescribed to combat the threat of hold-up men. Winter brought long and dark nights to Vancouver, especially during seasonal rain and fog. In 1921 the city's fire and police committee recommended advertisements be placed in local newspapers urging residents to keep their veranda lights burning during the winter months in order to light the city's streets.[55]

The electric industry relied on the accepted association between street lights and crime to expand its market for electric street lights. B.C. Electric mounted frequent advertising campaigns that associated darkness with crime and outdoor lighting with safety. In 1916 its advertisements promised that "An Electric Porch Light Will Protect You." Homeowners were informed that "no thief cares to take a chance in the light" and that for an average cost of only sixty-two cents per month "you and your family are assured good security against burglary and perhaps even more serious happenings."[56] In 1921 B.C. Electric's porch-lighting campaign had a new slogan, "a porch light at night puts the burglar to flight," and company employees were encouraged to set an example in their neighbourhoods by leaving

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[55] Minutes of the Fire, Police and Returned Soldiers, 19 October 1921, VCA, Vancouver City Council and Office of the Clerk Records, MCR-2-33
[56] "An Electric Porch Light Will Protect You," 14 January 1916, B.C. Electric newspaper advertisement, UBCSD, B.C. Electric Newspaper Clippings, Reel #38.

their porch lights on all night.[57] Similarly, when British Columbia's first 'Electrical Home' was showcased in 1922 it included a master switch in the bedroom to quickly turn on every interior and exterior light; "in the event of there being burglars in the house there would be little chance of their escape."[58] When B.C. Electric lowered its Vancouver lighting rates in 1924 the local newspaper supported the mayor's suggestion of investing the savings in improving the city's street lighting. It encouraged residents to use more electricity and thwart burglars and muggers by leaving their porch lights on at night. "Good lighting is the only thing that will deter criminals of that type."[59] As late as 1938 a letter was published in the local newspaper over the signature "Holdup" warning city residents of the danger of dark winter nights and the efficacy of porch lights in reducing burglaries. Homeowners were encouraged to seek the assistance and safety provided by B. C. Electric, for a small monthly charge.[60]

Increased lighting was also recommended to reduce traffic accidents. With the introduction of gas lighting technology in Victoria in the early 1860s, city boosters called for the installation of street lights in the city's business district,

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[57] "A Porch Light at Night," BCEEM 3.12 (1921) 8.
[58] "Model Electric Home is Unique Treat to Public," Vancouver Sun, 4 October 1922: 10.
[59] "Better Lighting for the West End," Vancouver Sun, 9 March, 1924: 6.
[60] "Kindly Lights," Vancouver Sun, 28 September 1938: 6.

arguing that the lack of street lights was dangerous for pedestrians.[61] The introduction of electric street lights in Vancouver in 1890 followed a similar pattern, with increased safety for pedestrians cited as a primary concern. Electric lighting coincided with new transportation opportunities, including streetcars and automobiles, which increased concerns for the safety of pedestrians. By the mid-1920s certain Vancouver streets were being identified as especially dangerous for pedestrians and coroner's juries recommended improved street lighting to reduce the threat of accidents.[62] Central generating stations, including B.C. Electric, promoted the importance of electric street lighting in preventing accidents, with 'illumination experts' expounding on the correlation between increased lighting, lower accident rates and lives saved.[63]

Concerns for safety led Vancouver city council to debate an enhanced street lighting plan in 1938. The city had reduced the brightness of street lights in 1934 to cut expenses during the economic depression, but increased night-time traffic and the resulting accidents now forced government officials to review their

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[61] Patricia Roy, "The Illumination of Victoria: Late Nineteenth-Century Technology and Municipal Enterprise," BC Studies 32 (1976-77) 81.
[62] Kingsway was particularly notorious. See "Driver Not to Blame for Bennett's Death," Vancouver Province, 28 August, 1926(?) 2 and "Death of Mrs. George Accidental; Jury Finds Lighting Inadequate," Vancouver Province, 28 January 1926: 20.
[63] "Eyesight and Illumination," BCEEM 6.8 (1923) 21.

decision.[64] The debate revealed how arguments based on electric lighting and street dangers were part of larger contests over the responsibility for and control of street space. Following a long tradition in European cities of property owners whose land abutted streets being responsible for their improvement and maintenance, Vancouver property owners were expected to bear at least part of the expense of installing street lights. Businesses in commercial districts tended to accept this burden, considering increased street lighting as integral to the creation of a commercial space suitable for safe and comfortable shopping. Homeowners on quiet residential streets were less likely to appreciate the 'improvements' and often resisted the added expense. This was especially true when the reason given was the need for better street lighting for vehicular and pedestrian safety. Homeowners resented having their streets transformed into traffic thoroughfares and were reluctant to bear the expense so automobile owners could drive even faster at night through their neighbourhoods.[65]

The electric industry played an important role in transforming streets into transportation thoroughfares through the introduction of streetcars. In most North American cities streetcars were predated by omnibuses and horsecars, both of

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[64] "Better Street Lighting Urged for Safety," Morning News, 20 December 1938: 9, and "Street Light Plan Shelved," Vancouver Province 20 September 1938: 22.
[65] "New Lights Urged on Seymour Street," Vancouver Province 18 November 1938.

which relied on horses for their motive power. They were a familiar and established form of transportation presenting few new challenges to urban residents. Omnibus service began in Victoria in 1885 with two routes, hourly service and a ten cent fare.[66] The service expanded during the late 1880s but was superseded by streetcars powered by electricity in February 1890. This was part of the proliferation of electric streetcar companies across North America during the 1890s. In the United States their domination of urban transportation peaked during World War I while in Vancouver and Victoria they maintained their primary position until the mid-1920s before being gradually displaced by automobiles.[67]

The streetcar era may have been relatively short, but it was instrumental in producing new forms of public space which facilitated the introduction of the automobile. This was achieved through both real and perceived new dangers. Before the advent of streetcars urban streets were social, organic places, suitable and welcoming to a wide variety of purposes and needs. Streets were primarily used for transportation, but there were many forms of transportation, including walking, private carriages, omnibuses, wagons, horse riding and bicycles. Urban

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[66] Parker, No Horsecars in Paradise, 21-24.

[67] David O. Whitten, The Emergence of Giant Enterprise, 1860-1914 : American Commercial Enterprise and Extractive Industries (Westport, Conn.: Greenwood Press, 1983) 61 and Allen Seager, "The Resource Economy, 1871-1921" The Pacific Province: A History of British Columbia, ed. Hugh J.M. Johnston (Vancouver: Douglas & McIntyre, 1996) 219.

streets were also vital social and economic places. Open-air stalls and street vendors were common sights, as were political rallies, community meetings, social gatherings, games and dancing. Streets enhanced and extended the domestic space of private homes, especially for the urban poor living in inner cities, often in crowded row houses and later in tiny apartments. Streets were also an important source of fresh air and sunlight and served as a playground for the children of parents who could not afford spacious homes and sprawling lawns in new suburban neighbourhoods.[68]

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[68] For a description of pre-industrial streets in North American cities see Clay McShane, Down the Asphalt Path: American Cities and the Coming of the Automobile (New York: Columbia University Press, 1994) 62-64 and Susan G. Davis, Parades and Power : Street Theatre in Nineteenth-Century Philadelphia (Philadelphia: Temple University Press, 1986). For a similar description of Vancouver streets see Robert A.J. McDonald, Making Vancouver: Class, Status, and Social Boundaries, 1863-1913 (Vancouver: UBC Press, 1996) 224-225.

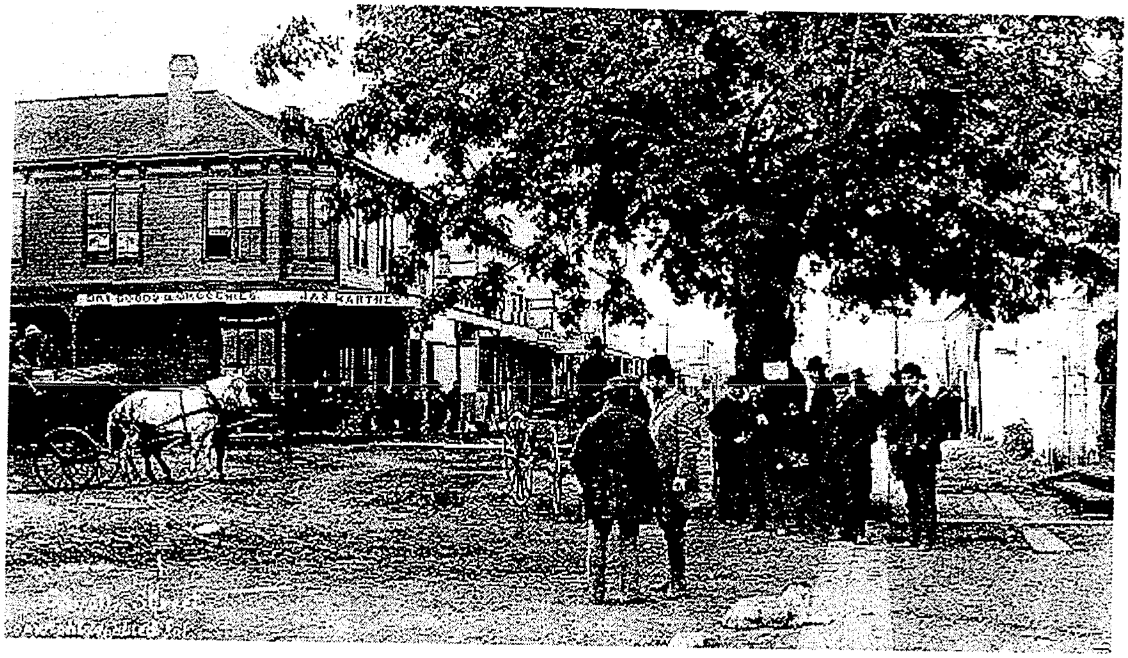

Figure 5.7. Intersection of Carrall and Water Streets, Vancouver, May 1886. The large tree, in the centre of one of Vancouver's busiest intersections, was a focal point for social and political gatherings in early Vancouver.
Source: City of Vancouver Archives, #STR.P.83, N.107#1.

The diversity of pre-industrial streets precluded any pretence of harmony. They were 'contested terrain' where class, ethnic and racial politics were on public display.[69] The introduction of streetcars exacerbated and magnified these differences by sanctioning greater corporate dominance of streets and eroding the local and social character of streets in favour of transportation thoroughfares for

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[69] This argument is found in Davis and adopted by McDonald. Also, see Howard L. Preston, Automobile Age Atlanta : The Making of a Southern Metropolis, 1900-1935 (Athens: University of Georgia Press, 1979).

the suburban middle-class.[70] B.C. Electric's command over a street was rooted in the streetcar franchise it received from local government. The practice of granting franchises in North America began with the early horsecar lines and typically included conferring a monopoly over passenger traffic on a private company in exchange for street improvements—either the laying of gravel or pavement—and increased efficiency in transporting city residents. Local governments expected that private enterprise and a new technology would solve one of the most urgent problems associated with rapid urban growth in the late nineteenth century.[71] Streetcars carried more people and moved them around the city faster than earlier forms of public transportation. They also created new dangers in part because of their unusual mass, but mostly because of their unprecedented speeds.

Until the introduction of electric streetcars in the 1890s city transportation was restricted to the motive power of either humans or horses. The average human walk is roughly five kilometres per hour, similar to the speed of a horse-drawn freight wagon. While coaches and buggies could reach speeds of closer to ten kilometres per hour, this was highly unusual on city streets because of congestion

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[70] Nye, Consuming Power 179 and McShane, Down the Asphalt Path, 65.
[71] McShane, Down the Asphalt Path, 19.

and the potential damage to the street surface.[72] Artist Emily Carr described transportation in Victoria before streetcars as being restricted to walking and horses, with both being conducive to leisurely enjoyment of the surroundings and fresh air.[73] Bicycles introduced a dramatic increase in speed, raising the maximum to roughly twenty kilometres per hour, and created alarm because they were relatively silent and unpredictable. Their excessive speed led to their early banishment in some American cities as well as to fears that riders would develop disfiguring 'bicycle face.'[74]

Streetcar speeds were regulated by the streetcar company's franchise agreement. In Vancouver the initial speed limit was ten kilometres per hour. This was found to be too slow to attract passengers when the city was still relatively small and residents could walk to most destinations.[75] Consequently, in 1901 the speed limit was increased to sixteen kilometres per hour and increased again in

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[72] For average speeds see Vaclav Smil, Energy in World History (Boulder, Col.: Westview Press, 1994) 238 and figure 6.7.
[73] Emily Carr, The Book of Small, quoted in Parker, No Horsecars in Paradise, 20-21.
[74] Stephen Kern, The Culture of Time and Space, 1880-1918 (Cambridge, Mass.: Harvard University Press, 1983) 111 and McShane, Down the Asphalt Path, 116.
[75] "General History of B.C. Electric," Vancouver City Archives, Add Mss 321, vol. 1.

1915 in response to jitney competition.[76] The presence of relatively fast-moving streetcars on city streets created new dangers that were exacerbated by speed limit increases in advance of the development of adequate braking technology.[77] Some city residents feared the adoption of streetcars. When the news became public of the granting of a streetcar franchise in Victoria in 1888 a concerned citizen wrote to the local newspaper warning of the danger. "Those who have lived in towns where they have streetcars know what a nuisance they are in narrow streets, and how injurious they are to wheeled vehicles."[78] Streetcars immediately began to impose discipline on the disorder of pre-industrial streets. When Vancouver's new electric streetcars were tested in the spring of 1890 the local newspaper warned city residents to keep their horses tethered in the street. "With a little care many accidents will be prevented."[79]

Collisions between streetcars and horse-drawn vehicles became a common occurrence during the ensuing years, but it was children who were the most vulnerable.[80] Aside from being struck when simply crossing streets, children,

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[76] Parker, No Horsecars in Paradise, 16, 44 and Henry Ewert, The Story of the B.C. Electric Railway Company (North Vancouver: Whitecap Books, 1986) 128.
[77] McShane, Down the Asphalt Path, 50.
[78] Victoria Colonist, 27 November 1888, quoted in Parker 26-27.
[79] Quoted in Ewert, The Story of the B.C. Electric, 15.
[80] See for example, "Collides with Street Car," Victoria Colonist, 1 January 1907 and "Series of Accidents," Victoria Times, 22 May 1915.

especially those of poor inner city families, were at risk when they used streets as playgrounds and integrated streetcars into their games.[81] As streetcar service expanded in Victoria and Vancouver, and speeds increased, a growing number of children were injured or killed.[82] The death of two-year old Victoria resident Ethel Anderson in 1891 exemplified how the electric industry introduced a new street reality for children. The little girl was playing in the street in front of her parents' home when one of the city's new streetcars began descending the hill towards her. Although the exact speed of the streetcar was later disputed, it was agreed that the steep grade of the hill and the inadequacy of the streetcar's braking system made it difficult for it to stop abruptly. Ethel ran to avoid the streetcar but was struck, dragged under the wheels and died. During the subsequent inquest the streetcar conductor testified that the "place where the accident took place is a dangerous place on account of the number of children playing around."[83] Through the introduction of a new transportation system a children's play ground had been transformed into hazard space.

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[81] For streetcars and children's games see Nye, Electrifying America, 50.
[82] For Vancouver examples from 1923 examples see "Japanese Injured by B.C.E. Train," Vancouver Sun, 19 September 1923: 2; "Street Car Cuts Off Boys Fingers," Vancouver Province, 21 August, 1923: 7; "Motorman is Given Bail on Manslaughter Charge," Vancouver Province, 7 August 1923: 7; "Sled Accident Proves Fatal," Vancouver Province, 30 January 1923:10.
[83] Coroner's Inquisition for Ethel Anderson, 26 May 1891, BCA, GR 1327, reel B2373, file 46/91.

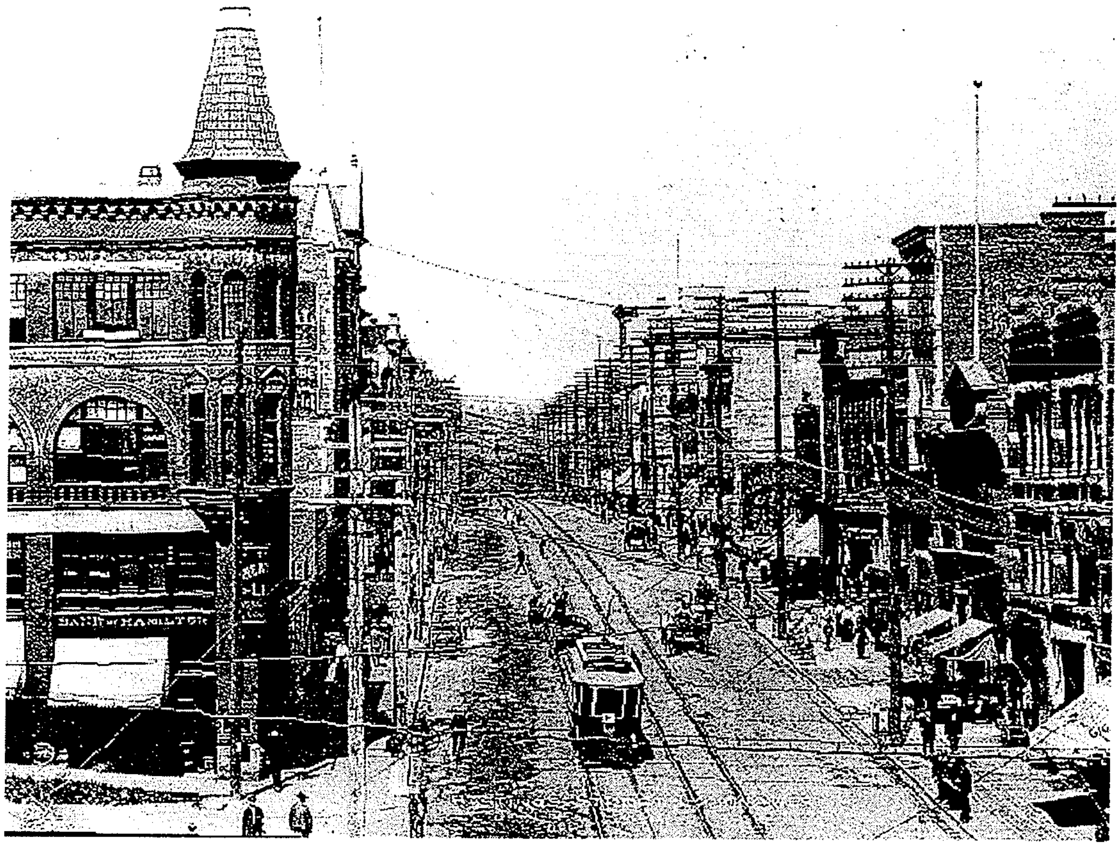

Figure 5.8. Hastings Street in 1905, the centre of downtown Vancouver, alive with pedestrians, cyclists, wagons and streetcars and covered in a net of electrical, telephone and trolley wires.

Source: City of Vancouver Archives #STR.P.308, N.259.

The suffering on city streets was not equally distributed along class lines. In part this was due to the cost of riding the streetcars on a regular basis. Most working-class people could not afford to ride streetcars to and from work every day. They were more likely to walk, especially because they tended to live close to their jobs.[84] Streetcar companies serviced and helped create 'streetcar-suburbs', the middle-class's popular retreat from the squalor and congestion of urban life.[85] B.C. Electric, along with other North American streetcar companies, encouraged the establishment and growth of suburbs. The suburbs increased daily streetcar traffic and represented the growth of single-family, energy-intensive homes. Their efforts were supported by civic boosters who extolled the health benefits of suburban living.[86] In 1907 B.C. Electric entered into an agreement with a local real estate company to offer home-owners in a new Vancouver suburb 'settler tickets', a discount on their daily commute into the city.[87] When B.C. Electric extended its local streetcar service east of Vancouver's city limits in 1909 it offered a similar discount to middle-class 'pioneers' who ventured far from the downtown.[88] B.C. Electric's later speculation in the creation of suburbs included agreements with the Canadian Pacific Railway, a major land owner in Vancouver,

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[84] McShane, Down the Asphalt Path, 15 and Nye Electrifying America, 97-98.
[85] Sam Bass Warner, Streetcar Suburbs: The Process of Growth in Boston, 1870-1900 2nd ed (Cambridge: Harvard University Press, 1978), Gwendolyn Wright, Building the Dream, a Social History of Housing in America (New York: Pantheon Books, 1981) 107.
[86] Victoria Colonist, 2 May 1889: 2, quoted in Patricia E. Roy, "The British Columbia Electric Railway Company, 1897-1928: A British Company in British Columbia," Ph.D. (University of British Columbia, 1970) 10.
[87] Love to Sperling, 19 December, 1906 and Sperling to Love, 8 January, 1907, UBCSC, BCER Records, box 6, file 6-B158.
[88] Ewert, The Story of the B.C. Electric, 80.

to build streetcar lines through the forests surrounding the city of Vancouver and to create the suburban districts of Fairview and Kitsilano. The companies anticipated a real estate and transportation boom with the building of middle-class homes.[89]

The creation of predominantly white, middle-class suburbs reveals how a new technological system, developed and promoted by specific corporate interests, can facilitate, encourage and shape social and spatial transformations. The automobile, with its higher cost and greater mobility, soon usurped the streetcar's role in this process, but it was the streetcar that formed the initial pattern and established new standards and expectations.[90] The most deadly new expectation was faster city travel. Middle-class suburbanites soon grew dissatisfied with their streetcar service. They complained about inadequate and unreliable schedules and aggravating delays. Suburban residents organized themselves to pressure streetcar companies for what they described as better service. By 1907 the newly formed Kitsilano Improvement Association had succeeded in capturing the attention of B.C. Electric's management in Vancouver. The association, representing the residents of one of Vancouver's new suburbs, badgered the company with letters

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[89] Roy, "The British Columbia Electric Railway," 74-75 and Ewert, The Story of the B.C. Electric, 22 and 45.
[90] For an analysis of the automobile's role in creating a suburban 'Jim Crow' city, see Preston, Automobile Age Atlanta.

and secured several private meetings with company officials demanding more frequent and faster service.[91] Streetcar companies responded by instituting tight, often unrealistic, schedules that necessitated higher speeds. The result was more accidents on city streets.[92] The move to the suburbs and the increased use of streetcars had changed some city residents' perceptions of the function and uses of streets. Streets were no longer a social space for local residents to meet, haggle and play. They were perceived as transportation thoroughfares for the quick and efficient movement of the suburban middle class.[93]

The chaotic mix of streetcars, bicyclists, wagons and pedestrians was thrown into even greater confusion with the proliferation of automobiles. Vancouver streets received their first automobile in the fall of 1899. With the introduction of the Ford Model T in 1908 automobiles became increasingly affordable for the average person and the fledging automobile industry began to compete directly with the electric industry and street-car companies for control of city streets. Automobile advertisements targeted 'straphangers', streetcar patrons unable to secure a seat on packed streetcars. It was assumed that these people

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[91] Kitsilano Improvement Association correspondence, UBCSCD, B.C. Electric Railway Company, box 24, file 24-B619.
[92] For an example see Parker, No Horsecars in Paradise, 94-96.
[93] McShane, Down the Asphalt Path, 28-29.

would prefer the freedom and independence of private automobile ownership.[94] By the beginning of World War I many city dwellers had embraced the automobile and with the economic depression that accompanied the start of the war, many seized on the new technology to reassert their place on city streets. In the summer of 1914 private motorists in Los Angeles began to offer rides within the city for 5 cents and the 'jitney craze' was born. It spread quickly to most North American cities, reaching Victoria by November and Vancouver soon after. Established streetcar stops in downtowns became targets for jitneys cruising for customers. Jitneys were a serious threat to B.C. Electric's streetcar business. The company experienced an immediate and significant decrease in passengers.[95]

There were class and spatial elements to the jitney craze. Most jitney operators were members of the working-class hurt by the economic depression and who used their access to new transportation technology to supplement their income.[96] They provided a service to inner-city residents frustrated with streetcar

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[94] McShane, Down the Asphalt Path, 193.
[95] Roy, "The British Columbia Railway," 204-14. By early 1915 B.C. Electric was complaining to Premier McBride that the jitneys had reduced its streetcar revenues by 21%; Horne-Payne to McBride, 7 January, 1915, UBCSC, BCER Records, Box 39, private file #14. B.C. Electric mounted an extensive campaign to combat the jitneys. See UBCSC, BCER Records, Box 38, file 38-B1163 and Box 49, file B-1419.
[96] Ewert, The Story of the B.C. Electric,127; Preston, Automobile Age Atlanta, 56-57.

companies that offered them poor service while favouring the suburbs. Streetcars often operated on a flat rate, usually 5 cents, regardless of the distance travelled. This meant that people living and working close to downtown subsidized those with new houses in the suburbs. This subsidy was favoured by streetcar companies speculating in suburban real estate and local governments supporting population diffusion from the downtown core and the growth of suburbs.[97] The jitneys siphoned off profitable inner-city ridership and forced B.C. Electric to abandon its service to suburban neighbourhoods. The company reasoned that it could justify the reduction in service by explaining that:

> the outside lines had been enabled to be run only because the Company received 5 cents for the short distance travellers on the city lines, and that the losses on the outside lines were made up by the inside lines, but that now the profitable portion of the business was taken away by the jitney cars it would be necessary to cut out the unprofitable business on the outside lines.[98]

Streetcar companies, including B.C. Electric, also responded to the jitney threat by lobbying local governments to impose onerous and expensive regulations on jitney operators.[99] In early 1915 B.C. Electric also instituted a new, tighter

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[97] Ross Eckert and G.W. Hilton, "The Jitneys," Journal of Law and Economics 15 (1972) 293-325.
[98] Memo of meeting in Mr. Kidd's Office, 10 February, 1915, UBCSC, BCER Records, Box 38-B1163.
[99] Christopher Armstrong and H.V. Nelles, Monopoly's Moment: The Organization and Regulation of Canadian Utilities, 1830-1930 (Philadelphia:

schedule to force its streetcar operators to increase their speed.[100] Key to the company's efforts was the promotion of the perception that jitneys were dangerous. Jitney operators fought back by organizing themselves and taking their case to the public and B.C. Electric's shareholders. In early 1915 a Victoria newspaper criticized the presence of jitneys on city streets prompting a jitney supporter to defend their presence and their safety record.

> The contingency of hard times is not a class contingency, and if it demoralizes the bank accounts and credits of the middle classes and thrusts the poor upon charity it ill-becomes any newspaper to cry out for such legislation as will embarrass that class of taxpayers who have adopted the jitney method of turning an honest dollar and helping themselves over a rough road till the smoother highway is again reached....in no city on the Pacific coast have accidents to passengers riding on jitneys averaged higher than tramway accidents.[101]

Jitney drivers in Victoria organized themselves into the Victoria Jitney Association and dedicated themselves to safety and service. The association adopted a set of rules intended to "go a long way towards protecting the public from unsafe driving. The chief aim of the association will be 'Safety and

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Temple University Press, 1986) 206-10; Roy, "The British Columbia Railway Company," 204-214; Goward to Kidd, 13 February, 1915, UBCSC, BCER Records, Box 38, file 38-B1163.

[100] Memo of meeting in Mr. Kidd's Office, 10 February, 1915, UBCSC, BCER Records, Box 38-B1163.

[101] "The Jitney Busses," Victoria Times,1 February 1915.

Service.'"[102] A dedication to safety failed to save the jitney operators. Instead of supporting them, local governments capitalized on their threat to streetcar and electric industry monopolies to extract concessions in exchange for imposing disabling regulations on jitneys. In Victoria, jitney regulation became part of a deal with B.C. Electric to lower its domestic electricity rate.[103] Within a few years jitneys had disappeared from city streets across North America.

As streetcars and automobiles struggled for control of city streets the space for pedestrians was reduced and new restrictions were placed on their movements. In 1914 the Victoria Colonist reported on a recent Ontario court decision which had ruled that it was every pedestrian's responsibility to "recognize the new methods of locomotion and take precautions accordingly." If pedestrians were allowed to saunter across a street at will, forcing streetcars to slow and even stop for them, it would undermine the central purpose of a rapid transit system.[104] The diminishing purposes of city streets, the marginalization of pedestrians and the association of the city with modernity and the country with the primitive were reflected in new additions to the language. A person who crossed a street mid-

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[102] "Safety and Service will be Watchwords," Victoria Times, 19 February 1915.
[103] Blair E. Tothill, "Living Electrically: The British Columbia Electric Railway Company and the Development of the Domestic Electric Appliance Market in Victoria, 1919-1939," (M.A. Thesis, University of Ottawa, 1997) 26.
[104] editorial, Victoria Colonist, 22 March 1914.

block was now labelled a 'jaywalker' with 'jay' being American slang for a hick or a rube.[105] The implication was that anyone using the streets as they had traditionally been used for hundreds of years was an unsophisticated country bumpkin who had refused to accept the realities of modern, urban life and the pre-eminence of new transportation systems. If a rube was struck by either a streetcar or an automobile it was obviously his or her own fault for not obeying the new laws of the road.[106] Streetcar companies and automobile associations adopted a policy of blaming pedestrians for street accidents. They lobbied governments to discipline and punish pedestrians who insisted on perpetuating older forms of street usage.[107]

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[105] McShane, Down the Asphalt Path, 188.

[106] For examples of blaming pedestrians for accidents in the United States see McShane, Down the Asphalt Path, 113. For Britain see Robert Davis, Death on the Streets: Cars and the Mythology of Road Safety (Hawes, North Yorks: Leading Edge Press, 1993) and Sean O'Connell, The Car and British Society: Class, Gender and Motoring, 1896-1939 (Manchester and New York: Manchester University Press, 1998) 131 and 140.

[107] R. Mayne-Reade, "Accident Prevention is Everybody's Business," Convention of Canadian Electric Railway Association, Ottawa, January 31-February 1, 1921, UBCSCD, B.C. Electric Newspaper Clippings, reel #1. For the role of automobile associations in these re-education campaigns see Davis, Death on the Streets, O'Connell, The Car and British Society, and Wolfgang Sachs, For Love of the Automobile: Looking Back into the History of Our Desires trans. Don Reneau (Berkeley: University of California Press, 1992).

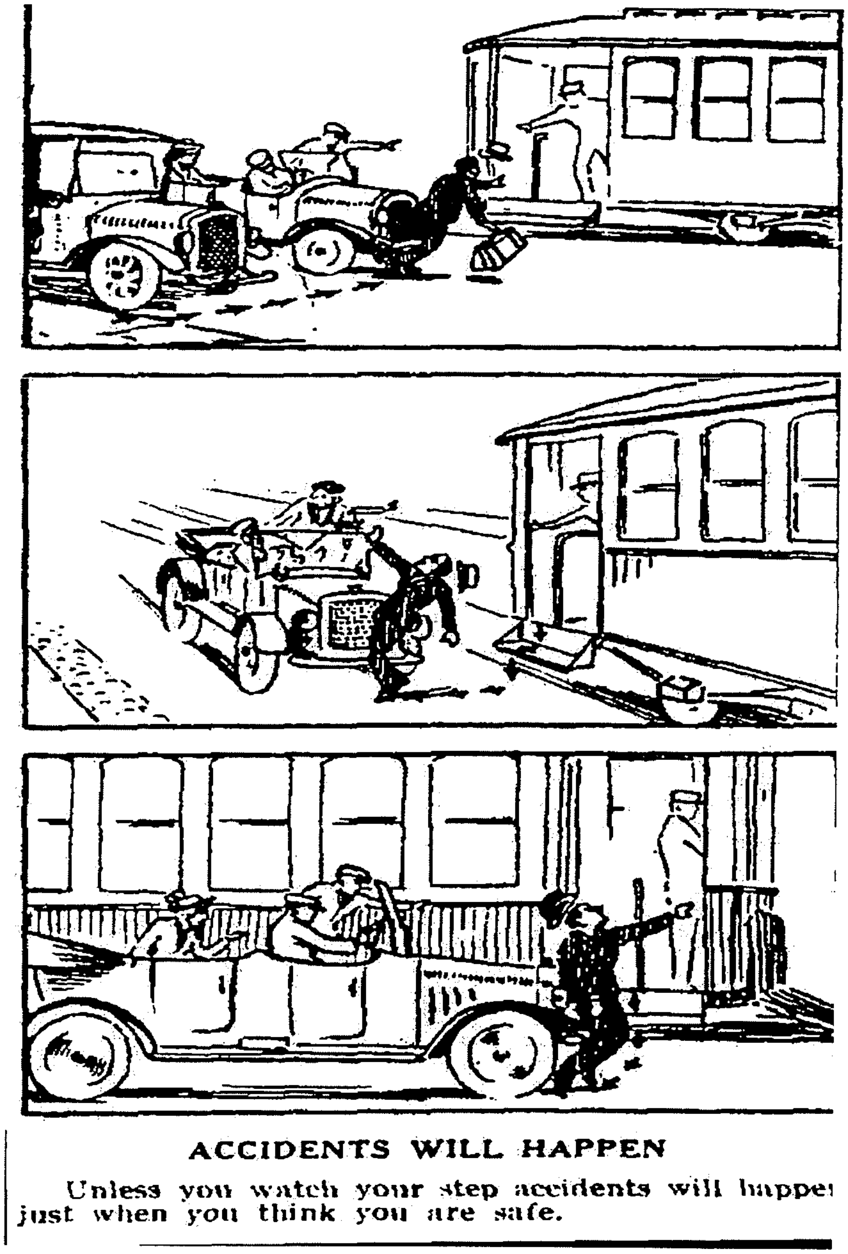

Figure 5.9. A 1923 reminder from B.C. Electric to its passengers to tread safely when boarding or departing streetcars.

Source: BCEEM 5.12 (1923) 14.

The proliferation of automobiles shortly before World War I led to an increase in the number of street accidents. The willingness of juries to award large sums of money to injured plaintiffs encouraged streetcar companies to review their safety policies.[108] Industry journals urged companies to adopt 'Safety First' programs. These educational programs were aimed at company employees, passengers, automobile drivers and all others who regularly used the street. The message was that the streets were now the dominion of streetcars and automobiles; all others, especially pedestrians, were advised to discipline themselves and adopt new habits in the name of safety.[109] These streetcar-company initiated programs—B.C. Electric's began in 1913—spawned demands for local community safety leagues to combat dangers posed by modern "mechanical contrivances" which "menace the existence of others."[110] In the early 1920s this movement took the form of 'Safety First' weeks and parades. Seattle's included advice on preventing accidents, including admonitions to jaywalkers, a caution on hanging electric appliance cords on nails, hooks or other metals and a suggestion on how to step

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[108] "The Evolution of 'Safety First'," by T.M. Lyall, n.d., UBCSC, BCER Records, box 45, file B-1340.
[109] "Extract from Minutes of Departmental Meeting," 21 January 1914; "Extract from Minutes of Management Meeting," 14 February 1914; Wagner to "Dear Sir," n.d., circa 1914; UBCSC, B.C. Electric Railway Company, box 45, file B-1370.
[110] "Safety-First League Needed," New Westminster News, 9 October 1913.

safely in and out of an elevator.[111] By 1912 B.C. Electric was advocating a similar safety week in Vancouver. The company also urged city council and community organizations to co-operate with the streetcar company in forming a local 'Safety Council' similar to safety councils that had been recently formed in Toronto and several American cities.[112]

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[111] "Safety Doctrine Will be Preached," Seattle Times, 4 April 1921.
[112] "A Week of Safety First," Vancouver Sun, 8 May 1922: 4; "'Safety First' Policy to be Emphasized," Vancouver Sun, 16 May 1922: 7; "Safety First Move Planned," Vancouver Sun, 16 September 1922: 1; "Safety Week is to be Planned," Vancouver Sun, 6 October 1922: 3.

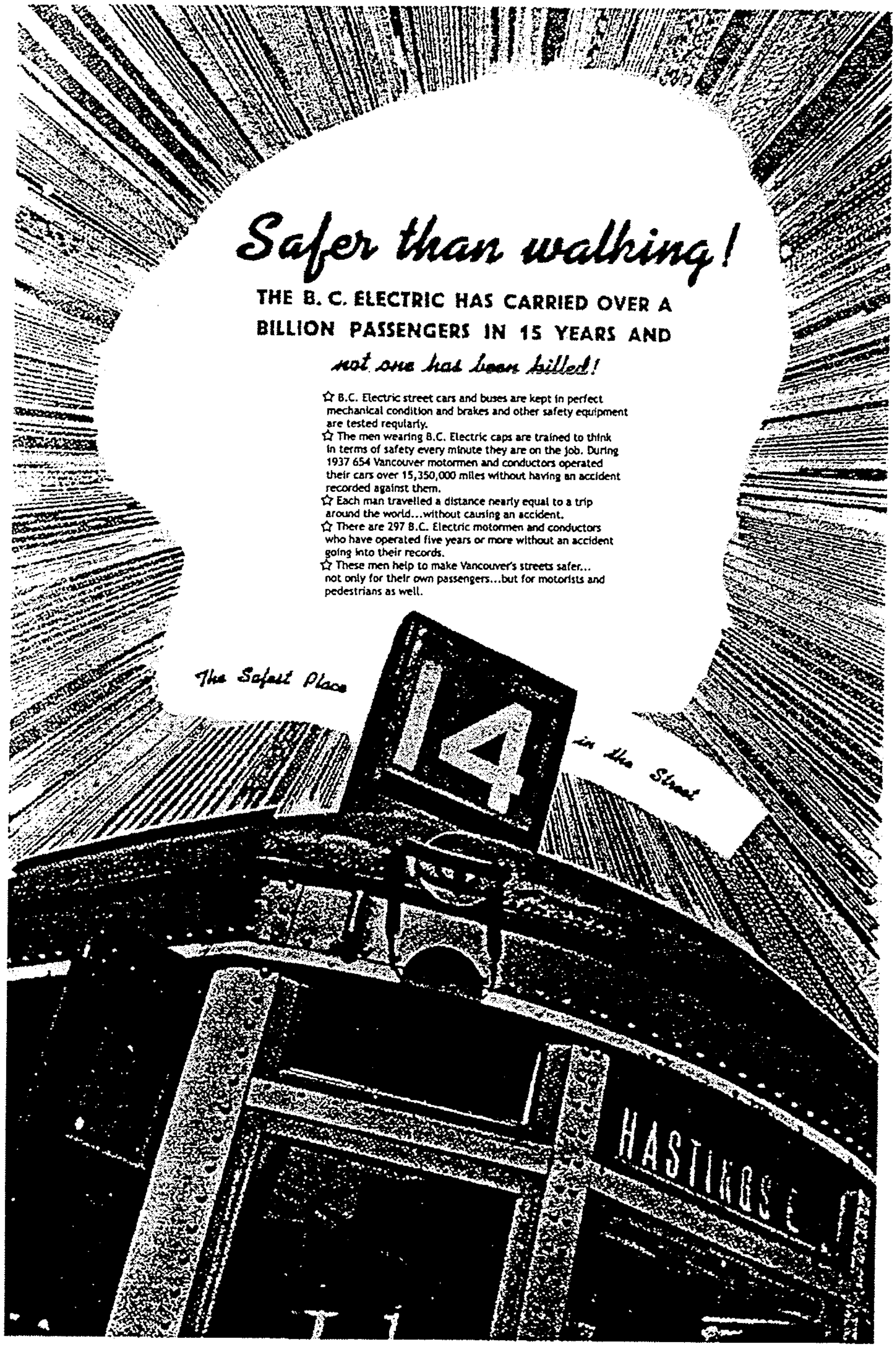

Figure 5.10. B.C. Electric advertisement proclaiming streetcars as the 'safest place in the street.'

Source: BCEEM 21.3 (1938) 7. The text has been reset for readability.

In 1927 advocates for a cooperative safety organization celebrated the formation of the B.C. Safety League, a new provincial member of the Canadian National Safety League. B.C. Electric was involved in the formation of the provincial chapter, which was dedicated to the reduction of accidents in the home, the workplace and the street.[113] A local Vancouver newspaper reported that the B.C. Safety League was specifically committed to reducing the number of traffic accidents in the province. It argued that while there were no doubt many reckless drivers at large, "in many cases it is the pedestrian who is to blame, and not infrequently the pedestrian is a child."[114] The League was instrumental in lobbying for changes to Vancouver's traffic bylaws that would place increasingly rigid regulations on pedestrians and cyclists. Its 1929 proposals included licence plates for bicycles and limitations on their handle-bar length. It also argued that speed limits in Vancouver were too low and that greater speed would save lives, a

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113 "B.C. Branch of Safety League Formed," Vancouver Province, 23 July 1927: 9.
114 "Working For Safety," Vancouver Province, 1 September 1927:6. The emphasis on children was common to safety education programs. B.C. Electric's 'Safety First' campaign of 1914 included safety presentations in Vancouver and Victoria schools by company employees, as well as posters being displayed in school rooms and hallways listing "Don'ts for Children." These included touching hanging electric wires and playing near streetcars. See "The Evolution of 'Safety First,'", circa March 1914, UBCSCD, BCER Records, box 45, file B-1370 and "Prefer School Traffic Duty by Policemen," ?, 1929, Vancouver Sun; "Safety Education Talks," Vancouver Sun, 14 May 1935.

proposal endorsed by the city's mayor.[115] In May 1929 the B.C. Safety League organized a four-day safety campaign that flooded Vancouver with lessons on the new rules of the road. The campaign included advertising, a safety-first film shown in local theatres, lectures in every Vancouver school, the teaching of a song entitled "Safety All the Time" to school children, and lectures at Sunday schools and church services on the importance of traffic regulations.[116] The campaign culminated with fifty men armed with megaphones storming B.C. Electric streetcars to deliver safety lectures to captive audiences. Passengers were counselled that their foremost responsibility was to obey traffic regulations and warned that "'jay-walking is a cut—to the hospital.'"[117]

The conflicts between pedestrians, streetcars and automobiles resulted in new traffic regulations intended to reduce traffic accidents while allowing for the rapid movement of streetcars and automobiles. A persistent problem was that streetcars dominated the middle of the street but were unable to move to the curb to load and unload passengers. Before the introduction of automobiles, streetcar passengers navigated between wagons, carriages, bicyclists and streetcars when

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115 "Vancouver Street Traffic too Slow Malkin Declares," 9 February 1929, ?? Star, UBCSC, B.C. Electric Newspaper Clippings, reel #29.
116 "Prepare Four-Day Safety Campaign," Vancouver Province 14 May 1929; "Safety League Plans to Open Drive May 19," 14 May 1929, ?? Star, UBCSC, B. C. Electric Newspaper Clippings, reel #29.
117 "Minute Men Talk Safety on B.C.E. Cars," Vancouver Sun 20 May 1929..

moving between streetcars and the sidewalk, a short journey often fraught with danger. When city streets began to fill with automobiles after 1910 passengers found themselves in even greater peril. The provincial government responded in 1912, on the advice of B.C. Electric, by amending the Motor Traffic Regulation Act to make it unlawful for an automobile to pass a stationary streetcar at a speed in excess of four miles an hour.[118] This regulation failed to protect streetcar passengers from unruly automobile drivers. The result was the complete prohibition on automobiles passing stationary streetcars. Automobile drivers were greatly displeased with this setback to their growing control of city streets and insisted that it was an unjustified and pernicious law. They received support from the Vancouver Sun which granted that pedestrians should be safe in the streets, but "vehicular traffic must not be slowed up. On the contrary, the demands of future years will call for even greater speed."[119]

In 1922 B.C. Electric responded to the need for greater safety for its passengers by introducing 'safety zones', an innovation that had first appeared in New York City in 1905 and been adopted and enhanced by other American cities. B.C. Electric's first safety zones were simple rectangular, chalk-drawn boxes where passengers could gather in supposed safety from onrushing automobiles.

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118 "Warning Issued to Motorists," Victoria Colonist, 15 December 1912.
119 "'Pedestrians Have Rights,'" Vancouver Sun, 25 September 1922: 4.

The City of Vancouver followed B.C. Electric's lead and began installing its own safety zones in 1923.[120] Vancouver's safety zones evolved from chalk outlines to raised platforms, four to five feet wide and the length of a streetcar, but both pedestrians and automobile drivers were dissatisfied with them. Pedestrians complained that they continued to be run down in the street. Drivers, while pleased that they no longer had to stop for streetcars, grumbled that they were still required to slow down when passing safety zones.[121] In contrast, B.C. Electric was fully supportive of Vancouver's safety zone program and urged the city to install more safety zones in the downtown area. The company claimed that the safety zones had greatly reduced the number of accidents in the city, but it also conceded that it had another motive. "'It is our objective to reduce the time necessary for travel between town and the residential districts, and in so doing we reduce street congestion to a minimum.'"[122] Under the rubric of 'safety first' B.C. Electric sought to transform downtown streets to shorten the commute between the

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[120] "Safety Zones Needed," Vancouver Sun, 18 August 1922; "Police Inaugurate Safety Zone Plan," Vancouver Sun, 29 May 1923; McShane, Down the Asphalt Path, 186 and 198.

[121] "Safety Zones Not Success," Vancouver Sun, 19 November 1927: 24; "Zones May Go Owing to Auto Drivers' Haste," Vancouver Sun, 5 November 1927: 4; "Rules as to Safety Zones Not Clear to Autoists," Vancouver Province, 29 May 1927: 9; "Says Motorists Have No Right to Pass Street Cars at Safety Zones," Vancouver Sun, 14 February 1929.

[122] "B.C.E.R. Urges Safety Zones," Star, 10 February 1927: 1.

city and the suburbs. This was hazardous space in the employ of space-time compression for the benefit of the suburban middle-class.

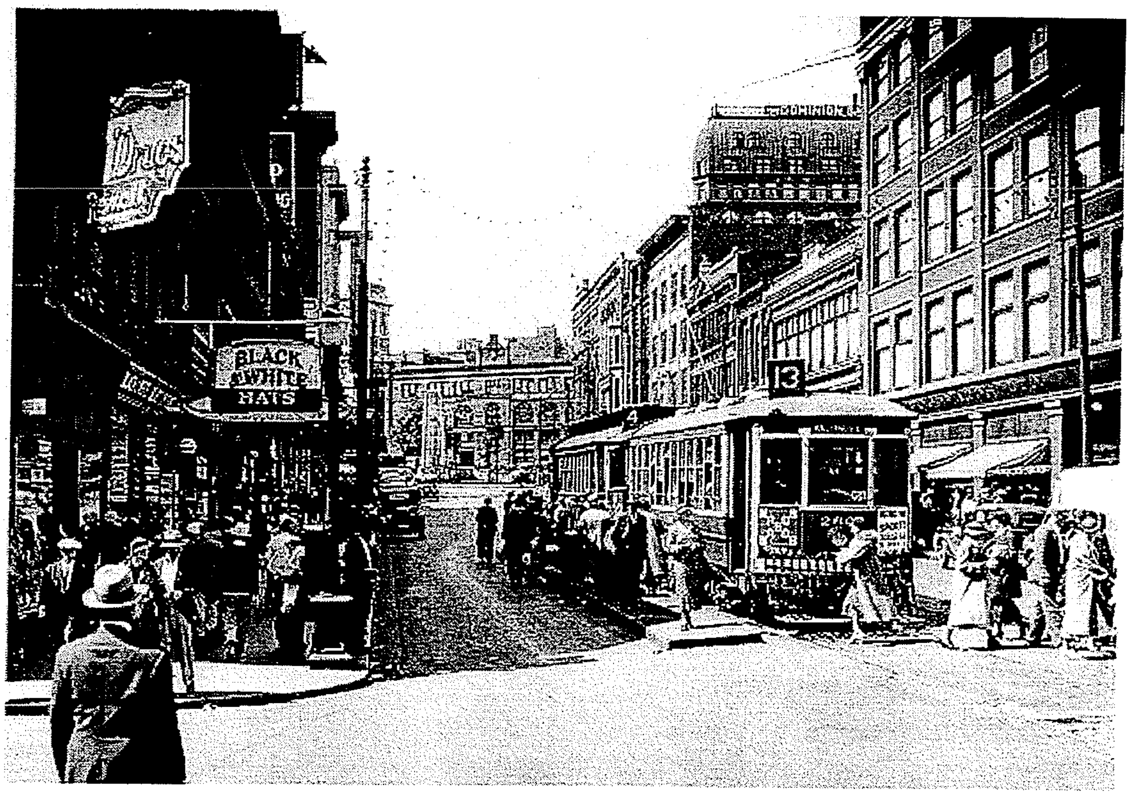

Figure 5.11. A safety platform at the intersection of Hastings and Abbott Streets, Vancouver, 1935.

Source: Vancouver Public Library #7837.

Conclusion

Through the production of hazardous space the electric industry exercised increased power over everyday life. The development of the hydroelectric industry created new hazardous space in the home, on the street and in the natural world. This hazardous space was both real and imagined. By creating and defending this space corporations such as B.C. Electric extended their authority and control over previously public or private spaces in the country and the city. Hydroelectric dams, transmission systems, electric lighting and streetcars were part of a new technological system that transformed public and private space. They imposed new disciplines, imposed new rules of conduct and in the process revealed class divisions.[123] In this way, city streets and natural rivers were similarly transformed. They were brought under the umbrella of a single technological system and often a single corporation. The transformation also included a temporal element as represented by the operation of hydroelectric dams and streetcars. The dominance and operation of these components of the electric industry exemplified the ascendance of time over space. Through time-space compression organic, natural,

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[123] An example of this argument in the literature on automobiles is found in Sachs, For Love of the Automobile. See especially pp. 12-13.

concrete space was framed, disciplined and marginalized by the production of electric space.

Chapter 6

Conclusion: Electric Space in British Columbia

Early hydroelectric power installations resembled older waterpower developments based on waterwheels. They were located close to the site where the energy was utilized, they were relatively inexpensive and locally controlled, and as run-of-river projects they did not depend on a dramatic re-engineering of the river. With run-of-river hydroelectric projects the natural basis of the energy source was apparent. This system had definite limitations. The amount of energy that could be generated was not significantly greater than older systems of energy conversion. Also, the energy supply was unreliable due to natural fluctuations in the water supply. This necessitated the maintenance of an auxiliary oil or coal-powered thermal generator. The industries that abandoned their older energy sources for hydroelectricity, and the corporations that began to supply electricity to businesses and city residents, sought to overcome these limitations. Their vision was of an unlimited supply of energy available at any time, regardless of the natural hydrologic cycle. The realization of this dream required the storage of greater and greater amounts of water, the spatial reorganization of natural rivers and lakes and the transformation of natural rhythms. To overcome the shortage of water in the Victoria area B.C. Electric moved its major generation facility out of the rain shadow on the south eastern corner of Vancouver Island to the Jordan

River in the San Juan River watershed. In the Vancouver area there was an abundance of precipitation and several opportunities to generate hydroelectricity within 100 kilometres of the city, but development of adequate storage required spatial reorganization through the construction of large dams and two diversion tunnels. By the end of the 1920s B.C. Electric had acquired control of and fully developed the best hydroelectric locations near Vancouver. The economics of the hydroelectric industry led B.C. Electric to look farther afield for a larger development, which it found 135 miles north on the Bridge River. For West Kootenay Power, the solution to the storage problem was its 1938 go ahead to use the Corra Linn dam to store water on Kootenay Lake.

The movement towards larger and more invasive hydroelectric facilities was also driven by the peculiar economics of hydroelectric generation. The British Columbia government controlled the right to develop provincial sites to generate hydroelectricity from natural flowing water but it did not place a high value on this water. Instead, it adopted a policy of 'beneficial use' which assumed that water had a 'duty' to be as productive as possible. In this configuration water's only value lay in the energy it could made to generate; the detrimental effects of hydroelectric generation were not part of the equation. Consequently, capitalist schemes which promised the greatest generating capacity were favoured over small projects with low generation. The water itself was practically given away and salmon runs were sacrificed as long as the water was made to generate as much electricity as possible. This system of property rights further skewed the costs and benefits of hydroelectric generation. High fixed costs for the construction of hydroelectric dams and generating stations combined with cheap water and a disregard for the uncalculated costs of flooding valleys and transforming natural river flows, drove the industry towards giantism and its social and environmental consequences.

Greater generating capacities also meant greater corporate social and economic power. Whereas early run-of-river hydroelectric plants had cost only a few thousands of dollars, the high fixed-costs of large-scale storage and generation facilities required large, multi-million dollar capital investments. Capitalists were reluctant to make these investments unless they had a guaranteed market for their product. The fortunes of the Western Canada Power Company had illustrated the economic folly of investing in a major project without a guaranteed market. It was this logic of hydroelectric development that demanded streetcar franchises and long-term water licenses. It also drove B.C. Electric to wring monopoly guarantees out of local governments and thwart or acquire potential competitors.

The structure of the hydroelectric industry also affected consumption. The tendency towards giantism meant that hydroelectric companies did not simply look to increase their generating capacity to meet expected demand, they looked to build larger, more cost effective generating facilities with larger and larger generating capacities. B.C. Electric's first Vancouver-area hydroelectric plant, the

1903 Buntzen/Coquitlam facility, had an initial generating capacity of six thousand kilowatts. Nine years later Western Canada Power brought its Stave Falls plant online, with an initial capacity of twenty thousand kilowatts. Within five years B.C. Electric was beginning work on Bridge River, which had the potential to generate 500,000 kilowatts. Exponential increases in generating capacity meant that the market was frequently flooded with a huge increase in supply creating a situation of supply in search of demand.

An unprecedented supply, represented by huge reservoirs in mountain valleys, influenced the industry's efforts to market its product. With the technological infrastructure in place and with 'free' water stored and waiting to generate electricity, the obvious step was to encourage greater consumption because it would lead to almost pure profit. This logic, although especially applicable to hydroelectricity, was common to the entire electric industry, as exemplified by Insull's influential 'gospel of consumption.'

Fixed-costs and water storage also influenced the electric industry's decisions on how to market electricity. Transactions between electricity wholesalers aside, electrical energy is never sold as a distinct, isolated commodity. Electricity, as the potential to do work, is sold as part of a set of social relations which involve space, time and machines. In this sense, Edison and other leaders in the development of the electric industry were not simply creating and selling a system for the production and consumption of electricity; as Le Corbusier, Gropius and other architects recognized, they were promoting a new system for living. For central generating stations an important aspect of this new system was its potential to fill-up the valleys on the daily load chart. The industry made its greatest profits by selling electricity at times of the day when there was low demand. For this to occur there had to be work to do that required electrical energy. Beginning in the pre-War World I years and escalating during the 1920s, the industry embarked on an ambitious project to transform social relations by changing the way people worked.

There was a strong gender element to this project. The industry attempted to convince women performing household work to adopt equipment that required electricity. In some instances this involved remodelling established equipment for a new energy source (e.g. stoves and irons); in other cases it involved new equipment (electric vacuums). It also involved new standards of cleanliness, which created more work and therefore required more energy, and new ideas regarding the purpose of household work. Household work was reduced to questions of efficiency and economy, of production and consumption.

The development of hydroelectricity contributed to the increased alienation of society from nature in several ways. The replacement of waterwheels with hydroelectricity marked a crucial change in the relationship between society and the kinetic energy of falling water. Energy derived from waterwheels was part of a local, tactile and knowable energy regime. There was no doubt as to the source of the energy and the effects of its generation were readily apparent. Hydroelectricity was part of a very different energy regime. Hydroelectricity appeared to sever the connection between production and consumption. As the industry developed and long distance transmission technology improved, the distance between the site of generation and the site of utilization of hydroelectricity increased, further alienating consumers from the natural and technological basis of hydroelectric generation.

While the increased long distance transmission of hydroelectricity alienated society from its energy source it also produced a new space based on interconnectivity. The 'crisis of abundance' in the hydroelectric industry and the logic of load factor management encouraged central generating stations to connect to each others transmission systems in the search for new markets. The Western Canada Power Company's arrangement to transmit excess power from its new Stave Falls plant to Bellingham, Washington was the first example. Similarly, West Kootenay Power's successful application to the International Joint Commission to store water on Kootenay Lake had allowed it to send excess power across the border to the Washington Power Company. The ability to generate and transmit larger and larger amounts of energy over increased distances allowed the electric industry to imagine new and more expansive electric spaces of consumption. Instead of thinking in terms of local seasonal fluctuations in supply and demand, the electric industry increasingly thought in continental terms.

The system that developed in southern British Columbian and the American Pacific Northwest was an example of continental load factor management. In British Columbia and the American Pacific Northwest demand for electricity peaks during cold winter months and slackens during warm summers. In the American Southwest the opposite is true. Demand for electricity is greatest during hot summers when air-conditioners are maximized and lessens during the region's mild winters. The dream of connecting the two regions for continental load factor management dated to 1919, but remained unrealised due to technological limitations on the long-distance transmission of electricity and the northwest's fear of losing control of its power and water to California. By the early 1960s the long-distance transmission of electricity had improved and desire to sell electricity overcame regional fears of loss of autonomy. A proposal emerged to connect eleven western states through four main transmission lines. It was proposed by the American Congress in August, 1964 and on 17 September, the day after President Johnson and Prime Minister Pearson had signed the Columbia River Protocol at the Peace Arch in Blaine, Washington, Johnson attended the "Intertie Victory Breakfast" in Portland, Oregon.[1] The system that finally emerged created a electric space of production and consumption that spans the continent (see Figure 6.1).

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[1] Paul C. Pitzer, Grand Coulee: Harnessing a Dream (Pullman, Washington: Washington State University Press, 1994) 339-40.

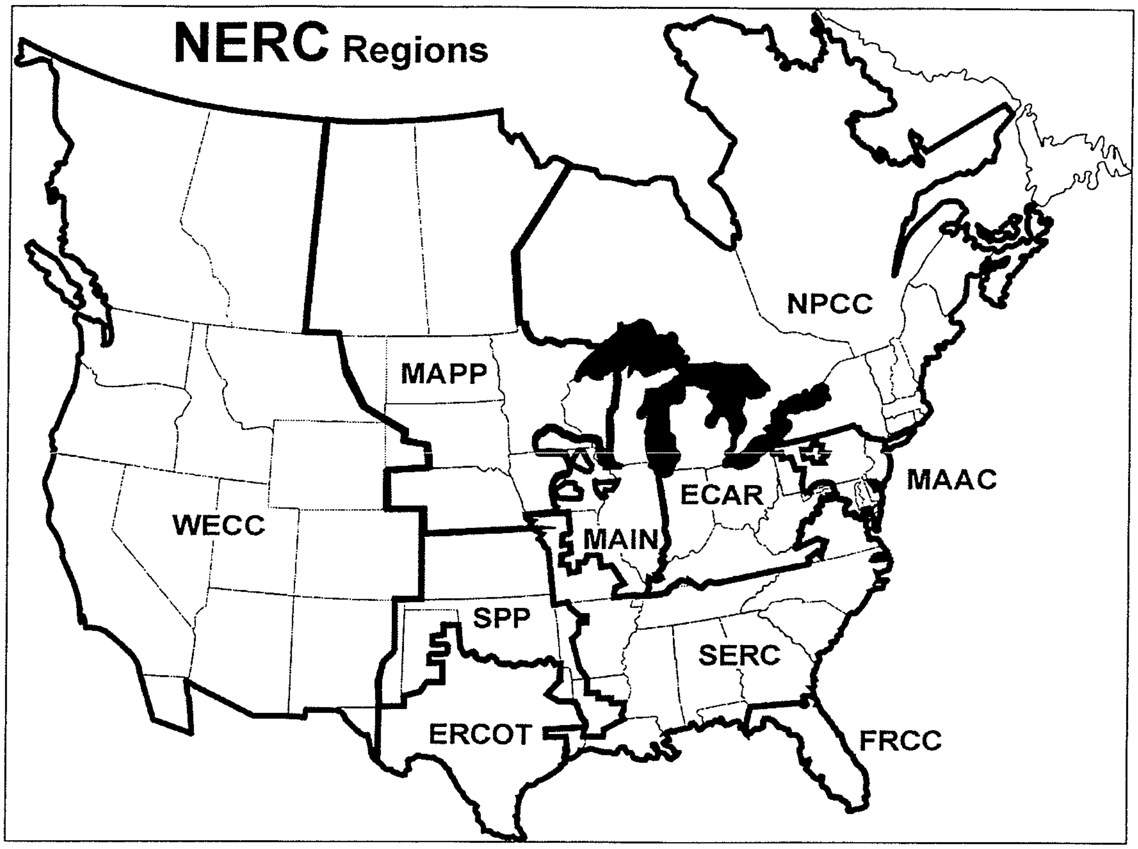

Figure 6.1. Map of the NERC Regions. British Columbia is now part of the Western Electricity Coordinating Council (WECC), a power grid that reaches from British Columbia to New Mexico.

Source: North American Reliability Council internet site; http://www.nerc.com/regional/nercmapbw.jpg

Just as the hydroelectric industry's system of production served to alienate society from its energy source, so too did its system of consumption. The conversion of kinetic energy to electrical energy and its transmission hundreds of miles to a point of consumption created a perfect opportunity for the fetishization of nature's work. The electric industry, dominated by General Electric, Westinghouse and powerful local generating stations, sought to attach a new set of ideas to the utilization of electrical power that had little to do with the natural and social realties of the electric energy regime. Instead of invoking images of dammed rivers, flood valleys, marginalized aboriginals, submerged communities and powerful corporations, electricity was presented to consumers as a modern, clean, unlimited and benign energy source. Furthermore, the private and public urban spaces created through the efforts of the electric industry confirmed the illusion. City streets awash in electric light were a space for uncritical consumption. Similarly, the interiors of buildings, transformed through a reliance on the new energy regime, were a space for detached consumption. In this way the domestic spaces exemplified by Frank Lloyd Wright's architecture resembled other spaces of capitalism, with the house's occupants observing and consuming an external world separate from them; sitting in one of Wright's living-rooms resembled riding a train, attending an exhibition or window-shopping.

During its formative years the electric industry expended considerable resources on creating a consumer space suitable for a dramatic increase in energy consumption. In the process it contributed to the creation of a suburban middle-class dependent on the new energy regime. The middle class wanted to live in a space that was a hybrid of country and city. Through space-time compression the electric industry, with the support of the state, sought to create this hybrid. This space imposed new rhythms on nature, created new hazards for everyday life and marginalized social groups and ways of being in the world.

The development of a new energy source, based on a large-scale technological system and corporate capitalism, led to the production of electric space in both the country and the city in British Columbia prior to World War II. Both rural and urban space was homogenized and 'pulverized' to meet the demands of production and consumption in the hydroelectric industry. The natural basis for this new energy-intensive society was obscured by the technological system that generated and delivered the energy to urban consumers. Paradoxically, as this energy regime developed consumers became increasingly dependent on and alienated from the natural world.

Appendix A: British Columbia Hydroelectric Plants to 1914

Sources: Canada, Commission of Conservation. Water-Powers of Canada (Ottawa: Mortimer Co., 1911) 317-28; G.R.G. Conway, Water Powers of Canada: Province of British Columbia (Ottawa: Dominion Water Power Branch, 1915) 23-148; "Report of the British Columbia Hydrographic Survey, 1913" Water Resources Paper No. 9 (Ottawa, 1915) 22-49; "Report of the British Columbia Hydrographic Survey, 1914" Water Resources Paper No. 14 (Ottawa, 1916) 17-25, 33-41; "Report on Small Water-Powers," Water Resources Paper No. 12 (Ottawa, 1915) 273-85); Jeremy Mouat, The Business of Power: Hydro-Electricity in Southeastern British Columbia, 1897-1997 (Victoria: Sono Nis Press, 1997).

Location	Capacity (kW)	Operator
Towns and Cities		
Buntzen Lake	61,500	Vancouver (B.C. Electric)
Stave Lake	20,000	Vancouver (Western Canada Power)
Jordan River	18,655	Victoria (B.C. Electric)
Goldstream	3,000	Victoria (B.C. Electric)
Upper Bonnington	3,000	Nelson
Barrier River	2,090	Kamloops
Illecillewaet River	1,500	Revelstoke
Woodworth Lake	1,230	Prince Rupert
Millstream	375	Nanaimo Electric Light Co.
Boundary Creek	150	Greenwood City Power and Light
Arrowhead Creek	112	Arrowhead, B.C.
Fortune Creek	112	Armstrong, B.C.
Illecillewaet River	75	Glacier, B.C. (CPR Hotel)
Murray Creek	75	Spence's Bridge (Mr. Clemens)
Nakalliston Creek	25	Mount Olie Light and Power Plant
Bonaparte Creek	?	Ashcroft, B.C.
Carpenter Creek	?	New Denver, B.C.
Four-Mile Creek	?	Silverton, B.C.
Kaslo River	?	Kaslo, B.C.
Subtotal	111,899	

Mining & Smelting

Upper Bonnington	12,000	West Kootenay Power
Puntledge River	7,000	Canadian Collieries (Dunsmuir)
Falls Creek (Anyox)	5,500	Granby Consolidated Mining, Smelting & Power Company
Granby	5,500	Granby Mining, Smelting and Power
Lower Bonnington	3,000	West Kootenay Power
Cascade (Kettle River)	2,240	West Kootenay Power
Britannia Creek	2,040	Britannia Mining and Smelting
Similkameen River	2,000	Hedley Gold Mining Co.
Twenty-Mile Creek	560	Hedley Gold Mining Co.
Granby	485	Granby Mining, Smelting and Power
Four-Mile Creek	485	Silverton, B.C.
Sheep Creek	450	Sheep Creek, B.C.
Granite Creek	400	Silverton, B.C.
Cedar Creek	375	Ainsworth, B.C.
Carpenter Creek	260	Sandon, B.C.
Mark Creek	260	Kimberley, B.C.
Four-Mile Creek	240	Silverton, B.C.
Payne & Reciprocity Cr.	225	Sandon, B.C.
Carpenter Creek	200	Sandon, B.C.
Juniper Creek	190	Rocher de Boule Copper Co.
North Fork of Salmon R.	190	Salmo, B.C.
Indian Creek	190	Riondel, B.C.
Kokanee Creek	150	Nelson, B.C.
Beaver Creek	150	Ymir, B.C.
Twelve-Mile Creek	150	Kaslo, B.C.
Whitewater Creek	150	Kaslo, B.C.
Ten-Mile Creek	112	Slocan Valley
Wilson Creek	112	Roseberry, B.C.
Wild Horse Creek	112	Ymir, B.C.
Tributary & Miller Creeks	105	Sandon, B.C.
Cedar Creek	95	Ainsworth, B.C.
Kaslo Creek	75	Kaslo, B.C.
Cathedral Creek	75	Field, B.C.
Sandon & Whitewater C.	55	Sandon, B.C.
Last Chance Slide Creek	37	Sandon, B.C.
Avalanche Rapids	30	Ymir, B.C.
Carpenter Creek	26	Sandon, B.C.

Gilley Creek	?	Gilley Brothers (Rock Quarry)
<u>Subtotal</u>	45,224	

<u>Wood, Pulp and Paper</u>

Powell River	17,900	Powell River Co.
Link River	8,357	Pacific Mills
Swanson (Mule) Creek	930	Swanson Bay Forests, Wood Pulp & Lumber
Crazy Creek	112	Taft, B.C. (Sawmill)
<u>Subtotal</u>	27,299	

<u>Canneries</u>

Mill Bay, Nass River	112	Kincolith Packing Plant (Cannery)
<u>Subtotal</u>	112	
<u>Grand Total</u>	184,634 kW	

Appendix B: British Columbia Hydroelectric Plants to 1939

Sources: A. Vilstrup, "Early History of the British Columbia Electric Power System in the Lower Mainland of British Columbia," address before the Vancouver section of the American Institute of Electrical Engineers, 20 March 1936, UBCSC; Henry Ewert, The Story of the B.C. Electric Railway Company (North Vancouver: Whitecap Books, 1986); George Green, "Some Pioneers of Light and Power," British Columbia Historical Quarterly 2.3 (1938): 145-62; Patricia E. Roy, :The British Columbia Electric Railway Company, 1897-1928: A British Company in British Columbia," Ph.D. University of British Columbia, 1970; G.R.G. Conway, Water Powers of Canada: Province of British Columbia (Ottawa: Dominion Water Power Branch, 1915); Canada. Commission of Conservation, Water-Powers of Canada. (Ottawa: Mortimer Co., 1911); Canada. Commission of Conservation, Water Powers of British Columbia (Ottawa: Commission of Conservation, 1919); George E. Luxton, "The Electric Power Industry in British Columbia," Graduating Essay, UBC, 1933; B.C. Department of Lands, Water Powers of British Columbia (Victoria: British Columbia, 1924); Jeremy Mouat, The Business of Power: Hydro-Electricity in Southeastern British Columbia, 1897-1997 (Victoria: Sono Nis Press, 1997); Boyd C. Affleck "A History of the Cottonwood Falls Hydro-Electric Plant, Nelson, B.C.," Nelson Museum, Mss 262; Boyd C. Affleck, "City Power Plant Had Major Part in Nelson's History," Nelson Museum, Mss 265; "Early Development and Progress of the B.C. Electric Railway Company," BCEEM 8.12 (March, 1926): 5-41; "General History B.C. Electric," Add Mss 321, vol. 1, Vancouver City Archives; Henry Ewert, The Story of the B.C. Electric Railway Company (North Vancouver: Whitecap Books, 1986); Cecil Maiden. Lighted Journey: The Story of B.C. Electric. Vancouver: British Columbia Electric Company Ltd., 1948; "BCE Plans $33 Million Program," Vancouver Sun, 28 November, 1953: 1-2; Canada, Water Resources Branch. Water Powers of Canada. (Ottawa, 1958) 69.

Note: Many of the sources are contradictory regarding dates and generator capacity. An attempt has been made to compare them and come to the best approximation; * indicates circa. Most of the sources measure capacity in horsepower. These totals have been converted into totals and kilowatts and rounded. Some, but not all, of the generating capacity expansions for major generating stations have been noted.

Name	Year	Location	Capacity	Operator
Cottonwood	1896	Cottonwood Creek	70	Nelson Electric Company
Sandon	1896	?	?	Sandon Water Works and Light Company
Kaslo	1897	Kaslo River	?	Kootenay Electric Company
Ainsworth	1898	Kootenay Lake	?	?
Lower Bonnington #1	1898	Kootenay River	1,500	West Kootenay Light and Power
	1899		3,000	
	1925		30,000	
	1926		45,000	
Goldstream	1898	Goldstream River	700	B.C. Electric
	1903		1,200	
	1905		2,200	
Cascade Falls	1902	Kettle River	1,680	Cascade Water Power and Light Co
Hedley	1903	Twenty-Mile Creek	560	Hedley Gold Mining Company
Buntzen	1903	Buntzen Lake	6,000	B.C. Electric
	1909		16,000	
	1911		21,000	
	1914		61,500	
	1951		79,000	
Upper Bonnington #2	1906	Kootenay River	12,000	West Kootenay Light and Power
	1916		25,400	
	1940		64,000	
Britannia Creek	1907	Britannia Creek	2,000	Britannia Mining & Smelting
	1922		9,500	

Upper Bonnington	1907 1949	Kootenay River	3,000 10,000	City of Nelson
Granby	1910*	Kettle River	520	Granby Mining, Smelting and Power
Jordan River	1911 1953	Jordan River	18,655 30,000	B.C. Electric
Ashcroft	1910*	Bonaparte River	?	?
Powell River	1911 1925	Powell River	17,900 45,000	Powell River Company
Ocean Falls	1911	Link River	18,000	Pacific Mills
Illecillewaet River	1911*	Illecillewaet River	1,500	City of Revelstoke
Swanson Bay	1911*	Mule Creek	930	Swanson Bay Forests, Wood Pulp
Stave Falls	1912 1926	Stave River	20,000 65,000	Western Canada Power Company
Puntledge	1913 1955	Puntledge River	8,900 26,117	Canadian Collieries (Dunsmuir)
Barrière River	1914	Barrière River	1,500	City of Kamloops & Lumber Mills
Prince Rupert	1914* 1930	Woodworth Lake	1,200 6,000	Northern B.C. Power Corporation
Anyox	1913	Falls Creek	5,500	Granby Consolidated Mining, Smelting & Power Company
Lois River	1920* 1948	Lois River	16,400 37,000	Powell River Company

Bull River	1922	Bull River	5,300	B.C. & Alberta Power Co.
Elk River	1924	Elk River	11,000	East Kootenay Power Co.
Alouette	1928	Stave Lake	9,000	B.C. Electric
South Slocan	1928 1929	Kootenay River	27,300 46,000	West Kootenay Light and Power
Shuswap Falls	1928 1942	Shuswap River	2,800 5,800	Western Canadian Hydro
Ruskin	1930 1950	Stave River	35,000 105,000	B.C. Electric
Corra Linn	1932	Kootenay River	42,500	West Kootenay Light and Power
Bridge River	1934 1953	Bridge River	3,500 185,000	B.C. Electric

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