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Creating Supply, Creating Demand: Gas and Electricity in Montréal from the First World War to the Great Depression

Résumé
Réduire l'utilisation d'énergie est un impératif urgent pour les sociétés occidentales. Pourtant, il est dur d'anticiper comment cela se fera et quelles conséquences seront engendrées. Cet article avance que l'étude de l'histoire énergétique aide à comprendre la flexibilité des systèmes énergétiques. À partir du cas de Montréal, il analyse la fluctuation de l'offre et de la demande en électricité et en gaz entre la Première Guerre mondiale et la Grande dépression, une période marquée autant par l'expansion que par la stagnation des systèmes énergétiques. En étudiant les activités de la compagnie énergétique monopolistique de la ville ainsi que les pratiques des consommatrices et consommateurs d'énergie, cet article propose une typologie de quatre différents types de flexibilité énergétique : flexibilité à la hausse menée par les fournisseurs, flexibilité à la baisse menée par les fournisseurs, flexibilité à la hausse menée par les consommateurs, flexibilité à la baisse menée par les consommateurs. Les conclusions de cette analyse ont des répercussions importantes sur l'analyse des mégaprojets énergétiques futurs et sur le façonnement de la consommation d'énergie. Elles montrent aussi comment l'histoire énergétique révèle la manière dont les structures héritées du passé influencent les décisions futures.

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INTRODUCTION: THE FAULT LINES OF GROWTH

1 Looking at a chart illustrating the evolution of global energy consumption since the 19th C. tells a pretty straightforward story (fig. 1). Slow growth during the 19th C. was superseded by an exponential increase in the 20th C., in particular from the 1950s onwards. Historian Steve Penfold has recently, and provocatively, argued that "you could reduce the entire history of Canadian gasoline to a single keyword: *more*."[1] Claims like these reinforce the impression that the history of modern energy consumption is one of growth and acceleration. However, by zooming in on the chart we discover a different story that is both geographically and historically situated. At various points over the last two centuries there have been phases of *reduced* energy consumption (fig. 2). For example, wars and economic recessions have sometimes caused people to use less energy than they had done before.[2]

2 These episodes are tremendously revealing in that they allow historians to examine past forms of flexibility. Anthropogenic climate change, carbon emissions from fossil fuels, and resource scarcity compel industrialized nations to reduce energy consumption and in response, policymakers and scholars argue for greater energy flexibility. There are different interpretations of what this actually means. Some argue that energy flexibility must come from the supply side: in other words, the energy sector needs to promote the development of renewable energy sources and the reduction of energy intensity through technological improvement.[3] Others contend that energy flexibility must come from the demand side: for them, individuals need to change their energy-intensive lifestyles and pivot towards more sustainable ways of living.[4] This article argues that these two positions are reconcilable: going further, it suggests that supply and demand within energy systems are inextricably linked, both when energy systems expand and when they contract.

3 The story it tells takes place in Montréal during the first half of the 20th C., a period during which the city was Canada's economic, industrial, and cultural capital.[5] The First World War is its starting point: during this period, energy entrepreneurs built additional gas and electricity capacity to help meet the requirements of energy-intensive wartime production. Once the war ended, the monopolistic gas and electricity utility controlling the city of Montréal generated more energy than its home market could immediately absorb. For this reason, the utility actively sought to create markets by encouraging the adoption of energy consuming appliances, and by promoting conventions of cleanliness and comfort as a means of fostering the normalization of lifestyles dependent upon limitless and invisible forms of energy. But these plans were severely checked by the Great Depression of the 1930s. Economic hardship and massive unemployment in Montréal led to a reduction in energy consumption, and to something of a reversal in energy-intensive lifestyles: a historically significant moment. The last part of the paper reviews these trends and proposes a typology of flexibility, based on experiences in Montréal from the 1910s to the 1930s. Based on municipal, provincial, and business archives, the paper provides new

1 Steve Penfold, "Petroleum Liquids", *in* Ruth W. Sandwell (ed.), *Powering up Canada: A History of Power, Fuel, and Energy from 1600*, (Montréal & Kingston: McGill-Queen's University Press, 2016), 277. Italics in the original.

2 Jean-Baptiste Fressoz, "Pour une histoire désorientée de l'énergie", *in* Daniel Thevenot (ed.), *25èmes Journées Scientifiques de l'Environnement - L'économie Verte En Question*, Journées scientifiques de l'environnement (Créteil, France, 2014).

3 See for example: Eric Martinot, "Grid Integration of Renewable Energy: Flexibility, Innovation, and Experience", *Annual Review of Environment and Resources*, vol. 41, 2016, 223–51.

4 See for example: Clare Hocking and Ulla Kroksmark, "Sustainable Occupational Responses to Climate Change through Lifestyle Choices", *Scandinavian Journal of Occupational Therapy*, vol. 20, no° 2, 2013, 111–17.

5 This changed after the Second World War, when Toronto took the crown. For more discussion on this topic, see: Jane Jacobs, *The Question of Separatism: Quebec and the Struggle over Sovereignty*, 2nd ed. (Montréal: Baraka Books, 2011); Mario Polèse, "Montréal économique : de 1930 à nos jours," *in* Dany Fougères (dir.), *Histoire de Montréal et de sa région, t. II* (Québec: Presses de l'Université Laval, 2012), 959–1004.

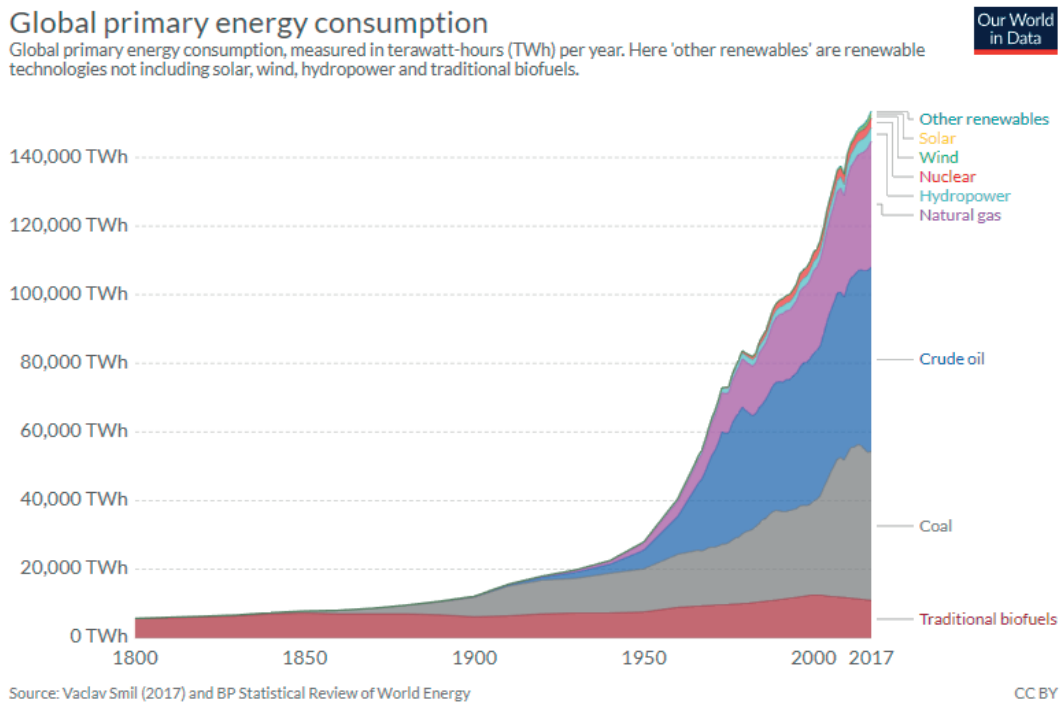

Figure 1: Global energy consumption. Source: Ritchie and Roser, 2018.[6]

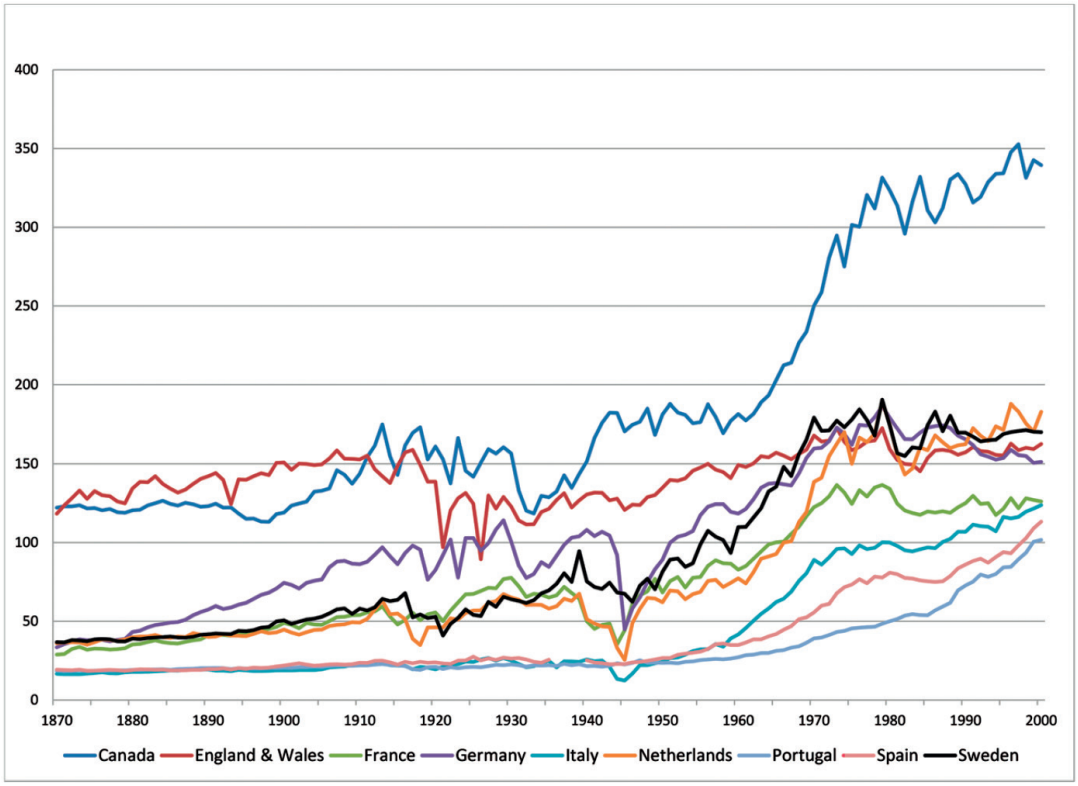

Figure 2: Energy consumption per capita in different Western countries. Source: Unger, 2018.[7]

6 Hannah Ritchie and Max Roser, "Energy Production & Changing Energy Sources", *Our World in Data*, 2018, https://ourworldindata.org/energy-production-and-changing-energy-sources.

7 Richard W. Unger, "Shifting Energy Sources in Canada: An International Comparison, 1870–2001", *Canadian Journal of History*, vol. 53, n° 3, 2018, 489.

insights into present and future energy transitions, arguing that supply and demand cannot be treated separately and that if decarbonization is to happen, both supply- and demand-side solutions need to be considered simultaneously.[8]

GREAT WAR, GREAT BUSINESS

4 At the dawn of the First World War, Montréal was Canada's major metropolis, and home to around 500,000 inhabitants.[9] After the development of thermoelectricity — generated from the combustion of coal — in the last two decades of the 19th C., Anglo-Canadian businessmen with experience in running urban utilities started to construct hydroelectricity schemes in the late 1890s, building run-of-the-river generating stations at Lachine in 1897 (fig. 3) and Chambly in 1899. Montréal's unique situation meant that the city had access to a variety of energy sources: it is nestled within a particularly rich hydrographic basin (fig. 4) and relatively close to the coal deposits needed to produce manufactured gas.[10] In that sense, this case study documents the energy history of a city in which there was an abundance of energy supply, an oddity compared to cities like Berlin.[11]

5 The city's local entrepreneurs could also count on both British and American capital to help them finance the construction of large infrastructure. All three levels of government — municipal,

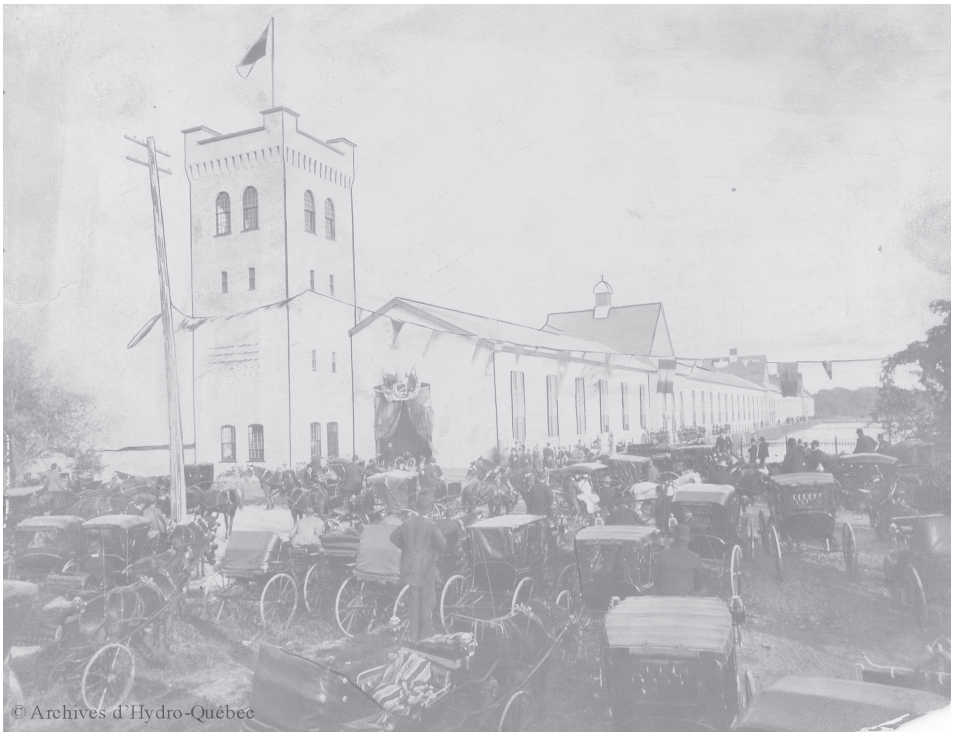

Figure 3: Opening day at Lachine, 1897. Source: Hydro-Québec Archives

8 This article is based upon the author's master's thesis. See: Clarence Hatton-Proulx, "A Lust for Power. Electrifying Montréal's Streets and Homes, 1884-1939" (M.A. Thesis, Toronto, York University, 2019).

9 Ville de Montréal, "Population Totale et Variation de La Population, Agglomération de Montréal," *Ville de Montréal* (blog), 2016, http://ville.montreal.qc.ca/portal/page?_pageid=6897,67887840&_dad=portal&_schema=PORTAL.

10 On Montréal's water history, see : Michèle Dagenais, *Montréal et l'eau. Une histoire environnementale* (Montréal: Boréal, 2011); Dany Fougères, *L'approvisionnement en eau à Montréal. Du privé au public, 1796-1865* (Québec: Septentrion, 2004); Robert Gagnon, *Questions d'égouts. Santé publique, infrastructures et urbanisation à Montréal au XIXe siècle* (Montréal: Boréal, 2006).

11 See this article in the special issue: Timothy Moss and Siddharth Sareen, "Demanding Demand: Political Configurations of Energy Flexibility in Berlin, 1920-2020", *Journal of Energy History / Revue d'Histoire de l'Énergie [Online]*, n°5, 2020.

Figure 4: MLHP's main gas and electricity stations. Made by the author using Google Maps.

provincial, and federal — were favourable to big business.[12] Despite vigorous public opposition, the state didn't prevent the creation of a gas and electricity monopoly that reigned over the island of Montréal. The Montreal Light, Heat & Power Company (MLHP) was formed in 1901 after the merger of the Royal Electric Company, the Saint Lawrence Company, and the Montreal Gas Company.[13] Cartel arrangements were reached in subsequent years with the Shawinigan Water & Power Company (SWP), a strong industrial conglomerate operating from the city of Shawinigan.[14] So, from the 1900s until its expropriation by the Québec provincial government in 1944, MLHP operated a virtual monopoly over the distribution of gas and electricity in Montréal.[15]

In practice, this means that the firm's history can be taken as a history of the gas and electricity sectors in Montréal during the first half of the 20th C. In this instance, business history becomes a proxy for understanding urban energy history.

Once MLHP took control of the domestic market, it looked to slowly increase the supply of energy but without flooding the market with low-cost power. Different locations had been identified by engineers as potentially interesting sites for hydroelectric schemes, attesting to the richness of Montréal's hydrographic basin. However, the utility company wasn't interested in exploiting them all at the same time. After the fusions and acquisitions of 1901 and 1903, it had to stabilize its activities and wasn't in an expansionist mode, having seen its fixed charges increase by 99% between 1902 and 1903, and by 153% between 1903 and 1904 — a complete anomaly in the firm's history.[16] It is improbable that the state would have granted emphyteutic leases for multiple locations simultaneously since this could have disrupted water circulation around Montréal. In any case, the market for additional electricity

12 See for example the parallel case of neighbouring Ontario: Henry Vivian Nelles, *The Politics of Development: Forests, Mines, and Hydro-Electric Power in Ontario, 1849-1941* (Montréal & Kingston: McGill-Queen's University Press, 2005).

13 Monopolistic control was furthered in 1903, when MLHP acquired Lachine Rapids Company and its subsidiaries.

14 For an exhaustive account of SWP's history, see: Claude Bellavance, *Shawinigan Water and Power, 1898-1963. Naissance et déclin d'un groupe industriel au Québec* (Montréal: Boréal, 1994).

15 Except for a few municipal systems in suburbs like Westmount and occasional competition from smaller ventures that were eventually bought out by the monopolistic company, like the Quebec New England Hydro-Electric Corporation acquired by United Securities Ltd. On behalf of SWP, MLHP, and Montreal Tramways. Engineering Department, *Montreal Light, Heat & Power Cons. Valuation of Electric Property. General Report*, Archives d'Hydro-Québec (later referred to as AHQ) F9/3458/13549 loc. 3930 (Montréal: Montreal Light, Heat & Power Consolidated, 1943), 7.

16 Montreal Light, Heat & Power Consolidated, *A Statistical Analysis of Montreal Light, Heat & Power Consolidated*, AHQ F9/3413/12350 loc. 3121 (Montréal: Montreal Light, Heat & Power Consolidated, 1931), 8.

was not yet formed, meaning that the city could not have absorbed the additional energy produced. According to the city of Montréal's boiler inspector, in 1911 "steam was by far the main source of power in the city's plants."[17] Less than half of the city's households were connected to the electricity distribution network, and those that were mainly used electricity to power a few lightbulbs.[18] Hydroelectric capacity had to be developed selectively and patiently. An engineering report on the potential for capturing power from the Back River published in 1914 confirms this interpretation.[19] Water and ice conditions were deemed to be favourable for the construction of a hydroelectric plant. However, the authors stated that "the market for power is well supplied as there are two large developments [...] that have large quantities of power yet unsold. The Shawinigan Company too can send more power to Montreal than they now send, so that for some time at least the market for a new large development would not be favourable."[20] As a result, the proposed development on the Back River was shelved until the end of the 1920s.[21]

7 One of two developments mentioned in the report was the Cedar Rapids station. In 1912, MLHP and SWP acquired control of the Cedar Rapids Manufacturing & Power Company, incorporated in 1904, which had obtained permission from the federal and provincial governments to build a power station on the Saint-Lawrence River south-west of Montréal. MLHP and SWP immediately concluded supply contracts with the Aluminum Company of America (Alcoa) in 1913 for the delivery of 60,000 horsepower (HP) starting in 1915.[22] The development of additional electrical capacity was justified by this new industrial activity located in Massena, NY, without which it is probable that Cedar Rapids wouldn't have been developed at that time. The outbreak of the First World War proved a great business opportunity for both MLHP and Alcoa. Canada, as a British Dominion, entered the conflict from the start and produced important wartime goods such as aluminum. Smelting aluminum through electrolysis requires large amounts of energy. This energy-intensive activity fitted well with the huge hydroelectric capacity found in the province of Québec and some of SWP's most important customers were aluminum companies like Alcan, the Canadian subsidiary of Alcoa.[23] During the First World War, a major outlet was found for aluminum: airframes. As military aviation kicked off during the conflict, warring sides started mass producing military aircrafts.[24] MLHP, through the Cedar Rapids station, took part in this impressive war effort.

8 Cedar Rapids started operating in January 1915. Nine units of 10,800 HP were built, bringing the station's installed capacity to 97,200 HP. A tenth unit was added a year later, and two more were

17 Cited in Alain Gelly, "A Precipitous Decline, Steam as Motive Power in Montreal: A Case Study of the Lachine Canal Industries", *IA. The Journal of the Society for Industrial Archeology*, vol. 29, n° 1, 2003, 65.

18 It is estimated that the 50% threshold for houses with electricity was reached between 1916 and 1921. Claude Bellavance and Paul-André Linteau, "La diffusion de l'électricité à Montréal au début du XXe siècle", *in* Paul-André Linteau et Horacio Capel (dir.), *Barcelona-Montréal: Desarrollo Urbano Comparado / Développement Urbain Comparé* (Barcelone: Publicacions de la Universitat de Barcelona, 1998), 249.

19 The Back River is now commonly known as the Rivière-des-Prairies and separates the island of Montréal from the Île Jésus, where Montréal's biggest suburb, Laval, is now situated.

20 Montreal Light, Heat & Power Company, *Engineer's Report. Sault Au Recollet*, AHQ F9/3425 13028 loc. 3942 (Montréal: Montreal Light, Heat & Power Company, 1914), 7.

21 For more information on the "industrialization" of the Rivière-des-Prairies, see: Dagenais, ch. 5.

22 The Cedar Rapids Manufacturing and Power Company, *Memorandum on the Cedar Rapids Manufacturing & Power Company and the Cedar Rapids Transmission Company*, AHQ F9/3409/12156 loc. 3960 (Montréal, 1944), 2.

23 The aluminum sector played an important role in the industrialization of the province of Québec and Canada. See: David Massell, *Quebec Hydropolitics: The Peribonka Concessions of the Second World War* (Montréal & Kingston: McGill-Queen's University Press, 2011); Matthew Evenden, *Allied Power: Mobilizing Hydro-Electricity during Canada's Second World War* (Toronto: University of Toronto Press, 2015).

24 At that time, the United States were responsible for 73% of all the aluminum produced globally, which necessitated huge amounts of electrical energy. Marco Bertilorenzi, *The International Aluminium Cartel: The Business and Politics of a Cooperative Industrial Institution* (New York: Routledge, 2015), 104.

contracted for in 1917.[25] Some have argued that Cedar Rapids was built to address the accelerated uptake of electricity in Montréal across all sectors.[26] However, historical records show that its existence was first justified by industrial and wartime demand. Between July 1915 and January 1916, 232,705 kWh were produced at Cedar Rapids.[27] Out of this total, 198,701 kWh were bought by Alcoa, and just 34,004 kWh by MLHP.[28] In other words, less than 15% of the power produced in the early history of Cedar Rapids supplied the Montréal market, the rest helping Alcoa accelerate wartime production. For the following years, it seems clear that most of the energy generated at Cedar Rapids was exported to Massena: in 1918, about 75% of the electrical energy produced went to Alcoa while 25% went to Montréal.[29]

9 During the conflict, Montréal's industry, while mostly dependent upon steam engines and independently produced thermoelectricity, also purchased some of the energy sold by MLHP. Munitions, weapons, ships, and military uniforms were all produced in the metropolis' factories, notably by the women replacing men gone to fight in Europe.[30] In 1915, the utility company finished the construction of a steam reserve plant and of a manufactured gas plant in the then suburb of Lasalle. The steam reserve plant, of an installed capacity of 25,000 HP, was designed to help the company meet peaks in electricity demand when its hydroelectricity wasn't sufficient, notably when climatic conditions, such as ice accumulation, disturbed the normal flow of water. The manufactured gas plant, of a capacity of 4,000,000 cubic feet per day, supplemented the company's existing gas infrastructure which provided gas for heating and cooking to the factories, shops, and dwellings connected to its network.[31]

POST-WAR BLUES IN THE JAZZ AGE

After important hydroelectric, thermoelectric, and manufactured gas expansion during the First World War, the transition to peacetime was difficult to negotiate for MLHP. The company's supply capacity had been massively extended thanks to industrial clients looking to profit from exceptional wartime production. However, once the war ended, many of these industrial firms slowed down their activities, and the demand for energy dropped. Alcoa, for instance, purchased less electrical energy from MLHP in 1919 than in 1918.[32] Up to this point, the utility company had managed to increase its supply capacity gradually by anticipating and meeting potential demand. Now, the company was faced with the problem of excess supply. The distinctive features of hydroelectricity made that a problem. Water flows around the clock through the turbines that produce electricity, and this is not 10

25 The Cedar Rapids Manufacturing and Power Company, *Memorandum on the Cedar Rapids Manufacturing & Power Company and the Cedar Rapids Transmission Company*; Engineering Department, *Montreal Light, Heat & Power Cons. Appraisal of Electric Property. Subsidiary Report No. 1. Cedars Rapids Mfg. & Power Co.*, AHQ F9/3458/13544 loc. 3930 (Montréal: Montreal Light, Heat & Power Consolidated, 1942).

26 See: Jacques Lecours and Raymonde Lavoie, *L'électrification de la région de Montréal. Synthèse historique* (Montréal: Hydro-Québec, 1991), 74–76.

27 I refrain from converting the measuring units and stick to the ones used in the sources.

28 Montreal Light, Heat & Power Company, *Statement Showing Comparison Between Power Generated and Power Sold Between July 1st 1915 & Jan. 1st 1916 at Cedar Rapids*, AHQ F9/3469/14235 loc. 3913 (Montréal: Montreal Light, Heat & Power Company, 1916).

29 Leo G. Denis, *Electric Generation and Distribution in Canada* (Ottawa: Commission of Conservation, 1918), 56.

30 Paul-André Linteau, *Une histoire de Montréal* (Montréal: Boréal, 2017), chap. 11. For an excellent account of the conflicts involved in the entry of women into munition production, see: Susan Pedersen, *Family, Dependence, and the Origins of the Welfare State: Britain and France, 1914-1945* (Cambridge: Cambridge University Press, 1993), chap. 2.

31 Montreal Light, Heat & Power Company, *Annual Report 1914*, AHQ F9/3413/12296 loc. 3121 (Montréal: Montreal Light, Heat & Power Company, 1914); Montreal Light, Heat & Power Company, *Annual Report 1915*, AHQ F9/3413/12297 loc. 3121 (Montréal: Montreal Light, Heat & Power Company, 1915).

32 In 1918, the American company purchased 390,000,000 kWh from MLHP. In 1919, that number fell to 321,000,000 kWh. Montreal Light, Heat & Power Consolidated, *Cedar Rapids - Alcoa Contracts and Correspondance*, AHQ F9/3470 #1 loc. 13322 (Montréal: Montreal Light, Heat & Power Consolidated, 1941).

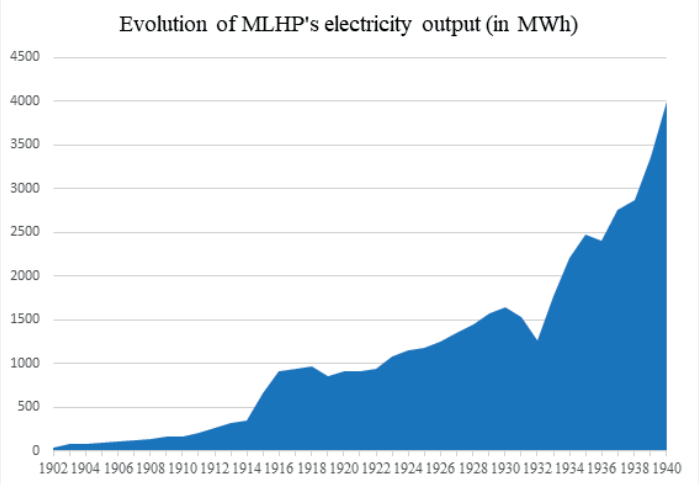

Figure 5: *Evolution of MLHP's electricity output measured in MWh. Sources*: A Statistical Analysis of Montreal Light, Heat & Power Consolidated *for years 1902-1930,* Cedar Rapids - Alcoa Contracts and Correspondence *for years 1931-1940.*

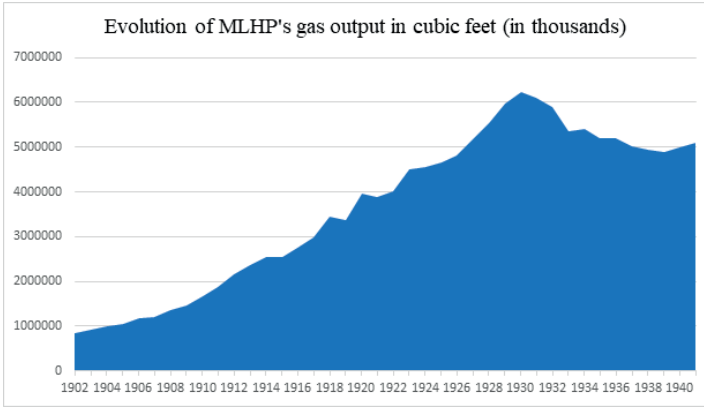

Figure 6: *Evolution of MLHP's gas output in thousands. Sources:* A Statistical Analysis of Montreal Light, Heat & Power Consolidated *for years 1902-1930,* Entre-Nous 1938 *for years 1933 and 1937,* A Record of Expansion and Improvement 1925-1943 *for years 1931-1932, 1934-1936, and 1938-1941*

something that can be stopped quickly or at will. A lot of the energy produced was 'lost' in the sense that it didn't find any users. This ran counter to the need to optimize the efficiency of costly equipment. One response was to slow down production. In 1919, MLHP reduced its electricity output over the previous year by 13% (fig. 5).[33] To do so, the company closed down some of its generating stations, or at least units, for parts of the day.[34] The gas division also witnessed a curtailment of production. In 1919, gas output diminished by 2% over the previous year (fig. 6).[35] Less coal was burned at the company's gas plants at a time when post-war coal shortages led prices in Montréal to increase rapidly. But these measures were only temporary. A strike in 1919 revealed the fragility of MLHP's post-war situation.[36]

Meanwhile, more structural shifts were under way in Montréal's energy markets as MLHP's executives turned their attention to the domestic sector. Utility companies courted households in the hope that this would help them diversify their load factor, an important concept in the history of electrification. Since operating costs and fixed expenses remained almost identical whether electricity was being used 18 hours per day or just a few hours every night, firms had a strong incentive to encourage the use of electrical energy over 24 hours per day, seven days per week, and 365 days per year.[37] This meant pushing uses beyond the usual peak demand,

33 In 1918, its total output was 967,462,529 kWh. In 1919, it was 852,680,550. Montreal Light, Heat & Power Consolidated, *A Statistical Analysis of Montreal Light, Heat & Power Consolidated*, 42.

34 For example, on June 30th, 1921, Chambly generating station was closed down at 12:05AM, and Soulanges at 7:55PM. Montreal Light, Heat & Power Consolidated, *Extracts from P.H. and Station Reports. June 1921*, AHQ F9/3427 13059 loc. 3941 (Montréal: Montreal Light, Heat & Power Consolidated, 1921). Montreal Light, Heat & Power Consolidated, *Cedar Rapids Production Journal*, AHQ F9/3427 #202 loc. 2140 (Montréal: Montreal Light, Heat & Power Consolidated, 1925).

35 In 1918, gas output was of 3,441,329,000 cubic feet. In 1919, it was of 3,375,125,000. Montreal Light, Heat & Power Consolidated, *A Statistical Analysis of Montreal Light, Heat & Power Consolidated*, 46.

36 Civic Investment and Industrial Company, *Meeting Minutes*, AHQ F9/3410/12062 loc. 4198 (Montréal: Civic Investment and Industrial Company, 1917).

37 Thomas Parke Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Baltimore: Johns Hopkins University Press, 1983), 463. The load factor is obtained by dividing the average load by the peak load over a certain time period. It is also important to note that the electricity sector is highly capital-intensive: operating electric networks involves acquiring prime real estate near rivers, building generating stations, installing heavy and expensive machinery like water turbines and generators, erecting the poles and wires making up the transmission and distribution networks, adding substations to step-down the voltage for end use, and paying interest on borrowed capital meant.

typically occurring in early evenings when electric lights and appliances were simultaneously turned on, especially in the winter.[38] As in other countries, night-time storage radiators were seen as a good way of selling electricity off-peak.[39]

12 Extending the domestic market and encouraging the use of electricity at times of the day, week, and year when industrial demand was low made good commercial sense. Promoting diversified uses of electricity around the clock would lower unit costs by maximizing the constant output of hydroelectric stations. The more electrical energy that could be sold without extending the existing transmission and distribution networks, the smaller the proportion of total expense per kWh, meaning that lower rates could be charged to end consumers.[40] The hope was that potential customers would be attracted by a cheaper rate and that those who were already connected would use more. This vision was consistent with the so-called rebound effect — according to which a drop in the cost of an energy service leads to an increase in demand. Manufactured gas is different in that it can be stored, but there are still economies of scale. Furthermore, since coal and oil were expensive in the aftermath of the war, MLHP risked having to increase the price of gas instead of being able to absorb the costs.[41] In this context, escalating consumption, an eternal mantra of gas and electricity utility companies, was critical to survival and success.

MLHP consequently invested in public rela- 13
tions and promotion, putting more emphasis on its public image and on advertising. While the former was tarnished by constant cries for public ownership from municipal and provincial politicians — the case of neighbouring Ontario was always cited by MLHP's foes — the latter attempted to convince potential domestic consumers to connect to gas and electricity systems and to persuade existing customers to use more.[42] At the end of the 1910s, around half of all Montréal's dwellings were wired to the electricity distribution network, a little less in the case of gas but at this point, consumption was minimal.[43] The use of electricity was by and large limited to a few lightbulbs turned on at night, and gas to a stove operated only a few times a week. To change that, MLHP employed a panoply of tactics to promote a new, modern moral economy based on invisible, effortless, and seemingly boundless forms of energy.[44]

Historical records reveal some of the strategies 14
involved, from two-tiered rate systems to the integration of energy infrastructure into plans

38 Montreal Light, Heat & Power Consolidated, *Schedule of Rates and Some Information Regarding the Sale and Measurement of Electric Current*, AHQ F9/3469/14279 loc. 3912 (Montréal, 1909), 18.

39 "Fuel-Power Problem of Canada", *Journal of the Engineering Institute of Canada*, n° 1, May 1918, 52–53. On storage water heaters and their importance for load balancing, see: Nina Lorkowski, "Managing Energy Consumption. The Rental Business for Storage Water Heaters of Berlin's Electricity Company from the Late 1920s to the Early 1960s", *in* Nina Möllers and Karin Zachmann (eds.), *Past and Present Energy Societies: How Energy Connects Politics, Technologies and Cultures* (Bielefeld: Transcript Verlag, 2012), 137–62.

40 Montreal Light, Heat & Power Consolidated, *Entre-Nous. 1938*, AHQ F9/3423/13000 loc. 3943 (Montréal: Montreal Light, Heat & Power Consolidated, 1938), 6 (April Edition).

41 Montreal Light, Heat & Power Consolidated, *Annual Report 1918*, AHQ F9/3413/12299 loc. 3121 (Montréal: Montreal Light, Heat & Power Consolidated, 1918).

42 The publicly owned Hydro-Electric Power Commission of Ontario was created in 1906 and bought up most of its competitors in the 1910s and 1920s until it achieved a public monopoly over the electricity sector in that province. See: Keith Robson Fleming, *Power at Cost: Ontario Hydro and Rural Electrification, 1911-1958* (Montréal & Kingston: McGill-Queen's University Press, 1992); Christopher Armstrong and H. V. Nelles, "Contrasting Development of the Hydro-Electric Industry in the Montreal and Toronto Regions, 1900-1930", *Journal of Canadian Studies/Revue d'Études* Canadiennes, vol. 18, no° 1, 1983, 5–27.

43 Data for electricity was calculated in Bellavance & Linteau, *op. cit.* For gas, I estimate that this proportion was a little bit lower, but not significantly. In 1921, MLHP counted 118,542 registered gas customers and 140,445 electricity customers.

44 See Joy Parr's superb case study on the competition between the wringer washing machine and the automatic one in Canada in which she argues whether some machines get domesticated — and energy systems more broadly in my view — depends on the moral economy of householders, particularly women. Joy Parr, *Domestic Goods: The Material, the Moral, and the Economic in the Postwar Years* (Toronto: University of Toronto Press, 1999), chap. 10.

for new construction and housing.[45] Alongside these, the method of associating high-energy living with material comfort, convenience, and cleanliness proved to be especially effective. According to a MLHP company document, "Every householder wants the comfort and convenience electrification brings; every company wants the higher load factor and lower unit costs such increased consumption ensures."[46] As it turns out, the householder in question was often a woman. Following the Victorian ideal of separate spheres, men were conceptualised as producers and women as consumers.[47] Thus, women first and foremost had to be convinced of the 'need' for gas and electricity. There was initially some resistance, after all, other energy sources, like wood and coal, had been integrated into daily routines for decades. In addition, the experience of power shortages, common in the early decades of the 20th C., meant that some were wary of relying on utility companies for the energy needed to complete daily chores reliably and to the expected standard.[48]

In response the utilities employed other women to speak to these reluctant housewives and went to considerable lengths to promote and sell household appliances.[49] In 1918, MLHP opened its first store outside of its headquarters. The showroom exhibited an array of gas and electric appliances. Public demonstrations were conducted, often by women, who were employed as salesladies and cashiers by the company in 1919.[50] MLHP managers hoped that women would speak more convincingly to other upper class women, and that these strategies would be more effective than having salesmen demonstrate the practical value of domestic appliances, most designed by men.[51] Home economists promised that appliances would liberate housewives by substantially reducing the time and effort spent on household chores. However, as Ruth Schwartz Cowan famously showed, the time and labour saved by the use of domestic appliances were soon filled by new activities and higher standards of efficiency, cleanliness, comfort, and normality.[52]

45 For the two-tiered rate system, which rewarded high consumers with lower rates per unit consumed, see: Harold L. Platt, *The Electric City: Energy and the Growth of the Chicago Area, 1880-1930* (Chicago: University of Chicago Press, 1991), 85. For the integration of different energy sources in council housing, see: Frank Trentmann and Anna Carlsson-Hyslop, "The Evolution of Energy Demand in Britain: Politics, Daily Life, and Public Housing, 1920s-1970s", *The Historical Journal*, vol. 61, n° 3, 2018, 807–39.

46 G.R. Whatley, *A Brief Submitted by Montreal Light Heat & Power Consolidated in Support of Revised Tariff for Residential Electricity Service*, AHQ F9/3413 loc. 3121 #15 (Montréal: Quebec Public Service Commission, 1934), 16.

47 This is an obviously flawed dichotomy. Even if most women didn't participate in the labor market to the same extent as men, they were still working, although their labor wasn't monetized and recognized as official labor by statistical offices and general popular representations. See: Ruth Schwartz Cowan, "The 'Industrial Revolution' in the Home: Household Technology and Social Change in the 20th Century", *Technology and Culture*, vol. 17, n° 1, 1976, 1–23. See also: Ruth Schwartz Cowan, "The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology", *in* Wiebe E. Bijker, Thomas Parke Hughes and Trevor Pinch (eds.), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge: MIT Press, 1987), 261–80.

48 Ruth W. Sandwell, "Pedagogies of the Unimpressed: Re-Educating Ontario Women for the Modern Energy Regime, 1900-1940", *Ontario History*, vol. 107, n° 1, 2015, 53.

49 Carolyn M. Goldstein, "From Service to Sales: Home Economics in Light and Power, 1920-1940", *Technology and Culture*, vol. 38, no° 1, 1997, 128. However, women weren't encouraged to train as electrical engineers as that would turn them away from their purported true vocation: housekeeping. Montreal Light, Heat & Power Consolidated, *Dual Service. 1927*, 15 (July Edition).

50 Montreal Light, Heat & Power Company, *Report on Strike*, AHQ F9/3412/12904 loc. 1992 (Montréal: Montreal Light, Heat & Power Company, 1919). In general, however, the electric and gas sectors overwhelmingly employed men, usually associated with technical trades. This is consistent with most infrastructure sectors. See: Matti Siemiatycki, Theresa Enright, and Mariana Valverde, "The Gendered Production of Infrastructure", *Progress in Human Geography*, vol. 44, no° 2, 297-134.

51 Joy Parr has shown how the appliance sales floor wasn't welcoming to women purchasers: stoves couldn't be tried, manufacturers designed them without consulting women — for example, they wanted stoves to be raised above waist level, which rarely was the case — and salesmen weren't experts in their use. See: Joy Parr, "Shopping for a Good Stove: A Parable about Gender, Design, and the Market", *in* Joy Parr (ed.), *A Diversity of Women: Ontario, 1945-1980* (Toronto: University of Toronto Press, 1995), 206–7.

52 Cowan, "The 'Industrial Revolution' in the Home: Household Technology and Social Change in the 20th Century," 15.

16 Even so, there was a definite shift of emphasis. Throughout the 1920s, MLHP acted as a comfort vendor, or what Elizabeth Shove *et al.* define as a profit-making enterprise with an interest in creating and inflating need and demand.[53] Often invoking medical discourses, MLHP's advertising department highlighted the importance of cleanliness for household health.[54] According to one such narrative, a respectable and responsible housewife had to keep her house perfectly clean and the best way of doing so was within an electric vacuum cleaner.[55] Another refers to new forms of domestic science in making the case for precision cooking.[56]

17 Technologies and norms of cleanliness and efficiency co-evolved[57] through the 1920s, along with and as part of MLHP's strategy for finding outlets for the excess electricity and gas capacity added during the First World War. Contrary to popular opinion, appliances, from the gas water heater to the electric washing machine, were not introduced to satiate an existing need for cleaner and more comfortable dwellings. Rather, their introduction and popularization boosted standards of normality, and transformed meanings and expectations of convenience.[58]

THE GREAT DEPRESSION

18 At the end of the 1920s, MLHP embarked on a new expansionist drive. After having shelved the project in 1914, MLHP allied with a subsidiary, the Montreal Island Power Company, to open the Rivière-des-Prairies hydroelectric station in 1929. The same year, work started at Beauharnois to construct a large hydroelectric facility at a site considered in the early 1900s but not developed at the time. MLHP, at first a simple customer of the Beauharnois Light, Heat & Power Company — a contract had been signed for the purchase of 150,000 HP — became majority shareholder soon after, strongly reinforcing its monopolistic situation.[59] Beauharnois started operating in 1932. These investment decisions were justified in the following manner: "It has always been our policy to keep well ahead of the market for power [...] notwithstanding the large quantity of unsold power at present available."[60] Archival documents indicate that this phase of increasing capacity was partly justified by the belief that Montréal's population would continue to grow at an impressive pace.[61] To meet the anticipated demand, MLHP also built a coke oven plant adjacent to its Lasalle gas generating station in 1927, in association with the Montreal Coke and Manufacturing Company. The

53 Elizabeth Shove et al., "Comfort in a Lower Carbon Society", *Building Research & Information*, vol. 36, no° 4, 2008, 309.

54 See for example: Montreal Light, Heat & Power Consolidated, *Dual Service. 1929*, AHQ F9/3423/12993 loc. 3944 (Montréal: Montreal Light, Heat & Power Consolidated, 1929), 13 (June Edition).

55 According to this article, housekeepers needed to be extremely careful when purchasing electric appliances for the efficiency and comfort of their home depended on them. "The Kitchen: 1933 Model", *Canadian Homes and Gardens,* vol. 10, no° 6, 1933, 44.

56 See for example: Montreal Light, Heat & Power Consolidated, *The Household Book. Le Livre Ménager* (Montréal: Montreal Light, Heat & Power Consolidated, n.d.). The nascent science of nutrition, learned by home economists, also fostered greater standards of cleanliness and efficiency. See: Caroline Durand, *Nourrir la machine humaine: Nutrition et alimentation au Québec, 1860-1945* (Montréal & Kingston: McGill-Queen's University Press, 2016), 15–16.

57 Elizabeth Shove, *Comfort, Cleanliness and Convenience: The Social Organization of Normality* (Oxford: Berg, 2003), 76. Magazines and the media in general also acted as comfort vendors. This is particularly clear in the *Canadian Homes and Gardens*: "There is no end, in these fast-moving days, to the business of making a house more comfortable and convenient." Ethel Craigie, "New Gadgets for the Modern House", *Canadian Homes and Gardens*, vol. 8, no° 1, 1931, 34. One writer in particular, Eustella Burke, penned many articles inflating norms of normality. The motivations of such women journalists in early 20th C. Canada should merit further study.

58 Shove, *Comfort, Cleanliness and Convenience*.

59 Montreal Light, Heat & Power Consolidated, *Montreal Light Heat and Power Consolidated and Operating Subsidiaries*, AHQ F9/3409/12338 loc. 3960 (Montréal: Montreal Light, Heat & Power Consolidated, 1933).

60 Montreal Light, Heat & Power Consolidated, *Annual Report 1927*, AHQ F9/3413/12308 loc. 3121 (Montréal: Montreal Light, Heat & Power Consolidated, 1927).

61 "There is not a single city in the same stage of development in North America, which shows such a steady high rate of growth as Montreal with the exception of a few communities of mushroom growth type such, for instance, as Los Angeles and Detroit." Montreal Light, Heat & Power Consolidated, *A Statistical Analysis of Montreal Light, Heat & Power Consolidated*, 13.

coke produced from the destructive distillation of coal was primarily destined for the domestic market as heating and cooking fuel.

19 But the Great Depression of the 1930s cut the grass under MLHP's feet. After a stock market crash in the neighbouring United States in October 1929, Canada faced reduced trade with its main economic partner, a harsh economic downturn, massive unemployment, and a fall in personal incomes and living conditions in general.[62] Between a fourth and a third of the labor force was unemployed during the worst years of the Great Depression in Montréal.[63] Economists, following the energy ladder model, assume that as incomes rise consumers switch to more modern fuels, going from biomass to coal, from coal to natural gas, and so on. Complicating this linear model, others have put forward the concept of energy stacking, according to which consumers use multiple fuel sources simultaneously, occasionally going back down the ladder to use more traditional sources of energy.[64] The case of Montréal during the Great Depression, a rare historical moment in which energy demand decreased significantly, offers empirical evidence in favor of the energy stacking model. Additionally, it demonstrates the flexibility of demand, as households adapted.

20 In its August 3rd, 1933 edition, the daily newspaper *Le Devoir*'s front page announced that the days when wood was used for heating were over. Interviewed by the Montréal paper, an experienced fuel dealer predicted the imminent demise of this traditional energy source, as urban dwellers turned towards anthracite coal. Lower on the same page, a classified ad targeted the unemployed, offering maple and wild cherry wood specifically for home heating.[65] Beyond reflecting a clash between elitist discourse and working-class realities, this anecdotal evidence shows that households switched between different energy sources during the 1930s. This is confirmed by two surveys conducted by the state in the second half of the 1930s. Out of 211 Francophone families surveyed in Montréal and Québec city by the Dominion Bureau of Statistics, 96% reported buying electricity, 74% wood, 55% coal, 51% gas, 16% fuel oil, 6% kerosene, 5% gasoline, and 12% other sources of energy.[66] Out of 4,216 working-class dwellings surveyed, the main fuel used for cooking was wood (3,039), followed by gas (1,412), coal (697), fuel oil (209), and electricity (83).[67] The capacity to switch fuels was inscribed in the design of combination stoves, allowing the user to employ both wood and coal, coal and gas, or gas and electricity. To be sure, this wasn't a break with previous decades, since relying on multiple forms of energy was already a characteristic of most Canadian households.[68] But economic hardship intensified the need to find innovative ways to get fuel by any means necessary, as this informant reminiscing about her husband's creativity told Denyse Baillargeon:

62 For the effects of the Great Depression in Canada, see: James Struthers, *No Fault of Their Own: Unemployment and the Canadian Welfare State, 1914-1941* (Toronto: University of Toronto Press, 1983).

63 Nadia Atallah, "Les quartiers ouvriers de Montréal pendant la Grande Dépression", *Bulletin de l'Institut Pierre Renouvin*, vol. 27, no° 1, 2008, 122.

64 For a discussion of the energy ladder model, see: Bianca van der Kroon, Roy Brouwer, and Pieter J.H. van Beukering, "The Energy Ladder: Theoretical Myth or Empirical Truth? Results from a Meta-Analysis", *Renewable and Sustainable Energy Reviews*, vol. 20, 2013, 504–13.

65 Émile Benoist, "L'âge du chauffage au bois serait bel et bien passé," *Le Devoir*, August 3, 1933.

66 It is important to note that this survey is characterized by an important selection bias. All the families surveyed had to be of wage-earner type, with husband and wife living together as joint heads. All families had to have a maximum of one lodger or domestic. Earnings were to range from $450 to $2,500 and all families had to be self-supporting during this period. Finally, no family shared any living amenities with other families. All these factors point towards a class bias towards richer and more conventional households. Were the study to be truly representative of working-class families in Canada, it is probable that the percentage of households purchasing wood, for instance, would be higher. Dominion Bureau of Statistics, *Family Income and Expenditure in Canada. 1937-1938* (Ottawa: Edmond Cloutier, 1941).

67 Réal Bélanger, George S. Mooney, and Pierre Boucher, *Les vieux logements de Montréal. Rapport d'une étude Faite pendant l'été 1937*, Archives de la ville de Montréal (AVM) 001 XCD00-P7450 (Montréal: Commission métropolitaine de Montréal. Département d'urbanisme et de recherche, 1938), 11.

68 See Ruth W. Sandwell (ed.), *Powering Up Canada: The History of Power, Fuel, and Energy from 1600* (Montréal & Kingston: McGill-Queen's University Press, 2016).

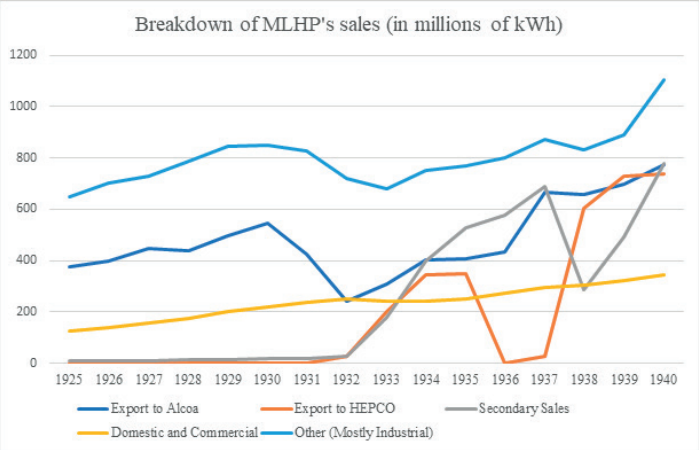

Figure 7: *Breakdown of MLHP's sales in millions of kWh, 1925-1940. Secondary sales correspond to surplus electrical energy sold under certain conditions when available. Source:* Cedar Rapids - Alcoa Contracts and Correspondence.

21 "He'd go out in the morning to look for wood in Saint Lambert (...). After that, he'd go to the store so he'd have some cardboard. He'd take the cardboard cartons apart, roll them up, and tie them with wire and stack them in the shed to make wood for next winter. Then (...) he'd soak newspapers in water in a basin (...) and make them into balls (...) and then let them dry. There, that was our coal for the winter. (E25)"[69]

22 Beyond switching between different fuels, domestic consumers in Montréal probably reduced the amount of energy they used, although hard evidence is tricky to amass. MLHP's electricity output decreased in 1931, 1932, and again in 1936 (fig. 5). At some point during this decade, production slowed at Chambly, Saint-Timothée, Cedar Rapids, Rivière-des-Prairies, and Beauharnois, while purchases from SWP were also stepped back.[70] Whereas in 1932 MLHP sold 250,000,000 kWh of electricity to its domestic and commercial customers, this amount decreased to 240,000,000 kWh the following year (fig. 7).[71] MLHP's gas output decreased even more severely and declined spectacularly between 1930 and 1939 (fig. 6).[72] Some customers unsubscribed from both services during the 1930s, in all likelihood because they could no longer afford them: even if they reduced their use to a minimum, the company still charged its clients a fixed monthly rate. In 1933, 264,351 households were paying MLHP for electricity. Four years later, despite demographic growth in the city, the firm lost around 2,000 paying customers — although the evidence is somewhat conflicting.[73] Important discrepancies separated working class districts — such as Verdun, where domestic consumption averaged 41 kWh per month — and wealthier ones — like Outremont, averaging 84.3 kWh per month for the year 1937.[74] The decline in gas consumption was starker. Between 1933 and 1937, the firm's gas customer base went down from 194,813 to

69 Denyse Baillargeon, *Making Do: Women, Family and Home in Montreal during the Great Depression* (Waterloo: Wilfrid Laurier University Press, 1999), 138.

70 Montreal Light, Heat & Power Consolidated, *Extracts from P.H. & Station Reports. June 1932*, AHQ F9 3427 13073 loc. 3941 (Montréal: Montreal Light, Heat & Power Consolidated, 1932).

71 Montreal Light, Heat & Power Consolidated, *Cedar Rapids - Alcoa Contracts and Correspondance*.

72 Exact statistical data for gas is somewhat lacking after 1930. However, multiple documents attest to a decrease in output in the 1930s. Montreal Light, Heat & Power Consolidated, *A Record of Expansion & Improvement 1925-1943*, AHQ F9/3409/12161 loc. 3960 (Montréal: Montreal Light, Heat & Power Consolidated, 1943).

73 The number of subscribers comes from the firm's internal journal, but the counting method seems to have changed between 1933 and 1937, the former number being calculated from total installations and the latter from average years billed. It is likely that the first method of calculation inflated the actual number of paying customers since it probably included dwellings that were wired to the distribution network but didn't use MLHP's services. Another document — produced to show the company's historical progress — doesn't provide exact numbers but presents a graph that seems to indicate an increase in the customer base from 1925 to 1932, then stagnation until 1936, after which point growth picks up. This isn't to say that disconnections were improbable: internal documents do attest to the existence of this phenomenon in the 1930s. Montreal Light, Heat & Power Consolidated, *Entre-Nous. 1938*; Montreal Light, Heat & Power Consolidated, *A Record of Expansion & Improvement 1925-1943*.

74 Montreal Light, Heat & Power Consolidated, *Electricity and Gas Sales, 1937*, AHQ F9/3469/14322 loc. 3686 (Montréal: Montreal Light, Heat & Power Consolidated, 1945). Unfortunately, no such precise figures exist before that year, which would've facilitated a comparison of consumption before and after the Great Depression.

174,909.[75] Reasons cited for this included change in habits (people eating away from home and buying cooked food), the use of small electric appliances to prepare breakfast, the use of oil burners in coal stoves, more efficient gas appliances, and competition from electricity.[76] Although we lack conclusive evidence, these elements put together likely signal reduced per capita gas and electricity consumption amongst Montréal's households. If industrial demand diminished drastically — in particular exports to Alcoa — domestic and commercial customers also reduced their use between 1932 and 1933, and for the rest of the decade sales were pretty much stagnant for this class of customer (fig. 7).

23 These quantitative indications — reduced output and sales, clients disconnecting — point towards qualitative changes in people's lifestyles. To cope with the Great Depression, some consumers resorted to various forms of illegal connection.[77] Some of these bootleg modifications were made by amateur technicians, acting at night — meaning that some energy services were pushed until the end of the day — and sometimes undertaken with the help of MLHP employees.[78] Others focused on manipulating electricity and gas meters. More fundamentally, as the women interviewed by Denyse Baillargeon showed, the recession prompted consumers to reorganise everyday routines — like cooking and heating — that depended upon energy.[79] The uptake of installment plans, introduced in the 1920s to boost the sales of appliances was limited, and many consumers defaulted on their payments.[80] Indeed, Robert Rumilly estimates that more than 20,000 families were deprived of electricity in Montréal in the 1930s for this reason.[81] All in all, customers stuck to their wood, coal, or combination stoves, which provided the majority of their energy services, and many postponed the purchase of expensive electric refrigerators and "modern" gas ranges.

24 MLHP blamed French Canadian thrift for the slow uptake of appliances and weak energy consumption. It was, for example, critical of those who only used the kitchen stove for heat and who turned off the lights when leaving a room — acceptable in the 1910s, but no more in 1934, according to MLHP's company journal.[82] Even when households acquired appliances like a gas water heater, these were often used sparingly, for occasional baths and weekly laundry.[83] Everyday activities, like washing dishes and cooking, still

75 Montreal Light, Heat & Power Consolidated, *Entre-Nous. 1938*.

76 D.D. Barnum, *Report on Ways and Means of Promoting Gas Sales in Montreal*, AHQ F9/3413/12352 loc. 3121 (Montréal: Montreal Light, Heat & Power Consolidated, 1937).

77 It is hard to find traces of these practices in the archives, but many of the documents consulted elliptically allude to it. Montreal Light, Heat & Power Consolidated, *Facture*, AHQ H2/1800-00 1444 loc. 211 (Montréal: Montreal Light, Heat & Power Consolidated, 1941). In one instance, a customer's electricity service was cut by MLHP after he was allegedly caught stealing gas. Régie des services publics, *Routine des dossiers de requêtes provinciale de l'électricité - Nos 1100 à 1500* (dossier 1216), BANQ Montréal, fonds Régie de l'énergie 1909-2012 (E175 1993-11-001\8) (Québec: Régie des services publics, 1940).

78 Denyse Baillargeon, *Ménagères au temps de la Crise* (Montréal: Remue-ménage, 1993), 175. This is an example of temporal variation in energy use, although it didn't have to see with considerations about load factors and peak demand. For more information on the temporal variation of energy demand, see: Jacopo Torriti, "Understanding the Timing of Energy Demand through Time Use Data: Time of the Day Dependence of Social Practices", *Energy Research & Social Science*, vol. 25, 2017, 37–47. Montreal Light, Heat & Power Company, *Bulletins to Employees*, AHQ F9/3423/12986 loc. 13404 (Montréal: Montreal Light, Heat & Power Company, 1911).

79 Baillargeon, *Ménagères au temps de la crise*, 175. See also: Harold Wilhite and Loren Lutzenhiser, "Social Loading and Sustainable Consumption", *NA - Advances in Consumer Research*, vol. 26, 1999, 281–87.

80 Montreal Light, Heat & Power Consolidated, *Dual Service 1933*, AHQ F9/3423/12998 loc. 3944 (Montréal: Montreal Light, Heat & Power Consolidated, 1933). On forms of credit in Montréal during this period, see: Sylvie Taschereau and Yvan Rousseau, "The Hidden Face of Consumption: Extending Credit to the Urban Masses in Montreal (1920s–40s)", *Canadian Historical Review*, vol. 100, no° 4, 2019, 509–39.

81 Cited in Baillargeon.

82 Montreal Light, Heat & Power Consolidated, *Dual Service 1934*, AHQ F9/3423/12999 loc. 3944 (Montréal: Montreal Light, Heat & Power Consolidated, 1934). John H. Dales, author of the most famous monograph on the energy sector in Québec, repeated the same questionable assumption: "In Quebec, no doubt, the power companies have been faced with stubborn cultural barriers to an expansion of the per-household consumption of electricity." John Harkness Dales, *Hydroelectricity and Industrial Development: Quebec, 1898-1940* (Cambridge: Harvard University Press, 1957), 192.

83 Baillargeon, *Ménagères au temps de la Crise*, 165.

Types of flexibility displayed in Montréal (1910s-1930s)	Description
Upwards supplier-led flexibility	-Construction of extra energy capacity in anticipation of potential demand -Marketing and advertising to sell more energy services
Downwards supplier-led flexibility	-Shelving of potential expansion projects in unfavorable business contexts -Reduction of output by switching off units or entire power stations, or by producing less gas
Upwards consumer-led flexibility	-Increased demand from industrial, commercial, and domestic consumers for energy services -Energy ladder model -Upwards revision of standards of cleanliness and comfort
Downwards consumer-led flexibility	-Reduction of gas and electricity use -Switching back to less "modern" fuel sources (wood, coal) -Downwards revision of standards of cleanliness and comfort

Figure 8: Typology of energy flexibility in Montréal, 1910-1930s

depended on water heated on the stovetop, fuelled by wood or coal. Most dwellings were heated by a central stove, which kept the central room warm but left distant rooms in the cold.[84] Different conventions of warmth and comfort coexisted. For instance, letting a child sleep all winter in a non-heated room — albeit with good blankets — was deemed better than potentially exposing them to noxious gases from a gas fire. At the same time, in richer neighbourhoods, bungalows were being built with central heating, electric refrigerators, and air conditioning.[85] Multiple standards of normality existed in parallel through the 1930s and it was only after the Second World War that networked energy services were the norm in Montréal, escalating domestic energy demand in the process.

CONCLUSION: THE FLEXIBILITY OF FIXITY

The story sketched in this paper presents different interpretations of energy flexibility that need to be unpacked (fig. 8). The first part described multiple examples of supplier-led flexibility. This process starts by anticipating energy demand. As potential customers are enrolled and markets are imagined, utilities create and expand infrastructures and systems of energy provision. Decisions are taken on the basis of anticipation: purported needs are constructed, to which solutions are offered.[86] Using projections of demographic and economic growth, executives rationalize their investment decision to shareholders. It was on this basis that MLHP built the Cedar Rapids hydroelectric station and the Lasalle gas plant, both inaugurated in 1915, in a display of upwards supplier-led flexibility. Wartime production enabled both plants to run at full speed. However, once the First World War ended, industrial demand slowed down. The gas and electricity capacity that had been added

84 Peter Ward, *A History of Domestic Space: Privacy and the Canadian Home* (UBC Press, 1999), 49–51; Bettina Bradbury, *Working Families: Age, Gender, and Daily Survival in Industrializing Montreal* (Toronto: McClelland & Stewart, 1993), 154–58.

85 Air conditioning as it was conceived in the 1930s was akin to today's humidifiers. See: "Air Conditioning. From the Woman's Point of View", *Canadian Homes and Gardens*, vol. 10, no° 10, 1933, 22. For a critical perspective on the popularization of AC, see: Elizabeth Shove, Gordon Walker, and Sam Brown, "Transnational Transitions: The Diffusion and Integration of Mechanical Cooling", *Urban Studies*, vol. 51, no° 7, 2014, 1506–19.

86 Engineering is in essence a future-oriented activity, part physical and part social engineering. See: Frédéric Graber, "Inventing Needs: Expertise and Water Supply in Late Eighteenth- and Early Nineteenth-Century Paris", *The British Journal for the History of Science*, vol. 40, n° 3, 2007, 315–32.

was being wasted and to correct this financially damaging situation, MLHP tried to develop new markets. The company focused on the domestic sector, under-exploited at the end of the 1910s yet coveted for its role in diversifying the load factor and its capacity to absorb intensive energy services. The monopolistic utility branched out into public relations and devised an impressive arsenal of promotional tactics to enroll new customers and persuade others to adopt a more energy-intensive lifestyle. Throughout the 1920s, the firm hiked up notions of cleanliness and comfort, arguing that modern ways of living could only be achieved with the help of energy demanding domestic appliances. For that, it targeted women specifically, employing home economists and strongly gendered discourses of home and care. This move into the realm of promotion and advertising is another example of upwards supplier-led flexibility, albeit targeting end use.

26 MLHP — like industry in general — benefitted tremendously from the two global conflicts of the 20th C., adding capacity and finding energy-thirsty outlets in the extraordinary context of wartime production. This is also true of the Second World War, which allowed MLHP to increase Beauharnois' capacity and step up its coke production, all to the benefit of industry. The company recognized that it would take years to build anything like the same demand under peacetime conditions.[87] This adds evidence to the thesis according to which wars and conflicts are major accelerators of environmental degradation and materialization. As others have argued, military demand fosters the development of goods and services for which civil uses must be found and invented once arms are laid-down.[88]

27 On other occasions, MLHP demonstrated that it could revise energy supply downwards.[89] It did so by stepping down its production on various occasions when it understood that demand was decreasing. In practice, this involved temporarily switching off units or whole power stations for hours or days, or reducing the amount of coal — and thus of gas produced — burned at the generating plant. More substantially, MLHP also shelved projects when its executives felt that the added power wouldn't be absorbed by the firm's customer base. What was supposed to become a hydroelectric station at Sainte-Thérèse ended up being used for storage purposes and to mitigate against frazil ice reaching the existing Chambly station.[90] Possible sites like Rivière-des-Prairies and Beauharnois were identified early in the 20th C. but only developed at the end of the 1920s. Other potential locations, were singled out in technical reports but never developed during MLHP's reign.[91] Often these were business decisions motivated by the necessity of maintaining manufactured energy scarcity in Montréal to keep prices relatively high. A public relations document advised executives on how to defend this policy: "Correct erroneous impression that superabundant water powers necessarily permit

87 Montreal Light, Heat & Power Consolidated, *Annual Report 1941*, AHQ F9/3413/12322 loc. 3121 (Montréal: Montreal Light, Heat & Power Consolidated, 1941), 6.

88 François Jarrige and Thomas Le Roux, *La contamination du monde. Une histoire des pollutions à l'âge industriel* (Paris: Le Seuil, 2017), chap. 7. Christophe Bonneuil and Jean-Baptiste Fressoz, *L'événement anthropocène. La Terre, l'Histoire et nous* (Paris: Seuil, 2016), chap. 6.

89 For cases of electric utilities encouraging its users to step down their consumption, see: Matthew Evenden, "Lights Out: Conserving Electricity for War in the Canadian City, 1939-1945", *Urban History Review / Revue d'histoire urbaine*, vol. 34, n° 1, 2005, 88–99; Yves Bouvier, "Observer, mesurer, maîtriser. Les entreprises du secteur de l'énergie et les consommateurs individuels (France, années 1950-1980), " *in* Geneviève Massard-Guilbaud et Charles-François Mathis (dir.), *Sous le soleil. Systèmes et transitions énergétiques du Moyen Âge à nos jours* (Paris: Éditions de la Sorbonne, 2019).

90 Montreal Light, Heat & Power Company, *Annual Report 1907*, AHQ F9/3413/12289 loc. 3121 (Montréal: Montreal Light, Heat & Power Company, 1907), 4.

91 For example, the potential of the Carillon site was spotted early on. But when the American firm International Paper courted the site, SWP and MLHP objected, illustrating in passing the cartel that the two companies had carved up for their province: "It is not desirable that any large block of power so geographically situated as that Carillon, should get into the hands of a Company, which through competition would interfere with the M.L.H&P. and S.W.&P. Co's plan of development of the Province of Quebec." Cited in Bellavance, *Shawinigan Water And Power, 1898-1963. Naissance et déclin d'un groupe industriel au Québec*, 111. Hydro-Québec finally opened a hydroelectric station at Carillon in 1962.

low rates. [...] Demonstrate that falling water is not in itself a dynamic asset."[92] These are all examples of downwards supplier-led flexibility, whereby the energy company diminished its output and capacity. However, it is important to stress that this type of flexibility was always temporary and often cosmetic. What really mattered for the company and for its shareholders was financial growth based on increasing output.

28 This article has also provided evidence of consumer-led flexibility. Instances of upwards oriented consumer-led flexibility are easy to document: in the 20th C. overall, more people used more energy for more services and uses, and Montréal is no exception. It is harder to find archival evidence of reductions in demand, but they do exist. In coping with economic hardship associated with the Great Depression Montreal's residents reduced demand and juggled between different sources of fuel. Wood, considered *passé* by some experts, appears to be one of the dominant fuels during this period.[93] Gas and electricity, which were both relatively expensive, were used sparingly by users trying to make ends meet. Quantitative data point to qualitative lifestyle changes, like dusting off the good old oil lamp to save on the electricity bill or putting away the electric iron and toaster.[94] These either involved reducing standards of cleanliness and comfort — fewer baths, un-ironed clothes, colder dwellings — or additional labour on the part of housewives — fewer clothes that had to be washed more frequently, say. Some users simply unsubscribed from MLHP's services, estimating that they could live without modern forms of energy. Others already embedded in the modern energy regime found ways to obtain the service illegally, whether by surreptitiously connecting to the company's distribution grid or by hacking its meters. More common was the delayed purchase of expensive domestic appliances, widespread adoption of which mostly came after the Second World War.

29 These are not the only scenarios of energy degrowth. Looking ahead, societies will either decarbonize, dematerialize, and reduce their energy consumption, or face environmental degradation. Montréal is unusual in having access to an abundance of energy supply but it is precisely this that allows us to see the modulation of supply and demand over time.[95] First and foremost, supply and demand were inextricably linked by feedback loops.[96] Utilities imagined markets, convinced investors, and built supply infrastructure to 'harvest' these resources. They employed numerous tactics to enroll consumers into their energy provision network. Doing so lowered the unit cost for companies who benefitted from economies of scale and the advantages of natural monopolies. Rate decreases followed, along with increases in consumption.[97] Additional production projects were justified on the assumption that demand would grow. As such, there is a certain performativity inscribed in energy infrastructure: if demand isn't directly there, it will be manufactured and invented.[98]

92 J.R. MacMillan, *Discussion and Summary of a Public Relations Campaign Designed to Promote Informed Public Opinion of and Favourable Reaction to the Proposed Revision of Electric Rates and to Gain Public Acceptance of New Rate Schedule*, AHQ F9/3469/14309 loc. 3912 (Montréal: Montreal Light, Heat & Power Consolidated, 1934), 7.

93 An argument needs to be made in energy history for energies-in-use, similar to David Edgerton's technologies-in-use. See: David Edgerton, "From Innovation to Use. Ten Eclectic Theses on the Historiography of Technology", *History and Technology*, vol. 16, 1999, 111–36.

94 Denyse Baillargeon, "La crise ordinaire : les ménagères montréalaises et la crise des années trente," *Labour / Le Travail*, vol. 30, 1992, 154.

95 Comparisons with similar contexts would be extremely insightful. Cities with similar conditions as Montréal — rich energy supply, cold climate, industrial city — could include Russian cities like Saint Petersburg, Scandinavian cities like Oslo, West Coast American cities like San Francisco, and more.

96 See: Christopher F. Jones, *Routes of Power: Energy and Modern America* (Cambridge: Harvard University Press, 2016).

97 Despite multiple rate decreases along its decades of operation, MLHP offered relatively high rates compared to neighboring cities — Toronto being the usual yardstick brandished by local elites and politicians. Public anger accelerated in the 1930s and led to more public scrutiny from the provincial administration which felt that unjust rates were caused by the greed of the company's Anglophone owners.

98 Olivier Coutard and Elizabeth Shove, "Infrastructures, Practices and the Dynamics of Demand", *in* Elizabeth Shove and Frank Trentmann (eds.), *Infrastructures in Practice:*

30 The value of future energy megaprojects has to be interpreted in this light: reduced energy consumption must be encouraged by reduced supply. This is particularly important in the Québec context today. Hydro-Québec, the province-owned monopolistic electric company created after MLHP was expropriated in 1944, is said to have a 'beaver complex' meaning that its legitimacy rests upon the realization of megaprojects. These are strongly associated with the emancipation of the Franco-Québécois nation and economic sovereignty since the so-called Quiet Revolution of the 1960s that saw Francophones reclaim power from an Anglo-Canadian minority in Québec. In practice, these megaprojects have always been problematic in that they implied the appropriation of traditional Indigenous land and the damaging of ecosystems. The cultural association between energy megaprojects, modernity, sovereignty, and technological prowess remains strong but in Quebec as elsewhere, the consequences are incompatible with demand reduction.[99]

31 Focusing only on supply-side flexibility obscures the changes that need to happen in what energy is used for and how and at what rate it is consumed. Historical research is powerful when it shows that what we find perfectly normal today is highly contingent and that what appear to be fixed demands are more flexible than they seem.[100] In 1930s households in urban Montréal, switched between fuels, prioritizing that which was cheaper over that which was cleaner and more efficient. Others revisited what seemed to be established conventions, opening up the possibility of re-negotiating meanings of normality, and the energy demands associated with them. These examples are born of economic hardship. As this and other historical evidence shows, energy degrowth is often associated with recession and times of social unrest.[101] The question for the future is whether economic prosperity and stability can stimulate decarbonization, dematerialization, and reduced energy production and consumption.

The Dynamics of Demand in Networked Societies (London: Routledge, 2018), 14.

99 On the links between Québec nationalism and hydroelectricity, plus its complex relationship with Indigenous populations, see: Caroline Desbiens, *Power from the North: Territory, Identity, and the Culture of Hydroelectricity in Quebec* (Vancouver: UBC Press, 2014); Stéphane Savard, "Les communautés autochtones du Québec et le développement hydroélectrique: Un rapport de force avec l'État, de 1944 à aujourd'hui", *Recherches amérindiennes au Québec*, vol. 39, no° 1–2, 2010, 47–60. On hydro-imperialism, see: Daniel Macfarlane and Andrew Watson, "Hydro Democracy: Water Power and Political Power in Ontario", *Scientia Canadensis: Canadian Journal of the History of Science, Technology and Medicine*, vol. 40, no° 1, 2018, 1-18. On Hydro-Québec's culture of mega projects, see: James Maxwell et al., "Locked on Course: Hydro-Québec's Commitment to Mega-Projects", *Environmental Impact Assessment Review*, vol. 17, 1997, 19–38.

100 On the fixity of flexibility as a concept used in energy research, see: Peter J. Forman and Elizabeth Shove, "The Fixity of Flexibility", *Center for Research into Energy Demand Solutions* (blog), 2019, https://www.creds.ac.uk/the-fixity-of-flexibility/.

101 See for example: Evenden, "Lights Out"; Meg Jacobs, *Panic at the Pump: The Energy Crisis and the Transformation of American Politics in the 1970s* (New York: Hill and Wang, 2016).

DATA

Year	Electricity output in kWh	Percentage change over previous year
1902	42980260	N/A
1903	79457180	85%
1904	85608160	8%
1905	93453141	9%
1906	116714695	25%
1907	130959031	12%
1908	135416358	3%
1909	164351087	21%
1910	167457418	2%
1911	211370008	26%
1912	269340961	27%
1913	323762843	20%
1914	352087460	9%
1915	656504088	86%
1916	920203324	40%
1917	946832817	3%
1918	976462529	3%
1919	852680550	-13%
1920	908658857	7%
1921	907231573	0%
1922	945200656	4%
1923	1089099507	15%
1924	1157648660	6%
1925	1175430650	2%
1926	1251502612	6%
1927	1354895244	8%
1928	1450484998	7%
1929	1568864226	8%
1930	1650636536	5%
1931	1539000000	-7%
1932	1270000000	-17%
1933	1768000000	39%
1934	2215000000	25%
1935	2482000000	12%
1936	2408000000	-3%
1937	2755000000	14%
1938	2865000000	4%
1939	3362000000	17%
1940	3994000000	19%

Evolution of MLHP's electricity output, 1902-1940
Sources: *A Statistical Analysis of Montreal Light, Heat & Power Consolidated* for years 1902-1930, *Cedar Rapids - Alcoa Contracts and Correspondence* for years 1931-1940

Year	Gas output in cubic feet	Percentage change over previous year
1902	848593000	N/A
1903	930470000	10%
1904	998286000	7%
1905	1046442000	5%
1906	1165748000	11%
1907	1192704000	2%
1908	1357681000	14%
1909	1456507000	7%
1910	1657426000	14%
1911	1874116000	13%
1912	2159445000	15%
1913	2373674000	10%
1914	2536688000	7%
1915	2539010000	0%
1916	2737456000	8%
1917	2989564000	9%
1918	3441329000	15%
1919	3375125000	-2%
1920	3951134000	17%
1921	3873797000	-2%
1922	4001525000	3%
1923	4504122000	13%
1924	4546422000	1%
1925	4660532000	3%
1926	4812848000	3%
1927	5172916000	7%
1928	5523937000	7%
1929	5969800000	8%
1930	6241947000	5%
1931	6100000000	-2%
1932	5900000000	-3%
1933	5346126000	-9%
1934	5400000000	1%
1935	5200000000	-4%
1936	5200000000	0%
1937	5008147000	-4%
1938	4950000000	-1%
1939	4900000000	-1%
1940	5000000000	2%
1941	5100000000	2%

Evolution of MLHP's gas output, 1902-1937
Sources: *A Statistical Analysis of Montreal Light, Heat & Power Consolidated* for years 1902-1930, *Entre-Nous 1938* for years 1933 and 1937, *A Record of Expansion and Improvement 1925-1943* for years 1931-1932, 1934-1936, and 1938-1941

Bibliographie

"Air Conditioning. From the Woman's Point of View", *Canadian Homes and Gardens*, vol. 10, no° 10, 1933, 22.

Armstrong, Christopher, and H. V. Nelles
"Contrasting Development of the Hydro-Electric Industry in the Montreal and Toronto Regions, 1900-1930", *Journal of Canadian Studies/Revue d'Études* Canadiennes, vol. 18, n° 1, 1983, 5–27.

Atallah, Nadia
"Les quartiers ouvriers de Montréal pendant la Grande dépression", *Bulletin de l'Institut Pierre Renouvin*, vol. 27, no° 1, 2008, 117–28.

Baillargeon, Denyse
"La Crise ordinaire: Les ménagères montréalaises et la crise des années trente", *Labour / Le Travail*, vol. 30, 1992, 135-162.

Making Do: Women, Family and Home in Montreal during the Great Depression. Waterloo: Wilfrid Laurier University Press, 1999.

Ménagères au temps de la Crise. Montréal: Remue-ménage, 1993.

Barnum D.D.
Report on Ways and Means of Promoting Gas Sales in Montreal. AHQ F9/3413/12352 loc. 3121. Montréal: Montreal Light, Heat & Power Consolidated, 1937.

Bélanger, Réal, George S. Mooney, and Pierre Boucher
Les vieux logements de Montréal. Rapport d'une étude faite pendant l'été 1937. AVM 001 XCD00-P7450. Montréal: Commission métropolitaine de Montréal. Département d'urbanisme et de recherche, 1938.

Bellavance, Claude
Shawinigan Water And Power, 1898-1963. Naissance et déclin d'un groupe industriel au Québec. Montréal: Boréal, 1994.

Bellavance, Claude, and Paul-André Linteau
"La diffusion de l'électricité à Montréal au début du XXe siècle." *In* Horacio Capel et Paul-André Linteau (dir.), *Barcelona-Montréal: Desarrollo urbano comparado / Développement urbain comparé*, 239–58. Barcelone: Publicacions de la Universitat de Barcelona, 1998.

Benoist, Émile
"L'âge du chauffage au bois serait bel et bien passé", *Le Devoir*, March 8, 1933.

Bertilorenzi, Marco
The International Aluminium Cartel: The Business and Politics of a Cooperative Industrial Institution. New York: Routledge, 2015.

Bonneuil, Christophe, and Jean-Baptiste Fressoz
L'événement anthropocène. La Terre, l'Histoire et nous. Paris: Seuil, 2016.

Bouvier, Yves
"Observer, mesurer, maîtriser. Les entreprises du secteur de l'énergie et les consommateurs individuels (France, années 1950-1980)", *In* Geneviève Massard-Guilbaud et Charles-François Mathis (dir.), *Sous le soleil. Systèmes et transitions énergétiques du Moyen-Âge à nos jours*. Paris: Éditions de la Sorbonne, 2019.

Bradbury, Bettina
Working Families: Age, Gender, and Daily Survival in Industrializing Montreal. Toronto: McClelland & Stewart, 1993.

Civic Investment and Industrial Company
Meeting Minutes. AHQ F9/3410/12062 loc. 4198. Montréal: Civic Investment and Industrial Company, 1917.

Coutard, Olivier, and Elizabeth Shove
"Infrastructures, Practices and the Dynamics of Demand", *In* Elizabeth Shove and Frank Trentmann (eds.), *Infrastructures in Practice: The Dynamics of Demand in Networked Societies*, 10–22. London: Routledge, 2018.

Cowan, Ruth Schwartz
"The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology", In Wiebe E. Bijker, Thomas Parke Hughes and Trevor Pinch (eds.), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, 261–80. Cambridge: MIT Press, 1987.

"The 'Industrial Revolution' in the Home: Household Technology and Social Change in the 20th Century", *Technology and Culture*, vol. 17, n° 1, 1976, 1–23.

Craigie, Ethel
"New Gadgets for the Modern House", *Canadian Homes and Gardens*, vol. 8, n° 1, 1931, 34–35.

Dagenais, Michèle
Montréal et l'eau. Une histoire environnementale. Montréal: Boréal, 2011.

Dales, John Harkness
Hydroelectricity and Industrial Development: Quebec, 1898-1940. Cambridge: Harvard University Press, 1957.

Denis, Leo G
Electric Generation and Distribution in Canada. Ottawa: Commission of Conservation, 1918.

Desbiens, Caroline
Power from the North: Territory, Identity, and the Culture of Hydroelectricity in Quebec. Vancouver: UBC Press, 2014.

Dominion Bureau of Statistics
Family Income and Expenditure in Canada. 1937-1938. Ottawa: Edmond Cloutier, 1941.

Durand, Caroline
Nourrir la machine humaine: Nutrition et alimentation au Québec, 1860-1945. Montréal & Kingston: McGill-Queen's University Press, 2016.

Edgerton, David
"From Innovation to Use. Ten Eclectic Theses on the Historiography of Technology", *History and Technology*, vol. 16, 1999, 111–36.

Engineering Department
Montreal Light, Heat & Power Cons. Appraisal of Electric Property. Subsidiary Report No. 1. Cedars Rapids Mfg. & Power Co. AHQ F9/3458/13544 loc. 3930. Montréal: Montreal Light, Heat & Power Consolidated, 1942.

Montreal Light, Heat & Power Cons. Valuation of Electric Property. General Report. AHQ F9/3458/13549 loc. 3930. Montréal: Montreal Light, Heat & Power Consolidated, 1943.

Evenden, Matthew
Allied Power: Mobilizing Hydro-Electricity during Canada's Second World War. Toronto: University of Toronto Press, 2015.

"Lights Out: Conserving Electricity for War in the Canadian City, 1939-1945", *Urban History Review / Revue d'histoire urbaine*, vol. 34, n° 1, 2005, 88–99.

Fleming, Keith Robson
Power at Cost: Ontario Hydro and Rural Electrification, 1911-1958. Montréal & Kingston: McGill-Queen's University Press, 1992.

Forman, Peter J., and Elizabeth Shove
"The Fixity of Flexibility". *Center for Research into Energy Demand Solutions* (blog), 2019. https://www.creds.ac.uk/the-fixity-of-flexibility/.

Fougères, Dany
L'approvisionnement en eau à Montréal. Du privé au public, 1796-1865. Québec: Septentrion, 2004.

Fressoz, Jean-Baptiste
"Pour une histoire désorientée de l'énergie." *In* Daniel Thevenot (dir.), *25èmes journées scientifiques de l'environnement. L'économie verte en question*. Journées Scientifiques de l'Environnement. Créteil, France, 2014.

"Fuel-Power Problem of Canada", *Journal of the Engineering Institute of Canada*, vol. 1, n° 1, 1918, 1–58.

Gagnon, Robert
Questions d'égouts. Santé publique, infrastructures et urbanisation à Montréal au XIXe siècle. Montréal: Boréal, 2006.

Gelly, Alain
"A Precipitous Decline, Steam as Motive Power in Montreal: A Case Study of the Lachine Canal Industries", *IA. The Journal of the Society for Industrial Archeology*, vol. 29, n° 1, 2003, 65–85.

Goldstein, Carolyn M
"From Service to Sales: Home Economics in Light and Power, 1920-1940", *Technology and Culture*, vol. 38, n° 1, 1997, 121–52.

Graber, Frédéric
"Inventing Needs: Expertise and Water Supply in Late Eighteenth- and Early Nineteenth-Century Paris", *The British Journal for the History of Science*, vol. 40, n° 3, 2007, 315–32.

Hatton-Proulx, Clarence
"A Lust for Power. Electrifying Montréal's Streets and Homes, 1884-1939", M.A. Thesis, York University, 2019.

Hocking, Clare, and Ulla Kroksmark
"Sustainable Occupational Responses to Climate Change through Lifestyle Choices", *Scandinavian Journal of Occupational Therapy*, vol. 20, n° 2, 2013, 111–17.

Hughes, Thomas Parke
Networks of Power: Electrification in Western Society, 1880-1930. Baltimore: Johns Hopkins University Press, 1983.

Jacobs, Jane
The Question of Separatism: Quebec and the Struggle over Sovereignty. 2nd ed. Montréal: Baraka Books, 2011.

Jacobs, Meg
Panic at the Pump: The Energy Crisis and the Transformation of American Politics in the 1970s. New York: Hill and Wang, 2016.

Jarrige, François, and Thomas Le Roux
La contamination du monde. Une histoire des pollutions à l'âge industriel. Paris: Seuil, 2017.

Jones, Christopher F
Routes of Power: Energy and Modern America. Cambridge: Harvard University Press, 2016.

Kroon, Bianca van der, Roy Brouwer, and Pieter J.H. van Beukering
"The Energy Ladder: Theoretical Myth or Empirical Truth? Results from a Meta-Analysis", *Renewable and Sustainable Energy Reviews*, vol. 20, 2013, 504–13.

Lecours, Jacques, and Raymonde Lavoie
L'électrification de la région de Montréal. Synthèse historique. Montréal: Hydro-Québec, 1991.

Linteau, Paul-André
Une histoire de Montréal. Montréal: Boréal, 2017.

Lorkowski, Nina
"Managing Energy Consumption. The Rental Business for Storage Water Heaters of Berlin's Electricity Company from the Late 1920s to the Early 1960s", *In* Nina Möllers and Karin Zachmann (eds.), *Past and Present Energy Societies: How Energy Connects Politics, Technologies and Cultures*, 137–62. Bielefeld: Transcript Verlag, 2012.

Macfarlane, Daniel, and Andrew Watson
"Hydro Democracy: Water Power and Political Power in Ontario", *Scientia Canadensis: Canadian Journal of the History of Science, Technology and Medicine*, vol. 40, no° 1, 2018, 1-18.

MacMillan, J.R.
Discussion and Summary of a Public Relations Campaign Designed to Promote Informed Public Opinion of and Favourable Reaction to the Proposed Revision of Electric Rates and to Gain Public Acceptance of New Rate Schedule. AHQ F9/3469/14309 loc. 3912. Montréal: Montreal Light, Heat & Power Consolidated, 1934.

Martinot, Eric
"Grid Integration of Renewable Energy: Flexibility, Innovation, and Experience", *Annual Review of Environment and Resources*, vol. 41, 2016, 223–51. https://doi.org/10.1146/annurev-environ-110615-085725.

Massell, David
Quebec Hydropolitics: The Peribonka Concessions of the Second World War. Montréal & Kingston: McGill-Queen's University Press, 2011.

Maxwell, James, Jennifer Lee, Forrest Briscoe, Ann Stewart, and Tatsujiro Suzuki
"Locked on Course: Hydro-Québec's Commitment to Mega-Projects", *Environmental Impact Assessment Review*, vol. 17, 1997, 19–38.

Montreal Light, Heat & Power Company
Annual Report 1907. AHQ F9/3413/12289 loc. 3121. Montréal: Montreal Light, Heat & Power Company, 1907.

Annual Report 1914. AHQ F9/3413/12296 loc. 3121. Montréal: Montreal Light, Heat & Power Company, 1914.

Annual Report 1915. AHQ F9/3413/12297 loc. 3121. Montréal: Montreal Light, Heat & Power Company, 1915.

Bulletins to Employees. AHQ F9/3423/12986 loc. 13404. Montréal: Montreal Light, Heat & Power Company, 1911.

Engineer's Report. Sault Au Recollet. AHQ F9/3425 13028 loc. 3942. Montréal: Montreal Light, Heat & Power Company, 1914.

Report on Strike. AHQ F9/3412/12904 loc. 1992. Montréal: Montreal Light, Heat & Power Company, 1919.

Statement Showing Comparison Between Power Generated and Power Sold Between July 1st 1915 & Jan. 1st 1916 at Cedar Rapids. AHQ F9/3469/14235 loc. 3913. Montréal: Montreal Light, Heat & Power Company, 1916.

Montreal Light
Heat & Power Consolidated. *A Record of Expansion & Improvement 1925-1943*. AHQ F9/3409/12161 loc. 3960. Montréal: Montreal Light, Heat & Power Consolidated, 1943.

A Statistical Analysis of Montreal Light, Heat & Power Consolidated. AHQ F9/3413/12350 loc. 3121. Montréal: Montreal Light, Heat & Power Consolidated, 1931.

Annual Report 1918. AHQ F9/3413/12299 loc. 3121. Montréal: Montreal Light, Heat & Power Consolidated, 1918.

Annual Report 1927. AHQ F9/3413/12308 loc. 3121. Montréal: Montreal Light, Heat & Power Consolidated, 1927.

Annual Report 1941. AHQ F9/3413/12322 loc. 3121. Montréal: Montreal Light, Heat & Power Consolidated, 1941.

Cedar Rapids - Alcoa Contracts and Correspondance. AHQ F9/3470 #1 loc. 13322. Montréal: Montreal Light, Heat & Power Consolidated, 1941.

Cedar Rapids Production Journal. AHQ F9/3427 #202 loc. 2140. Montréal: Montreal Light, Heat & Power Consolidated, 1925.

Dual Service. 1927. AHQ F9/3423/12992 loc. 3944. Montréal: Montreal Light, Heat & Power Consolidated, 1927.

Dual Service. 1929. AHQ F9/3423/12993 loc. 3944. Montréal: Montreal Light, Heat & Power Consolidated, 1929.

Dual Service 1933. AHQ F9/3423/12998 loc. 3944. Montréal: Montreal Light, Heat & Power Consolidated, 1933.

Dual Service 1934. AHQ F9/3423/12999 loc. 3944. Montréal: Montreal Light, Heat & Power Consolidated, 1934.

Electricity and Gas Sales, 1937. AHQ F9/3469/14322 loc. 3686. Montréal: Montreal Light, Heat & Power Consolidated, 1945.

Entre-Nous. 1938. AHQ F9/3423/13000 loc. 3943. Montréal: Montreal Light, Heat & Power Consolidated, 1938.

Extracts from P.H. & Station Reports. June 1932. AHQ F9 3427 13073 loc. 3941. Montréal: Montreal Light, Heat & Power Consolidated, 1932.

Extracts from P.H. and Station Reports. June 1921. AHQ F9/3427 13059 loc. 3941. Montréal: Montreal Light, Heat & Power Consolidated, 1921.

Facture. AHQ H2/1800-00 1444 loc. 211. Montréal: Montreal Light, Heat & Power Consolidated, 1941.

Montreal Light Heat and Power Consolidated and Operating Subsidiaries. AHQ F9/3409/12338 loc. 3960. Montréal: Montreal Light, Heat & Power Consolidated, 1933.

Schedule of Rates and Some Information Regarding the Sale and Measurement of Electric Current. AHQ F9/3469/14279 loc. 3912. Montréal, 1909.

The Household Book. Le Livre Ménager. Montréal: Montreal Light, Heat & Power Consolidated, n.d.

Moss, Timothy, and Siddharth Sareen
"Demanding Demand: Political Configurations of Energy Flexibility in Berlin, 1920-2020", *Journal of Energy History / Revue d'Histoire de l'Énergie [Online]*, n°5, 2020.

Nelles, Henry Vivian
The Politics of Development: Forests, Mines, and Hydro-Electric Power in Ontario, 1849-1941. Montréal & Kingston: McGill-Queen's University Press, 2005.

Parr, Joy
Domestic Goods: The Material, the Moral, and the Economic in the Postwar Years. Toronto: University of Toronto Press, 1999.

"Shopping for a Good Stove: A Parable about Gender, Design, and the Market." *In* Joy Parr (ed.), *A Diversity of Women: Ontario, 1945-1980*, 75–97. Toronto: University of Toronto Press, 1995.

Pedersen, Susan
Family, Dependence, and the Origins of the Welfare State: Britain and France, 1914-1945. Cambridge: Cambridge University Press, 1993.

Penfold, Steve
"Petroleum Liquids", *In* Ruth W. Sandwell (ed.), *Powering up Canada: A History of Power, Fuel, and Energy from 1600*, 274–99. Montréal & Kingston: McGill-Queen's University Press, 2016.

Platt, Harold L.
The Electric City: Energy and the Growth of the Chicago Area, 1880-1930. Chicago: University of Chicago Press, 1991.

Polèse, Mario
"Montréal économique : de 1930 à nos jours", *In* Dany Fougères (dir.), *Histoire de Montréal et de sa région, t. II*, 959–1004. Québec: Presses de l'Université Laval, 2012.

Régie des services publics
Routine Des Dossiers de Requêtes Provinciale de l'électricité - Nos 1100 à 1500. BANQ Montréal, Fonds Régie de l'énergie 1909-2012 (E175 1993-11-001\8). Québec: Régie des services publics, 1940.

Ritchie, Hannah, and Max Roser
"Energy Production & Changing Energy Sources", *Our World in Data*, 2018. https://ourworldindata.org/energy-production-and-changing-energy-sources.

Sandwell, Ruth W.
"Pedagogies of the Unimpressed: Re-Educating Ontario Women for the Modern Energy Regime, 1900-1940", *Ontario History*, vol. 107, n° 1, 2015, 36–59.

Sandwell, Ruth W., ed.
Powering Up Canada: The History of Power, Fuel, and Energy from 1600. Montréal & Kingston: McGill-Queen's University Press, 2016.

Savard, Stéphane
"Les communautés autochtones du Québec et le développement hydroélectrique: Un rapport de force avec l'État, de 1944 à aujourd'hui", *Recherches amérindiennes au Québec*, vol. 39, n° 1–2, 2010, 47–60.

Shove, Elizabeth
Comfort, Cleanliness and Convenience: The Social Organization of Normality. Oxford: Berg, 2003.

Shove, Elizabeth, Heather Chappells, Loren Lutzenhiser, and Bruce Hackett
"Comfort in a Lower Carbon Society", *Building Research & Information*, vol. 36, n° 4, 2008, 307–11.

Shove, Elizabeth, Gordon Walker, and Sam Brown
"Transnational Transitions: The Diffusion and Integration of Mechanical Cooling", *Urban Studies*, vol. 51, n° 7, 2014, 1506–19.

Siemiatycki, Matti, Theresa Enright, and Mariana Valverde
"The Gendered Production of Infrastructure", *Progress in Human Geography*, vol. 44, n° 2, 297-134.

Struthers, James
No Fault of Their Own: Unemployment and the Canadian Welfare State, 1914-1941. Toronto: University of Toronto Press, 1983.

Taschereau, Sylvie, and Yvan Rousseau
"The Hidden Face of Consumption: Extending Credit to the Urban Masses in Montreal (1920s–40s)", *Canadian Historical Review*, vol. 100, n° 4, 2019, 509–39.

The Cedar Rapids Manufacturing and Power Company
Memorandum on the Cedar Rapids Manufacturing & Power Company and the Cedar Rapids Transmission Company. AHQ F9/3409/12156 loc. 3960. Montréal, 1944.

"The Kitchen: 1933 Model"
Canadian Homes and Gardens, vol. 10, n° 6, 1933, 20–21.

Torriti, Jacopo
"Understanding the Timing of Energy Demand through Time Use Data: Time of the Day Dependence of Social Practices", *Energy Research & Social Science*, vol. 25, 2017, 37–47.

Trentmann, Frank, and Anna Carlsson-Hyslop
"The Evolution of Energy Demand in Britain: Politics, Daily Life, and Public Housing, 1920s-1970s", *The Historical Journal*, vol. 61, n° 3, 2018, 807–39.

Unger, Richard W.
"Shifting Energy Sources in Canada: An International Comparison, 1870–2001", *Canadian Journal of History*, vol. 53, n° 3, 2018, 480–514.

Ville de Montréal
"Population Totale et Variation de La Population, Agglomération de Montréal." *Ville de Montréal* (blog), 2016. http://ville.montreal.qc.ca/portal/page?_pageid=6897,67887840&_dad=portal&_schema=PORTAL.

Ward, Peter
A History of Domestic Space: Privacy and the Canadian Home. UBC Press, 1999.

Whatley, G.R.
A Brief Submitted by Montreal Light Heat & Power Consolidated in Support of Revised Tariff for Residential Electricity Service. AHQ F9/3413 loc. 3121 #15. Montréal: Quebec Public Service Commission, 1934.

Wilhite, Harold, and Loren Lutzenhiser
"Social Loading and Sustainable Consumption", *NA - Advances in Consumer Research*, vol. 26, 1999, 281–87.