Electrical Imperialism or Multinational Cooperation? The Role of Big Business in Supplying Light and Power to St. Petersburg before 1917

Timo Myllyntaus

Department of Economic and Social History
University of Helsinki

During the "long nineteenth century," St. Petersburg became one of Europe's most beautiful cities. Founded in 1703 by Peter the Great, the grandiose imperial capital gradually rose on the delta of the Neva River. The grand architectural epoch for St. Petersburg, however, was the period from Catherine the Great to Nicholas III, when most of the magnificent churches, splendid palaces, impressive business blocks, huge bridges, and colossal railway stations were constructed. The city became known for its exceptionally unified style of predominantly neoclassical architecture as it spread over the decades along a network of granite-lined canals. St. Petersburg was something extraordinary in the Russian Empire; as the "Venice of the North," it was designed to serve as "a window to the West."

With its 220,000 inhabitants, St. Petersburg was one of the Continent's major cities as early as 1800. By the mid-nineteenth century, it surpassed Moscow, and on the eve of World War I, the Russian capital had become a metropolis of two million, the fifth largest European city [Mitchell, 1978]. Full of life, it was a genuine melting pot for Russian and Western influences. It was a capital of contradictions, a rendezvous for all sorts of people. In the afternoons, its wide streets were crowded, while its outskirts resembled the sleepy villages of the Russian countryside. The spectrum of its inhabitants ranged from sophisticated nobles with unbelievable riches to impoverished and hungry beggars. And all over the city, sweet scents, exotic odors, and other strong smells wafted about. There were of course certain problems in the infrastructure and in hygienic standards. A contemporary German travel guide warned travelers not to drink unboiled water – "*dass der Fremde niemals in Petersburg ungekochetes Wasser trinke!*" – though it recommended drinking a certain amount of "*Schnaps* [vodka], *eine Medizin*," with fatty Russian food [Wernerkinck, 1910, pp. 6-7]. The uniqueness of the city was indisputable.

The capital of a great empire is like a magnet. St. Petersburg attracted not only natives from all corners of Russia's vast expanse, but also foreigners of various trades and professions. The capital was one of the major industrial

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cities, the commercial and financial center of Imperial Russia and the heart of cultural and scientific life [Gatrell, 1986, p. 35]. The role of foreigners among industrialists, businessmen, and scientists was conspicuous, but in the nineteenth century talented Russians emerged in the modern sectors of Tsarist society, including many prominent scientists and inventors.

Russian contributions to electric technology were not insignificant. Although the economy of the empire was backward, its leading experts in electrotechnology were among the foremost in the world. The Russian scientist Alexander N. Lodygin, for example, made contributions to the development of the incandescent lamp before Thomas Alva Edison; in 1872 he passed an electric current through a carbon rod placed in a closed, evacuated vessel. Four years later, Pavel Jablochkov, a Russian army telegraph engineer, completed his arc-lamp invention in Paris, and his "candle" subsequently became one of the most widely used arc-lamps. Nikolaj Benardos and Nikolaj Slavianov made significant contributions to electric welding technology. Finally, Mikhail Dolivo-Dobrovol'skii, a Russian electrical engineer born in St. Petersburg and educated in Riga and Darmstadt, made the major breakthrough in the development of three-phase current technology. In 1888, he built the first three-phase alternating current (AC) generator with a rotary magnetic field, and he proposed an asynchronous three-phase AC motor using a cast-iron rotor with a mounted hollow copper cylinder. Furthermore, in 1891 at the World Electrical Engineering Exhibition in Frankfurt-am-Main, Dolivo-Dobrovol'skii, then an employee of the German Allgemeine Elektricitäts-Gesellschaft (AEG), displayed the world's first large-scale three-phase system, transmitting electric power from the Lauffen hydropower plant over a distance of 170 kilometers [Mai, 1970, p. 199; Coopersmith, 1992, pp. 28-35].

The Introduction of Electric Lighting to St. Petersburg

Russian inventors met difficulties in translating their inventions into commercial success in their home country. However, some of them found technical and financial support in the West and thrived there. The Russian navy adopted Jablochkov's candles in 1878 and persuaded him to return to Russia to manufacture electric lighting equipment. His factory did not receive enough civilian orders, however, and closed in 1887; but Jablochkov had already moved back to Paris to continue his career as a businessman and inventor.

The electrification of Russia began with foreign-made equipment. The first power plant fired by fossil fuel was opened in St. Petersburg in 1879 to supply electricity for lighting the Liteinyi Bridge. A few years later similar small thermal power plants were set up in Moscow and other cities. In 1881 approximately 750 arc lights were in use in Russia; two-thirds of them illuminated military installations, military-related factories, or warships. The use of electricity for civilian purposes remained limited for a long time, and electric utilities were founded slowly. By 1910, utilities were operative in only 115 cities, although on the eve of World War I most Russian cities had a utility supplier [Coopersmith, 1992, pp. 15, 30-33, 43].

In the late nineteenth century, four gas utilities were operating in St. Petersburg. Despite the presence of these firms, in 1880 the city council granted permission to a Russian electricity company, Elektrotekhnik, owned by an entrepreneur named Chikolev, to light Nevskii Prospekt, the city's main street. The project was completed, but after the bankruptcy of Elektrotekhnik the installations were bought by the German company Siemens & Halske, which had worked in the Russian telegraph business since 1853. Street lighting was not enough for a subsidiary of a rising multinational company that aimed for serious involvement in the electricity supply business. The subsidiary's president and Finnish citizen Karl Siemens managed to obtain permission from the Ministry of Finance to set up a thermal power plant in St. Petersburg, which became the first commercial electrical utility in Russia. This large joint-stock company, called the Company for Electric Lighting from 1886 (and known as the 1886 Company), with an original capital of one million rubles, later became the owner of similar utilities in Moscow, Riga, Nishni Novgorod, Baku, and Lodz. When AEG and various German and Swiss banks later joined the shareholders, the company had enough resources to maintain its leading role in urban electrification in Russia. In Moscow, the 1886 Company gained a monopoly by buying out small private power plants and utilities [Mai, 1970, pp. 197-200].

In the mid-1890s, when the 1886 Company's concessions were expiring, the city councils of Moscow and St. Petersburg chose different strategies to supply electricity to citizens and industry. Moscow allowed the company to preserve its monopoly, whereas the Imperial capital decided to promote competition among utilities. Because the 1886 Company supplied electricity only to part of the city, the authorities of St. Petersburg provided concessions for other companies to electrify the rest of the capital. Between 1890 and 1896, the city made agreements with six other utilities to supply electric power. The one set up by the German company Helios had the strongest development potential. Later it became the parent company's "Russian" subsidiary, called Petersburger Gesellschaft für Electroanlagen (the Petersburg Electric Company). The other two utilities, the Russian Company for Electric Energy and the Gun and Shmattser Company, were purchased by the Company for Petersburg's Electric Lighting (CPEL), a Belgian company backed by the Société Générale de Belgique of Brussels and some German banks [Djakin 1966, pp. 124-32]. Three other utilities were owned by two gas companies, the firm of Nikolaj V. Smirnov, and an insurance firm. Three concessions were eliminated by buyouts and the recession of 1899-1902. Smirnov's utility, funded by domestic capital, remained the smallest company in the city and lacked the dynamism to grow [Coopersmith, 1992, p. 54].

Before the turn of the century, Helios and the Belgian company CPEL seriously challenged the leading position of the 1886 Company. In the late 1890s, all three utilities built new thermal power plants in St. Petersburg, and a few years later, their generation capacities were nearly equal. Competition among them intensified from 1901 when their short-lived cartel agreement was dissolved. Between May 1902 and May 1903, the 1886 Company's plant

delivered 5,334 megawatt hours (MWh) with a capacity of 7,200 horsepower [*Geschäftsbericht*, 1905]. During the decade 1903-1913, electricity consumption in the Russian capital grew by a factor of five. In 1913, with a total capacity of 71.5 megawatts, the three electricity supply utilities delivered 80,649 MWh to their customers with a rather low average operation time of 1,129 hours (under 13 percent of annual maximum capacity) [*Förslag*, 1917, pp. 231-32].

The 1886 Company did not give up under the pressure of competition; on the contrary, it was able to gain the upper hand in public electricity supply and, in addition, seized a major part of the tramway business in St. Petersburg. The concessions that the city council had granted to horse-driven tramway companies delayed the introduction of electric tramways until 1907, but by 1910 as many as fourteen electric tramway lines and two steam-driven lines were operating alongside some horse-driven lines in the Imperial capital [Wernerkinck, 1910; Sapilov, 1994].

It comes as no surprise that non-Russian companies controlled electricity supply in St. Petersburg. Before World War I, the concentration of foreign capital was higher in the electricity business than in any other Russian industry: in 1914, about 90 percent of that business was under foreign ownership [Rauber, 1985, p. 202].

The Electrotechnical Industry

In the beginning of electrification, the Siemens & Halske subsidiary in St. Petersburg had almost a monopoly as the supplier of electrical equipment. It had earlier manufactured telegraph devices, signal systems for railways, and other apparatus. As demand increased, it started to produce telephones and electrical equipment as well. In 1881, near the Smolenka quay in the Neva delta, Siemens & Halske set up an engineering workshop for the production of high- and low-voltage equipment, which was the first electrotechnical factory in Russia. The next year, the firm opened a cable factory in the capital [Mai, 1970, p. 197].

Siemens & Halske received very large orders from St. Petersburg and elsewhere in Russia. For example, in 1885 it electrified the Winter Palace with 20,000 electric bulbs and 56 arc lamps, at the time the largest electric lighting installation in the world [Mai, 1970, p. 200]. Siemens & Halske subsidiaries in Russia were not able to produce all the equipment, and the parent company therefore exported huge amounts from Germany to Russia. Protective import tariffs, however, were exceptionally high in the Tsarist Empire, delaying electrification and hampering the penetration of the vast Imperial markets by foreign electrical engineering companies. To gain a strong, durable foothold in Russia, it was preferable to set up a manufacturing subsidiary there.

In addition to fiscal goals, Russian customs policy aimed to support indigenous manufacturing, and small electrical engineering workshops were indeed set up, especially in the Baltic Provinces and in Finland. However, competition became sharper in the 1890s, when various electric manufacturers began to put more effort into exports. German companies such as Schuckert,

AEG, Union, Helios, and Lahmeyr & Co. penetrated into countries with weak domestic electrical engineering industries, and in Russia they were more successful than their American, Swiss, or Swedish competitors. Emil Rathenau, the chief executive of AEG, described Russia as "*ein Land der Zukunft*" (a country with a future). Foreign companies that had begun their penetration of Russia by appointing agents now changed their policy and set up their own "installation offices" in St. Petersburg and possibly also in some other major cities. In the next phase, they established assembly and manufacturing plants [Kirchner, 1982, pp. 406-9].

Just after the turn of the century, a crisis emerged in the international electrical equipment market as a result of overproduction, forcing even many large parent companies to merge – for example, Schuckert with Siemens & Halske, and Union Elektrizität AG with AEG. At this point, most of the small domestic workshops had to give up, because they were not able to compete with big multinational companies whose products were technologically more advanced, prices lower, and bids coupled with a financing package. Many domestic workshops were closed down or bought out by foreign competitors. For example, Lahmeyr & Co. bought out the Russian-Baltic Electrotechnical Factory that Heinrich Dettmann, a German optician, had founded in Riga in 1888. Similarly, in 1910 AEG purchased a Finnish firm, the electrical engineering workshop and utility of Paul Wahl & Co. in Viborg, that had sold electric lighting installations all over the western part of Russia [Mai, 1970, pp. 197-203; Myllyntaus, 1991, pp. 53-58].

By investing the profits that it had earned from the sales of cables and equipment into electric power plants, Siemens & Halske expanded its clientele and further increased its sales [Mai, 1970, p. 203]. Utility plants were important instruments that manufacturers could use to stimulate demand for electrical equipment.

Competition between Utility Companies

In St. Petersburg, electrical utilities were aware of their growth potential, and they had a desire to expand their activities within the city as well as around the greater capital district. The lack of generating capacity and the high cost of primary energy sources were the main obstacles to growth. The major problem of the Imperial capital was that it lacked not only local but also regional energy sources. Nevertheless, houses were fairly well heated – at least according to British standards, although the Russian climate was harsher.

In St. Petersburg, coal and firewood were the principal energy sources. Russia had several huge coal deposits, for example in the Donets Basin in the south, but because of problems in railway transport, indigenous coal was used in the capital only in limited amounts. Billets were shipped from the area around Lake Ladoga and from Finland. Between 1900 and 1913, nearly 0.7-1.0 million cubic meters of Finnish wood was transported to Russia annually. Because those energy supplies were insufficient, several thousand tons of British coal and coke were imported; in the late nineteenth century, Russia was among the

six largest importers of British hard coal [Fremdling, 1996, 604-9]. In St. Petersburg, the high prices of imported fuels substantially increased the cost of thermal power plants. Utilities realized that the only way to generate ample amounts of electricity at reasonable prices was to use alternative regional energy sources, peat and hydropower.

Within a range of 200 kilometers, there were three rivers with significant harnessable rapids: the river Vuoksi connecting Lake Saimaa and Lake Ladoga; the river Volhov emptying into Lake Ladoga; and the river Narva flowing from Lake Peipsi to the Gulf of Finland. Quite early it was recognized that each of these rivers had great potential for the generation of hydroelecticity, but major attention was focused on the Vuoksi. The Imatra waterfall along the Upper Vuoksi was a world-famous scenic spot, the most famous tourist attraction in the grand duchy of Finland. The travel guide by A. Wernerkinck [1910, pp. 128-29] claimed that "even those, who have seen the Niagara Falls, wonder at the splendour of these waterfalls, where the charm and grandeur of nature are united in a rare way. Each foreigner visiting St. Petersburg should take a detour of two days to Imatra." Also like Niagara, the waterfall meant power-generating potential. But the Vuoksi River was not situated in Russia as was the Volhov, but in Finland, whose political relations with the Tsarist Empire were strained at that time.

The story of the river Vuoksi as a hydroelectric resource began with two episodes that displayed key aspects of the conflicts that were to develop. In May 1894, the St. Petersburg Polytechnischer Verein (the Polytechnic Society of St. Petersburg) visited Imatra, but tourism and entertainment were not the only aims of the trip. The group was interested in the suitability of the rapids on the Upper Vuoksi for power generation. The idea of utilizing hydroelectric power was developed further by another scientific organization. In the same month, the Russian engineer Veniamin Feodorovitsh Dobrotvorskii gave a lecture on the topic at a meeting of the Russian Technical Society. He put forward his great scheme to harness both the River Vuoksi on the Karelian Isthmus and the river Narva in northern Estonia to supply hydroelectricity for St. Petersburg. His plan alarmed the Finns, who at the time were worried about the intensifying tendencies to russify their autonomous grand duchy [*Imatrium*, 1894; Kirchner, 1986, p. 98].

V.F. Dobrotvorskii did not lose any time before setting up a company, the St. Petersburger Gesellschaft zur Wasserfallkraft. As early as September 1894, he applied to the Finnish Senate for the right to use the state-owned rapids at Imatra to generate electricity. The Finnish Senate rejected the application to demolish the country's most precious beauty spot in order to supply electricity to the Russian capital. Even Russian engineers criticized the technical uncertainties of Dobrovorskii's plan, which omitted the expenses of the transmission lines and placed too much confidence in government subsidies and tax exemptions.

Dobrotvorskii's followers prepared similar plans to harness the rapids on the Upper Vuoksi and transmit electric power to St. Petersburg. Even the British company Vickers considered participating in the electrification of the

Russian railways with hydroelectric power from the vicinity of the Imperial capital [Trebilcock, 1973, p. 276]. The Finnish authorities rejected all plans to transfer hydroelectricity from the Karelian Isthmus to Russia. They did, however, allow the construction of hydropower plants on the Vuoksi to supply electricity for local needs, such as the Tornator spool factory, the Enso groundwood pulpmill, the Linnankoski carbide factory, and a small lighting plant for the Hotel Imatra. But it took a firm stand against any attempts to transmit energy to Russia or to electrify railway lines on the Karelian Isthmus, which was developing as a popular summer resort for the wealthy people of the Imperial capital.

Political friction between Russia and Finland and the policy of the Finnish Senate did not prevent Russians and other foreigners from buying riparian rights and plant sites along the Vuoksi. By mid-1914, foreign companies owned two-thirds of the total hydropower potential of the river.

The resistance of the Finns was not the only reason why large hydroelectric plants were not built on the Upper Vuoksi. The intense competition among the three large private power companies working in St. Petersburg also acted as a brake. The 1886 Company began to cooperate with the Belgian company CPEL in planning to acquire hydroelectricity to supplement the output of their coal-powered thermal plants in the capital. In 1908, they backed the foundation of Aktiebolaget Force, which was formally a Finnish company with its domicile at Jääski, a parish near Viborg. In a few years, Ab Force bought riparian rights to four rapids and eventually owned about 12 percent of the total hydropower potential of the river Vuoksi. In 1912, the majority of Ab Force's shares was taken over by the new Belgium-based firm Imatra AG für Erzeugung und Verteilung elektrischer Energie, which was set up to recruit international banks to join in the hydropower and transmission project [*Karjala*, November 8 and 9, 1912; Rauber, 1985, pp. 206, 209, 312, 367].

In the early 1910s, the 1886 Company and CPEL seemed to be in the lead in the competition with Helios. Their subsidiary, Imatra AG, announced in late 1912 that its workers were staking a right-of-way for a transmission line from the Vallinkoski rapids to St. Petersburg [*Mercator*, January 3, 1913, p. 8]. But Helios did not remain idle. The ownership of the electricity supply utility in St. Petersburg was reorganized after the collapse of the German parent company. Helios joined its efforts with Dobrotvorskii's company, which also was reorganized. The latter company took the French name Société St. Petersbourgeoise de transmission electrique de la force de chutes d'eau (SPTE), because after the reorganization Belgian and French investors were substantial shareholders in the company, which had capital of six million roubles. The Belgian banking house T & F Mottart of Brussels, for example, was closely connected with SPTE (*Karjala*, October 22, 1912; *Kauppalehti*, January 22, 1913, p. 51).

Competing power companies prepared various schemes to use the hydroelectric potential of the river Vuoksi for several purposes. The largest and most carefully prepared plan was drawn up by one of the power companies, SPTE. In the early 1910s, the company had hired the German engineering firm Gebrüder Hallinger from Munich to design a huge project, known as "the

Kuurmanpohja plan." The idea of the plan was to close the natural bed of the Upper Vuoksi by an upstream dam, to build a canal of 18 kilometers from Karsturanta, a neighboring village on the shore of Lake Saimaa, and to concentrate all water discharging from the lake through the canal at one large hydroelectric power plant with a 64-meter drop in the valley of Kuurmanpohja. A 12-kilometer tailrace canal was to lead water back to the original bed of the Lower Vuoksi. This hydroelectric plant of 300,000-400,000 hp (221-294 MW) would then have been the largest in the world, larger than the Niagara hydroplant with its 40-meter waterfall [*Uusi Suometar*, January 18, 1914; *Helsingin Sanomat*, January 19, 1914].

The construction of this plant was to be started in April 1914. SPTE proposed that, as a compensation for using Finnish natural resources, it would sell electricity to the Finnish State Railways at a reduced price, pay an annual rent that would gradually rise to 1.5 million Finnish marks within six years, and turn over the plant to the Finnish government without charge after ninety years [*Kauppalehti*, January 4, 1914; *Mercator*, January 3 and 9, 1914; *Uusi Suometar*, January 20, 1914].

Conclusion

Harnessing the river Vuoksi presented the opportunity for really sizeable projects involving technology transfer that seemed to promise both technical and economic opportunities. Most large companies that were planning to build hydroelectric plants on the river Vuoksi had solid financial underpinning, because they had close contacts with large Russian and central European banks. They had managed to acquire the riparian rights for the strong rapids on the Upper Vuoksi, and they had opportunities to distribute electric power to various customers in the St. Petersburg district.

At the same time, Finland had an extraordinary opportunity to receive considerable foreign investment and the most modern technology. In addition, it also had a chance to start setting up large-scale factories with high demand for electricity in Karelia and to begin the electrification of the railways. Over two decades, however, Finland obstinately rejected this kind of technology transfer. Repeatedly, it said no to direct foreign investments in the generation of hydroelectricity and to offers to introduce electricity-intensive industry and to import up-to-date technology. From the perspective of the late twentieth century, when less developed countries are competing to attract direct foreign investments, the policy of the grand duchy of Finland seems odd. It is possible to understand the situation only if we consider the political context of these development plans. In this case, the political filter controlling the application of technology was ardently opposed to direct foreign investment, and it was strong enough to prevent hydropower projects in the Karelian Isthmus despite support from the Russian government.

Before gaining political independence in late 1917, Finns persistently opposed the harnessing of the river Vuoksi and the transmission of electricity to Russia primarily for political reasons. Finns were afraid that granting

foreigners the right to use one of the most important natural resources of the country and to transmit electric power from the Karelian Isthmus to St. Petersburg would lead to the further transfer of political power to Russia and stimulate the Tsarist government's territorial demands in the southeastern part of the grand duchy.

Finnish public opinion and the press were quite unanimously against the large hydroelectric plants on the River Vuoksi. And, although the Finnish senates just before World War I have been viewed as increasingly pro-Russian, they still opposed all petitions to transmit electricity from the Upper Vuoksi to St. Petersburg. Several applications were turned down by being sent to a committee for further investigation or by being circulated for comment for years. The Kuurmanpohja plan fell into this void as well. It was finally withdrawn because, after the outbreak of World War I, the Tsarist government decided that a company under German ownership could not be allowed to carry out such a large project.

For Finnish authorities, the pivotal issues in the conflicts over the hydropower of the Upper Vuoksi were whether to allow foreign-owned companies to build any power plant in the grand duchy or to export hydroelectricity to Russia at all. For the private power companies operating in the Russian capital, the vital goal was to secure for their own projects the upper hand in transmitting hydroelectricity from the Karelian Isthmus to St. Petersburg.

One reason for the inaction of the Russian government lay in the ultimately irreconcilable differences among ministries concerning the ownership of land and waterfalls. Russian authorities were also in conflict over which companies should be allowed to carry out hydroelectric projects and over whether to support constructing one large power plant or a series of several small plants along the river Vuoksi. To solve the latter problem, the Finnish National Board of Public Roads and Waterways hired a Swedish engineering firm, Vattenbyggnadsbyrån i Stockholm, to investigate and recommend which one of the two alternatives was better. In its lengthy report, the firm stated that from a technical viewpoint, the plan to concentrate all outflow from Saimaa in one big hydroelectric plant at Kuurmanpohja was more advantageous, but from an economic perspective, the series of five power plants along the natural bed of the River Vuoksi was better.

Vattenbyggnadsbyrån's key argument against the Kuurmanpohja plan was that there was not enough demand for electricity in St. Petersburg and its surroundings to warrant such a huge hydroplant. Working at low capacity, the plant would have produced expensive electricity because of its high capital costs. It would soon have met serious financial difficulties, because it would not have been able to pay interest and amortization on capital loaned from central European banks [*Förslag*, 1917, pp. 228-29].

For a variety of reasons, then, the Russians seemed to abandon the Kuurmanpohja plan during the first years of World War I, but the Finns did not find themselves relieved: the idea of supplying St. Petersburg with Finnish hydroelectricity persisted. Finally in 1916, the Tsarist regime itself put forward a new plan, according to which the Russian government would have confiscated

some rapids under private ownership on the Upper Vuoksi and constructed a medium-sized hydroelectric plant within eighteen months to supply electricity for St. Petersburg, which was stricken by a wartime energy shortage. The March revolution of 1917 in Russia foiled that plan, just as the outbreak of World War I had terminated the attempts by the 1886 Company to build Utkina Zavod, a peat-fired thermal plant of 20 MW near St. Petersburg.

Consequently, because politics preceded technology and the economy, the Finns managed to escape a type of technology transfer that they did not regard as benevolent multinational cooperation, but rather as a formidable and frightening "electrical imperialism." As a result of its earlier traumatic experiences, the parliament of the young republic of Finland in August 1919 passed a law prohibiting the export of electricity and later took measures that substantially restricted foreign investment in general.

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