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SESSION 33

Foreign Investments in Urban Public Utilities: An International and Comparative Perspective in the Long Run

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Foreign Investments in Finnish Electricity Supply Utilities, 1884 – 1936

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Points of Departure

Building water, gas and electricity supply utilities in the late 19th century was a new type of business – especially in the European periphery. In this circle around the core countries, electrification met more hardships than in more advanced countries of Western and Central Europe. Peripheral regions often lacked suitable capital, entrepreneurs, technical knowledge, machinery, equipment, engineers, legislation, and favourable societal atmosphere.

The transfer of technology and imports of materials and equipment were a necessity, even if some domestic production had already started in this technological sector. In addition, investing in supply utilities and operating them also demanded for funds, management skills and technical

expertise. In European peripheries, several models were applied to setting up pipebound and wirebound supply utilities.

These models can be categorized as follows:

- 1) A supply utility was a company of one or more local investors whose motives were to earn profit, provide services to their communities and gain concessions from the municipal government for further business activities.
- 2) A local factory might set up an utility as its subsidiary. It might do business by selling some surplus gas, electricity, cold or hot water to the surrounding quarters. The motivation was often to support their workers, employees and communities, and/or utilise some of its refuse, such as wood waste, profitably.
- 3) Ordinary citizens - often merchants - could join their efforts to establish an utility to serve infrastructure services, such as gas, electricity and water. Utilities owned by consumers might be limited companies or cooperatives.
- 4) Municipal councils also founded various supply utilities and this activity speeded up from the 1890s. Collective interests, such as fire exhaustion or street lighting, often laid behind these expensive investments. The will to serve citizens and develop their cities also formed important motivations. Providing water, gas and electricity to local small business was part of municipal industrial policy. Furthermore, environmental reasons involved in the operation of utilities rose in some cities surprisingly early.
- 5) Some cases inhabitants were ready to buy services but they or their organisations did not have enough capital for utility investments. Therefore, a model emerged where manufacturers of technical equipment built utilities using their own products. Manufacturers of electrical machinery also owned utilities entirely or partly - at least some years. Sometimes they organized funding of utilities from ordinary or special investment banks. Both domestic and foreign electrical engineering companies applied this business model.

After the turn of the century, the trend was that the market shares of municipally owned utilities and utilities run by engineering companies and investment banks increased. Competition became sharper and business constellations developed more complex. Infrastructure services have always been also political issues, but debate turned heated when financial inputs soared to considerable sums or if services were not satisfactory.

Internationalisation of the Electrical Engineering

In the late 19th century, the electrical engineering industry was a new and rapidly changing manufacturing sector. At first, fairly small firms began to produce electrical equipment for regional or national purposes. Various countries had their national engineering works supplying materials and machinery for domestic customers. Soon the biggest companies started exporting, primarily dynamos, generators, cables, switches and various kinds of arc lamps and bulbs. Another way for technology transfer was selling patents and production licences to foreign companies. Both transactions of products and immaterial rights were done by using agents and agencies, which knew the conditions of the host countries.

A great change took place from the 1890s. In one country after another, the sales and manufacturing subsidiaries of big transnational companies sprang up besides the national workshops and installation firms. The electrical equipment business was swiftly internationalised and a world market for these products arose. Worldwide competition for market shares began between few giant transnational companies. Minor manufacturers relying primarily on their own national markets often found themselves overpowered by the rivalry of the transnational companies, which had much

bigger resources. The general framework of the modern worldwide electrical business was established by the year 1905.

American electrical companies were the pioneers in setting up subsidiaries abroad. In England the Anglo-American Brush Electric Light Corporation was organised in 1880 to exploit British rights for the arc-lighting system innovated by the American Charles F. Brush, whose company in the USA was then thriving. Thomas A. Edison became an entrepreneur in the electrical equipment business in the late 1870s, and a few years later he founded subsidiaries abroad as well. These subsidiaries, such as the Edison Electric Light Company Ltd set up in England in 1881, were to exploit the Edison system through the licencing, sale and manufacture of system components through supplying light.¹

The transformers and dynamos designed by the American professor Elihu Thomson laid the foundation for the Thomson-Houston Electric Company in 1883 and soon subsidiaries and agencies were opened abroad. One year later, George Westinghouse began to build up his corporation with dependent companies in major foreign countries. The American companies soon strengthened their position in the world market by merging. In 1889 Thomson-Houston bought the Brush company, while various Edison companies consolidated into the Edison General Electric Co. Only three years later, the latter was merged with Thomson-Houston under the name General Electric.²

Many of the big transnational electrical engineering companies emanated in the countries where rapid industrialisation and a large home market provided a good basis for growth, a strong demand for electrical

¹ Thomas P. Hughes, *British Electrical Industry Lag, 1882-1888*, *Technology and Culture* 3 (1962) no. 1, pp. 29-30.

² Malcolm MacLaren, *The Rise of the Electrical Industry during the Nineteenth Century* (Princeton, 1943), pp. 170-98; A. J. Körner, *Den elektriska industriens historia, Uppfinnigarnas bok III*, ed. by Sam Lindstedt (Stockholm, 1927), pp. 870-1.

equipment and a developed capital market. In the late nineteenth century, these characteristics prevailed in the USA and also in Germany where several transnational electrical engineering companies emerged. The earliest of these companies, Siemens & Halske, had specialised in electrical communication engineering since the 1840s, and later also gained a strong foothold in heavy current engineering.³ The company significantly grew under the management of the Siemens family.⁴ In 1875 it employed about 600 people. In Germany, there were then an additional electrical firms with about 560 employees in total. One of them, Schuckert & Co, founded in Nuremberg in 1874, swiftly developed into another considerable international supplier of dynamos. Schuckert's was the first foreign electrical firm to use a local agent, namely Daniel Joh. Wadén, in Finland. However, in the same year, 1882, its Swedish agent, Luth & Roséns Elektriska Ab from Stockholm, also started to install its equipment in the Grand Duchy.⁵

The Edison subsidiary in Germany, Deutsche Edison Gesellschaft, founded in 1883, was reorganised four years later and became an independent giant corporation under the strong German-Jewish businessman, Emil Rathenau (1838–1915). Under the name of the Allgemeine Elektrizitätsgesellschaft (AEG) it evolved from an installation firm to a prominent

³ Siemens & Halske founded manufacturing plants in Berlin in 1847, in St. Petersburg in 1855, in London in 1858, in Paris in 1878, in Vienna 1879, in Tokyo in 1887 and in Chicago in 1892. Ludwig von Winterfeld, *Entwicklung und Tätigkeit der Firma Siemens & Halske in den Jahren 1847-1897* (Hamburg, 1913), pp. 20ff; S. Von Weiher, *The Rise and Development of Electrical Engineering and Industry in Germany in the Nineteenth Century, A Case Study – Siemens & Halske, Development and Diffusion of Technology, Electrical and Chemical Industry*, ed. by Akio Okochi and Hoshimi Uchida (Tokyo, 1980), p. 42.

⁴ The founder of the company, Werner Siemens, made theoretical contributions in dynamo-electric principles and constructed his famous dynamo in the years 1866-1867. In 1888, the King of Prussia rewarded the achievements of Werner Siemens (1816-92) in electrical technology by raising him to the nobility. Werner von Siemens, *Lebenserinnerungen* (Berlin, 1897), pp. 252-3; (Eino S. Repo), *Siemens 60 vuotta Suomessa 1898-1958*, (Helsinki, 1958), p. 15.

⁵ Georg Siemens, *History of the House of Siemens, Vol. I* (Freiburg/Munich, 1957), pp. 150-1; Körner, *Den elektriska industriens historia*, pp. 870ff.

transnational electrical manufacturer. A link between the AEG, and the Edison corporation and its successor prevailed for several decades. Their mutual agreements included, among other things, the delivery of sole sales rights for some geographical area; thus North America went to the Edison corporation and Europe east of Germany and the whole of Russia to the AEG. Consequently, Finland fell into the AEG's sphere of influence.⁶

Among the other German electrical firms actively engaged abroad were Felten & Guillaume in Mühlheim, Helios AG in Cologne (est. 1882) and Lahmeyer & Co in Frankfurt-on-Main (est. 1890). Furthermore, in 1892 Thomson-Houston and AG L. Loewe & Co jointly founded the Union Elektrizitäts AG in Berlin to exploit the patents of the former, especially in the electrification of tramways in Europe. All these German electrical firms were severely hit by the depression just after the turn of the century. Helios AG went bankrupt, Schuckert & Co was merged with Siemens & Halske AG, and the Union with the AEG in 1903. About seven years later, the AEG also took over Lahmeyerwerke from Felten & Guillaume AG.⁷

The AEG and Siemens & Halske AG evolved as two true transnational giants of the electrical business, becoming the biggest and fourth biggest electrical companies in the world by 1911.⁸ British, French, Belgian and Dutch electrical manufacturers had only limited significance outside their own countries and colonies. By contrast, some notable transnational companies sprang up from a few smaller but rapidly industrialising countries. The Swiss electrical firms, Oerlikon Maschinenfabrik founded in 1882 in Zürich and Brown, Boveri & Co set up in 1891 in Baden, soon extended their business activities abroad from their comparatively limited home

⁶ Felix Pinner, *Emil Rathenau und das elektrische Zeitalter* (Leipzig, 1918), pp. 271ff; *50 Jahre AEG*, Allgemeine Elektrizitäts-Gesellschaft (Berlin, 1956), pp. 77-111.

⁷ *Ibid.*, pp. 223-50; Siemens, *History of the House of Siemens*, pp. 151-3.

⁸ *New-Yorker Handelszeitung* quoted in *Teknikern* (1913) no. 828, p. 152.

market. In northern Europe, the Swedish company, Allmänna Svenska Elektriska Aktiebolag (ASEA), grew into an important manufacturer of electrical equipment. This company was established in 1883 in Aalborga to exploit the patents and innovations of the Swedish inventor Jonas Wennström (1855-1893).⁹

Up to the early 1890s, several Finnish firms imported and installed foreign electrical machinery as appointed agents. The world market for electrical equipment was transformed at the close of the nineteenth century when oversupply and sharp competition emerged. When demand in the home market became saturated in countries such as Germany, the USA, Switzerland and Sweden, the big electrical firms directed their sales efforts more actively abroad.

The earliest foreign electrical firm to set up a subsidiary in Finland was the Swedish ASEA company in 1897. Four years earlier, the ASEA had appointed its first agent abroad in Helsinki with a branch in St. Petersburg. The ASEA and its Finnish agent, Gustaf Zitting, decided to establish a manufacturing subsidiary to produce generators and motors under licence both for the Finnish and Russian markets. After a promising start, this joint-venture, known as the Finska Elektriska Aktiebolag (FEAB), did not manage to make a real breakthrough either in the Finnish or Russian market.¹⁰ In 1904 tough competition in the depressed markets forced to close FEAB's factory in Helsinki and its installation workshop in Tampere. For the next ten years, the engineering office Zitting & Co represented the ASEA's products in

⁹ Johan Åkerman, *Ett elektrisk halvsekel. Översikt över ASEAs utveckling 1883-1933* (Västerås, 1933), pp. 17-33; Körner, *Den elektriska industriens historia*, pp. 875-83.

¹⁰ The ASEA owned 34 per cent of the FEAB's capital stock in 1903; the rest was owned by Gustaf Zitting and other Finns. Åkerman, *Ett elektriskt halvsekel*, p. 69; Glete, *ASEA under hundra år*, p. 38.

Finland. In 1913, the parent company opened up its sales subsidiary, namely Allmänna Elektriska Aktiebolag I Finland in Helsinki.¹¹

In the late 1890s, German firms started a strong penetration into countries with a weak domestic electrical engineering industry such as Britain and Russia. American, Swiss, French and Belgian electrical firms also attempted to gain a foothold there.¹² The German firms were, however, superior in Russia, which Emil Rathenau, for example, came to see as 'ein land der Zukunft' (a country with a future). In 1898 the AEG changed its policy in Russia from appointing agents only, to establishing its own 'installation office' in St. Petersburg.¹³

In 1898, the subsidiary of Siemens & Halske in Russia was reorganised as a limited company (Aktiengesellschaft) with a nominal capital of four million roubles, and in the same year its parent firm set up a new sales subsidiary in Finland under the name of 'Siemens & Halske AG, Teknisk byrå, Helsingfors.'¹⁴ This subsidiary immediately gained a considerable market share and between 1901 and 1905, it was probably the leading provider of generators and electric motors in Finland. Its biggest delivery was the installation of two Zoelly-turbogenerators, both 500 hp, at a textile factory in Tampere in 1905–1906.¹⁵¹⁶

¹¹ *Mercator*, 3.1.1914, pp. Vi, 12.

¹² I. C. Byatt, *The British Electrical Industry 1875–1914* (Oxford, 1979), pp. 71-2.

¹³ Walther Kirchner, Siemens and AEG and the Electrification of Russia, 1890–1914, *Jahrbücher für Geschichte Osteuropas*, 30 (1982) no. 3, pp. 406-9.

¹⁴ A year earlier, the parent company in Berlin had been reformed as a limited company with a nominal capital stock of 36 million Reichsmarks. *Ibid.*, pp. 404-5; Körner, *Den elektriska industriens historia*, p. 872; (Repo), Siemens, p. 31.

¹⁵ *Teknikern*, 14.3.1906, no. 455, p. 67.

¹⁶ See articles on Elektriska Aktiebolaget A.E.G and Siemens & Halske Aktiengesellschaft, Teknisk Byrå, Helsingfors, *Suomen kauppa, meriliike ja teollisuus, Helsinki I* (Helsinki, 1907-15), pp. 57-61, 81-6.

Table 1. The number and capacity of generators and electric motors installed annually by various suppliers in Finland, 1900–1906

Supplier		1900	1901	1902	1903	1904	1905	1906
Wadén	no.	5	-	-	-	-	-	-
	hp	120	-	-	-	-	-	-
Wahl	no.	46	20	26	35	29	18	18
	hp	..	..	..	..	..	..	..
Strömberg	no.	79	72	..	81	141	185	..
	hp	981	684	..	1365	1600	2700	..
Electron	no.	..	..	26	..	..	..	..
	hp	..	..	530	..	..	..	..
ASEA/FEAB	no.	22	25	..	..	..	..	..
	hp	1000	..	..	..	..	..	..
Siemens & Halske	no.	..	..	..	..	109	153	198
	hp	..	..	1805	..	1250	4250	4580
AEG	no.	..	79	72	68	128	174	331
	hp	..	1250	1160	1580	1200	2500	5880
Mercantile*	no.	-	-	-	-	-	..	..
	hp	-	-	-	-	-	..	1400

* The Finnish importing company, Ab Mercantile, was appointed as Finnish general agent by Felten & Guillaume und Lahmeyerwerke A.G., Mülheim-on-Rhein and Frankfurt-on-Main in 1905.

.. No data available

- Logically impossible, the firm did not do this kind of business

Source: *Teknikern* 1901-1907

In April 1900, the other German electrical giant, the AEG, opened its first subsidiary in Finland under the name 'Elektriska Aktiebolaget

AEG'. The significant new operation of the AEG in Finland were organised by the company's subsidiary in Stockholm and not directly by the parent company in Berlin. In early advertisements, the subsidiary in Helsinki was presented as a branch corresponding to those in the Swedish towns of Gothenburg, Malmö, Örebro and Sundsvall.¹⁷ Its principal working language was Swedish – not German or Finnish. During the first few years, Swedish nationals had at least as central a role in the management of this company as German and Finnish directors and the same was true of the Siemens & Halske's subsidiary in Helsinki.

The AEG's engineering office, as it was called, broke into the market by the sales of small, fully-equipped power plants with new Nernst-lamps and ordinary incandescent lamps at a very competitive price to provincial Finnish towns.¹⁸ Between 1899 and 1914, the AEG delivered nearly a half of the installations of the new urban electricity supply utilities (see Table 1) and after the recession of 1901–1903, it also managed quite well as a provider of industrial generation plants and electric motors.¹⁹

According to announcements made by Siemens & Halske and The AEG, both companies had delivered generators and electric motors with a capacity of nearly 30 000 hp in Finland by the end of 1907, whereas the domestic company, Strömberg, had sold similar electrical machinery with a capacity of about 15 000 hp between 1899 and 1907.²⁰ Immediately after

¹⁷ *Teknikern* (1901) no 242.

¹⁸ The Nernst-bulb was an incandescent lamp, which had a filament made from rare earths (zirconium and ytterbium) instead of carbon. The German professor Walther Nernst developed Pavel Jablockov's invention into a commercial product and sold his patents to the AEG. The first Nernst-lamps were on sale in 1900. In Finland, they were used from 1901, for example in the supply utilities of the towns of Lappeenranta and Hamina. *Teknikern* (1902) no. 265, p. 4; K. J. Laurell, *Det elektriska ljuset, Uppfinningarnas bok III*, ed. by Sam Lindstedt (Stockholm, 1927), pp. 191-2.

¹⁹ AEG and Siemens & Halske, *Suomen kauppa, meriliike ja teollisuus, Helsinki I* (Helsinki, 1907-15), pp. 57-61, 81-6.

²⁰ *Ibid.*, *Teknikern* (1900-08); Aktiebolaget Gottfrid Strömberg Osakeyhtiö, *Kotimaisen teollisuuden albumi* (Helsinki, 1913), pp. 22-5.

that period, Siemens & Halske lost its position as the market leader in Finland to the AEG's engineering office. From 1906 the AEG was the most important supplier of turbogenerators, while it also became the biggest electrical firm in the country, as demonstrated in Table 1. The AEG set up more branches in the major Finnish cities than any other electrical firm; besides the main office in Helsinki, it opened local branches in Oulu in 1905, in Tampere and Turku in 1906, and in Viipuri (present Viborg) on the Karelian Isthmus in 1907.²¹ The AEG was not only ready to import and install its machinery to Finland, it was keen to make direct investments to promote its sales and earn profit by its technical and managerial expertise.

Takeovers of Urban Utilities

The first electricity deliverers in Finnish cities were small block DC power plants; some of them started to operate in the 1880s. Two biggest of them (in Helsinki and Viipuri) were owned by Finnish electrical engineering works. In two provincial cities, Kuopio and Porvoo, the first electricity supply utilities were founded by printing companies, which sold their surplus power to their neighbourhoods. In Kotka, a metal workshop set up an electricity supply utility in 1897. In the 19th century, a limited company whose main activity was the generation and delivery of electricity was rare. Vasa Elektriska AB in Vaasa, established in 1893, was the first of this kind of companies.

A Finnish peculiarity has been municipally owned utilities. The first two municipal electricity undertakings in the world were set up in Sweden in the city of Härnösand in 1885 and Växjö in 1887. The next two were founded in 1888 in the industrial centres of Tampere in Finland and Västerås in Sweden. Bradford in England opened its municipal utility in

²¹ *Teknikern* (1906) no. 447, p. 18; (1907) no. 504, p. 59; (1908) no. 558, p. 77.

1889, just a year later before the second Finnish city, Oulu, started to deliver electricity from its own thermal power plant, which was the most northern urban electric utility. The first municipal electricity utility in Germany was opened in Königsberg (present Kaliningrad), the administrative centre of East Prussia, in 1890 – two years prior to the Zurich utility, the first municipally-owned electricity supply utility in Switzerland.

After 1900 most new urban electricity supply utilities were founded, owned and run by the municipality in Finland. One reason for this was related to municipal regulation. For example, utilities needed permissions from city councils to erect high tension lines over streets. As a result, it was not easy to set up competing utilities in the same areas. Another factor was financing. An urban utility was not a lucrative investment in its first years, because building infrastructure was expensive but sales were insecure and generally small.

By autumn 1914 at least one electricity supply utility was opened in each of 38 Finnish towns. At the time, 23 of them (60%) were owned by the local municipality.²²

When the trend in Finland was from the 1880s to municipally owned utilities, it might sound surprising that after the turn of the century there sprang up tendencies that seemed to push the tide to flow an opposing direction.

The city of Turku received its electricity from a local private electricity utility Ab Electron, which was opened in 1898. The capacity of the utility became insufficient only in some years. The company was required to make new investments. Negotiations with the city council led to the sale of Electron, which also had a notable installation department, to The AEG on the condition that the new owner will expand its generation capacity and start an electric tramway service in the city, which had no public transporta-

²² The Archive of the Board of Industry in the Archives of the Central Statistical Centre of Finland; The Archive of Strömberg Oy; *Teknikern* 1891–1918; various works in local history.

tion system yet. The AEG accepted this and other terms of the deal. After the takeover of 1907, the company was renamed in a German fashion *Electricitäts Åbo Aktiengesellschaft* and at the time, the company's nominal capital was announced to be 1.2 million German Reichsmarks (FIM 1.5m). The company built a new thermal power plant to deliver electricity to the town of Turku as well as to the municipal utility of neighbouring town Naantali and a nearby rural utility.²³ Its board of governors was led by Walther Rathenau, and the direction of the company was retained in Berlin – only the operational management worked in Turku.²⁴ This was the start of the AEG's direct involvement in the Finnish electricity utility business. In 1910, it took over *Elektricitets- och gasaktiebolag Paul Wahl & Co* in Viipuri with its manufacturing plant, gas and electricity utilities. As in Turku, The AEG built an electrified tramway network in Viipuri under a concession agreement with the town council.²⁵

The companies taken over in Turku and Viipuri were among the four largest electricity utilities and among the three leading domestic installation firms in the country. Taken as a whole, The AEG's subsidiaries in Viipuri made up the second biggest employer in the city, the next only to the engineering works of the State Railways.²⁶

In 1908 and 1913, the AEG also gained control of two other urban utilities in Hämeenlinna and Maarianhamina, the town on the island of Ahvenanmaa. In Hämeenlinna, the city council leased its utility to the AEG.

²³ *Teknillinen Aikakauslehti* (hereafter TAik) (1921), p. 317.

²⁴ Walther Rathenau (1867-1922) followed his father, Emil, as head of the AEG in 1915. Ilmari Ekström, *Turun kaupungin sähkölaitos 1908–1958* (Turku, 1958), pp. 25-44; Thomas P. Hughes, *Networks of Power, Electrification in Western Society 1880–1980*, (Baltimore, 1983), pp. 179-80.

²⁵ *Kontrahti Viipurin kaupungin ja Berliinissä olevan yhtiön Allgemeine Electricitäts-Gesellschaftin välillä* (11.11.1910) (Viipuri, 1932); (Oscar Schultz), *Sähkölaitos ja sähköraitiotiet Turussa* (Turku, 1908).

²⁶ Lyhyt kertomus yhtiön vaiheista vv. 1898–1923, *Ohjelma: Wiipurin kaasun ja sähkösaakeyhtiön 25-vuotisjuhlassa* (Viipuri, 1923), pp. 3-6.

In a short time span, the company became the most prominent private owner of urban electricity supply utilities in Finland. The AEG accounted for 81 per cent of the sales of the private urban electricity utilities and 22 per cent of the sales of all the urban electricity utilities in the country, as indicated in Table 2.

Table 2. The urban electricity supply utilities operated by the AEG in Finland in 1914

City	Year of establishment	Year of AEG's takeover	Year of municipalisation	Sales 100 kWh	Consumption kwh per capita
Turku	1898	1907	1919	2,797	52
Viipuri	1887	1910	1936	1,916	65
Hämeenlinna	1899	1908	1918 ^a	168	25
Maarianhamina	1909	1913	1919	24	17
<i>Total</i>				<i>4,905</i>	
All urban electricity utilities	1884-1914			22,233	44

^a The end of a leasing period

Sources: The Archive of the Board of Industry in the Archives of the Central Statistical Centre of Finland; The Archive of Strömberg Oy; *Teknikern* 1891–1918; various works in local history.

World War I interrupted the rapidly growing influence of the AEG, while the wartime crisis accelerated the plans of city councils to municipalise the private electricity utilities in their area. A further pressure was directed on the AEG utilities because the main office of the company was located in an enemy country. Consequently during the war, the Finnish government confiscated German property in its territory and put it under special control.

In these actions, the government followed the policy of the Russian government. After the Peace of Brest-Litovsk (March 1918), the property was returned to its former German owners, but many of them were ready to sell their possessions in Finland because of internal turmoil in the country and anxiety for the Allies' final decisions about German property in neutral countries, what Finland was after gaining its political independence in December 1917. In this respect, the AEG was not an exception; it was also willing to negotiate seriously on the municipalisation of its utilities.

Re-evaluation of Takeovers

In Turku, Viipuri, Maarianhamina and Hämeenlinna, it was considered that although the AEG had brought new technology and capital to local electrification, co-operation with the company did not fulfil all hopes. The prices of electricity sold to the municipalities and to the public were criticised as being unreasonably high.²⁷ To be fair, one must state that the retail prices of the AEG utilities were quite close to the average electricity prices in Finnish towns and certainly not among the most expensive rates.²⁸ The AEG was also said to be an inefficient distributor of electricity, and too inflexible in its relations with the town councils and stiffer than Finnish private counterparts in other towns. Hence, three of the town councils were anxious to municipalise the utilities immediately, when the war ended. In Viipuri, the town council did not accept the terms of the AEG's tender and so the municipalisation of the very profitable utility in that town was postponed to a par-

²⁷ *Teknikern* (1911) no. 729, p. 133.

²⁸ *Selostus Suomen kaupunkien sähkölaitosten virranhinnoista* (Kotka, 1915).

ticularly late date, 1936; only the municipalisation of the supply utility in Kemi in Lapland came later.²⁹

The original agreement between the town council of Viipuri and the AEG resembled the common German-type concession of the agreement, the unreasonable consequences of which had to be restricted later by law, for example in Switzerland and Germany.³⁰

There was an interesting coincidence between the attempts of the Finnish government to facilitate electrification by reducing import tariffs on electrical equipment in 1897 and the penetration of foreign electrical firms into the Grand Duchy's market and the increase of electrical installations at the same time. Causal relations seem to be quite evident between these phenomena. From the electricity producers' viewpoint, it was clear that after 1897 prices of electrical equipment were substantially lower than earlier, while the quality and capacity of the available machinery rose. Together these factors boosted investments in electrical technology.

One can, therefore, claim that the entry of foreign electrical firms accelerated the electrification in Finland. At least in the short run, electricity producers and consumers benefited from the sharper competition between the providers of electrical equipment. Bearing in mind the Finns' initial enterprising disposition, it is however not correct to claim that "it was Berlin that pushed Finland on the road to electrification," paraphrasing Guenter Holzer's statement about Russia.³¹

²⁹ Ekström, *Turun kaupungin sähkölaitos*, pp. 79ff; B.J. Palme, *Näringarna, Mariehamns stads historia 1911–1961*, by Matts Dreijer et al. (Helsingfors, 1962), pp. 243.44; Y.S. Koskimies, *Hämeenlinnan kaupungin historia 1875–1944, Hämeenlinnan kaupungin historia IV* (Hämeenlinna, 1966), p. 385.

³⁰ *Historikki Viipurin sähkölaitoskysymyksen tähänastisista vaiheista ja kertomus Viipurin kaupungin sähkölaitoksen ja raitioteiden toiminnasta v. 1936* (Viipuri 1937), pp.1-8.

³¹ Guenter Sheldon Holzer, *The German Electrical Industry in Russia: From Economic Entrepreneurship to Political Activism, 1890–1910*, (unpublished Ph. D. Thesis, Lincoln, Nebraska, 1970), p. 90; Kirchner, Siemens and AEG, p. 412.

Nor did Berlin become the capital of the Finnish electrical industry as it did that of the Russian counterpart. However, the German firms had, undoubtedly, a technological and marketing lead in electrical engineering, as the Russian engineer P. Gurevič pointed out in 1915 in a Swiss journal: "No other country could deliver at so low a price such a variety of electrical goods" as Germany.³²

Fortunately, the intrusion of foreign electrical firms and products into the Finnish market did not crush the domestic electrical engineering industry completely, even if the engineering works of Paul Wahl & Co, one of the biggest Finnish electrical engineering workshops, fell into the hands of the AEG. The activities of both the domestic electrical industry and the Swedish companies balanced the German involvement, and this fact prevented Finland from becoming completely dependent on the transnational companies of the German origin.

The trend of the change was, however, threatening to domestic firms. Between 1895 and 1905, the market share of Finnish-made generators and electric motors dropped from about two-thirds to one-quarter, while their exports shrunk to a modest amount. During this process, Finland lost some part of its potential backward linkage effects but gained a considerable amount of forward linkage effects, which were probably more important for its national economy. The ideal situation would, of course, have been for the domestic electrical firms to have preserved a competitive level through this period of technological leaps and economic recessions, but that does not seem realistic if considered in an international perspective. At the turn of the century, a strong increase of German influence took place in Finnish industry in general, as well as in academic and technical education, technical R & D, management practice and various technical norms.

³² P. Gurewitsch, in *Electrotechnische Zeitschrift*, 36 (29 July 1915) no. 30, quoted in Kirchener, Siemens and AEG, p. 420.