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THE HISTORY OF ELECTRIC LIGHTING IN TRANSYLVANIA

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Abstract

FIAT LUX! In the legends of most cultures only a God could bring the first light in the creation of the World. Today anyone can turn on a light where-ever they wish. How did we get here, how did we become creators of our own light? This journey of creation passed through three major steps, which we call today the technical revolutions: I. The energy of nature (water, wind); II. The energy of steam; III. The energy of electricity. The story of this last kind of energy, used for lighting, was fulfilled at the beginning of the XX century. By what means and when did this process take place in Transylvania? This is what the study seeks to answer.

Keywords*: lighting, gas lighting, electric, lamp, Transylvania.*

1. The History of Public Lighting

Electric lighting can be said to be the driving force and culmination of the Third Industrial Revolution. At the same time, it is the most modern form of public lighting, so let us say a few words about the history of public lighting.

1.1. The Beginnings

The first lighting tool was a burning piece of wood, from which the torch developed.

Candle. The Phoenicians had already invented the beeswax candle in ancient times. But because of its high price, it was very rare. Around 1200, in England, a cheaper but foul-smelling solid lighting material was invented: the tallow candle made from mutton fat.

Oil lamp. The oil lamp was already used by the Egyptians. The first description of a lamp operating with crude oil comes from the Persian physician, chemist, and philosopher Rhazes (Muhammad ibn Zakariya al-Razi, 865–932), who in the 9th century referred to it as “naffatah.” Alongside the candle, the oil lamp accompanied humanity throughout the entire Middle Ages. However, streets remained dark at night, and the “Dark Middle Ages” were literally dar.

1.1.1. Public Lighting

As far as we know, the first streets to be lit were in Córdoba around the year 1000. The first regular street lighting system was introduced in London in 1417, when Mayor Henry Barton ordered every citizen to hang a lantern (with a candle or oil lamp) at their window or on the wall of their house to light the street. The next to follow was Paris, where in 1558 King Henry II of France ordered residents to hang a burning lamp or some other light source outside their houses after nine o’clock in the evening.

Other major European cities only adopted public lighting after 1600, once oil lamps had spread: Copenhagen (1640), London (1668 – with more complete regulations), Amsterdam (1669), Berlin (1679), Vienna (1687), Prague (1723), Göttingen (1735), Buda (1777), Rome (1787), Pest (1790).

Timișoara/Temesvár was the first city in Transylvania – and in the Kingdom of Hungary at the time – to introduce public lighting at all, in 1760. The street lamps were oil lamps enclosed in glass cages, mounted on wooden poles. They had to be lit and extinguished daily and refilled with oil.

In most Transylvanian towns, oil lighting disappeared around 1850, as after the Revolution of 1848 the cities could no longer afford such luxuries. Contemporary illustrated books of Hungary (Orbán Balázs in 1868, Hungary in Pictures 1870, Ludwig Rohbock in 1875) show depictions of Transylvanian cities without street lamps (except Timișoara).

1.1.2. Kerosene Lamp

In 1852, the Polish pharmacist Jan Józef Ignacy Łukasiewicz (1822–1882) distilled petroleum and obtained a new substance, kerosene ("lamp oil"). That same year, Schreiner, a Galician dairy merchant, successfully tested it for lighting in a Lviv hospital. Łukasiewicz immediately designed a kerosene lamp, which he patented in Lviv in 1853.

This is how Transylvania remembered it:

Three-quarters of a century ago the kerosene lamp replaced the dominance of the striking wax candle. [Brassói Lapok, nov. 25, 1927]

In 1864, Cluj (Kolozsvár) replaced its oil lamps with kerosene lamps. Other Transylvanian towns and villages followed, since kerosene had three major advantages over oil: it was cheaper, it was thinner (and thus absorbed into the wick more easily), and most importantly, its light was whiter.

1.1.3. Gas Lighting

In 1792, Scottish chemist William MURDOCH (1754–1839) discovered that when coal was heated, it released a flammable gas ("coal gas") that burned with bright light. In 1807, London's Pall Mall became the first street in the world lit by gas lamps.

Paris followed in 1817, then Hanover and New York (1823), Berlin (1826), Prague (1847), Vienna (1852), Bratislava (1856), Budapest (1856), and Timișoara (1857). In the 19th century, gas lighting was the most modern form of illumination in Europe, replacing kerosene lamps. It smoked less, gave stronger light, and didn't require constant refilling since the lamps were supplied via underground pipelines.

Because of the high costs, gas lighting was introduced only in large cities, where many consumers justified the investment (underground pipelines, gasworks). Contracts for public lighting were long-term, 30–50 years. Smaller towns continued using kerosene lamps.

This was also true in Transylvania, where only larger cities had gas lighting:

Timișoara (Temesvár, 1857–1884),
Brașov (Brassó, 1864–1933),
Arad (Arad, 1869–1897),
Cluj (Kolozsvár, 1871–1906),
Oradea (Nagyvárad, 1873–1903.

In the smaller towns typical of Transylvania, gas lighting was rare, and kerosene lighting remained dominant for a long time.

2. The History of Electric Lighting

At the beginning of the 19th century, in parallel with the development of gas lighting, a new field of science was born and slowly evolved: electricity. This, in fact, marked the start of the Third Industrial Revolution. Already in the early part of the century, it was discovered that electricity could be used for illumination, but for decades this remained only at an experimental stage. The reason was that no sufficiently strong power source existed, and either the lightbulbs burned out too quickly or were too expensive.

Dozens of inventors worked on electric lighting until, by the end of the century, usable arc lamps and incandescent bulbs were successfully manufactured. By 1880, cheap lightbulbs and strong power sources had been produced—mainly thanks to Edison's company. All of these generated direct current (DC). Tivadar Puskás, Edison's European representative, flooded the European market with these products. At this point, electric lighting became a serious competitor to gas lighting, and in Transylvania too, a veritable gas-versus-electricity battle began.

European inventors, including researchers at the Ganz company in Budapest, saw more potential in alternating current (AC). By transforming the power generated in power plants up to high voltage, it could be transmitted over long distances with little loss. Direct current, by contrast, could only be used within a radius of about 500 meters, because of the losses on the line. By 1885, the Ganz factory in Budapest had developed an alternating current lighting system, which also entered the market battlefield.

Edison recognized alternating current as a rival. A fierce competition broke out between the two systems—AC versus DC—which in America escalated into an actual war („War of Currents"). Edison conducted experiments on live animals to prove that alternating current was deadly to humans, whereas direct current was not. Under his influence, the first electric execution chair was powered by alternating current. In Europe, the conflict was mostly fought in newspapers—and behind the scenes—but it still had market consequences.

3. The History of Electric Lighting in Transylvania

In Transylvania, the conflict between gas and electric lighting was the most characteristic, es-

pecially in cities where gas lighting was already present. Decisions were made by city councils, which were composed of members of varying levels of education. Competing companies tried to exploit this. Often the decision depended on the will of a single person, such as the mayor or a determined council member.

Where no gas lighting existed, replacing kerosene lighting posed no problem, since it was usually operated by the city itself. But even these towns did not escape the usual conflict, because offers—and persuasive tactics—came from both directions (gas and electricity).

In Transylvania, electric lighting was first used by industrial facilities, especially mines. The very first was the salt mine at Ocna Mureș (Marosújvár), where electric lighting was installed in 1880 with 14 arc lamps, replacing the weak light of kerosene lamps and candles:

> *The electric lighting installed a year and a half ago in the salt mines of Marosújvár has proven to be fully satisfactory, and now it will be made permanent.* [*Fővárosi Lapok*, June 7, 1882]

In towns, electric lighting was at first connected to special events, such as celebrations, gatherings, or skating rinks. Civil organizations that organized these events wanted to extend their programs into the evening hours, and the attractive, modern solution was electric lighting.

> *As we have been informed, at this month's May Day celebration of the Faculties of Natural Sciences and Humanities, electric lighting will be used.* [*Ellenzék*, Cluj, May 3, 1881]

3.1. The Introduction of Electric Lighting up to 1900

At the end of the 19th century, steam engines reached Transylvania. Anyone who wanted to generate electricity, but had no nearby water power, could only drive the generators with fairly large and expensive steam engines. Towns or wealthy entrepreneurs could afford to buy them, since a boiler was also needed to produce the steam.

1884 TIMIȘOARA/TEMESVÁR/TEMESWAR (DC, 110 V)

In 1882, the 25-year contract with the gas company in Timișoara expired. This created the opportunity to switch to electric lighting—already appearing in certain buildings or streets of Europe's large cities—and the city's energetic mayor, János Török, seized the chance. Thus, in 1884, Timișoara became the first city in Europe with public electric lighting for the whole city. Since Edison's direct current system dominated the European market from 1880 to the mid-1880s, Timișoara's public lighting was also based on Edison's DC system.

1889 COMANDĂU/KOMMANDÓ (AC, single -phase, 110 V)

But from 1885, the alternating current lighting system developed by the Ganz factory entered the market. This sparked a great dilemma in Transylvania too: which system should a small Transylvanian town introduce—the aggressively promoted Edison DC system, with its powerful propaganda machinery, or the more versatile Ganz AC system?

In 1889, a Budapest entrepreneur purchased the Ganz system for Comandău, equipping his sawmill with electric motors and providing electricity for the village's street lighting as well.

> *Alongside the glow of electric lighting, visitors admired the buildings skillfully erected by master builder Nedoma, the machines transported from and manufactured at the Krompach ironworks, the Ganz electrical machines, the workshops, warehouses, and boiler house."* [*Székely Nemzet*, Jan. 19, 1889]

In the same year, Timișoara enlarging the power plant also upgraded its system, replacing DC with AC.

1890 CARANSEBEȘ/KARÁNSEBES (AC, 42 Hz, 1 phase, 2000V/105 V)

A year later, three entrepreneurs in Caransebeș commissioned Ganz to modernize their mill with electric power. Caransebeș became the second city in Transylvania to introduce public electric lighting, in July 1890. Unlike in Timișoara, the generator here was not steam-driven, but powered by the country's—and indeed the Carpathian Basin's—first hydroelectric plant, built on the Sebeș stream at the site of the old mill. It generated single-phase (1 ph) alternating current at 42 Hz and 2000 V, which was transformed down to 105 V in the town to supply public lighting.

1892 BĂILE HERCULANE/ HERKULESFÜRDŐ (AC, 42 Hz, 3 ph, 2100V/110 V)

Băile Herculane was a prestigious state spa resort, frequented by politicians, archdukes, and kings. For this reason, already in 1892 a small hydroelectric power plant was built on the Cerna River—the country's second hydro plant after Caransebeș. Water drove two Francis turbines,

powering two generators (total 260 kVA). The result was three-phase alternating current (3 ph) at 42 Hz, which illuminated villas, casinos, and streets.

1892 SATU MARE/SZATMÁRNÉMETI (DC, 110 V)

The city purchased a small Siemens & Halske generator, in which a 50 HP steam engine drove a dynamo. Installed in a power house on the banks of the Someș, this supplied electricity to light the theater and the main square in front of it. On January 3, 1892, the first street lamps were lit, making Satu Mare the third Transylvanian city with electric lighting.

Despite several renovations and upgrades, the city only switched to alternating current in 1934.

1892 SEBEȘ/BOROSSEBES (AC, 1 ph, 1000V/110 V)

Count Frigyes Wenckheim installed a 50 HP turbine on the White Körös River, driving a dynamo that produced AC for his ironworks, but also for the village's public lighting. A total of 100 light bulbs were installed in the factory and the village.

From the railway station to the town, and along the main street, electric lamps have been shining with daylight brightness every night for a year already. This too is thanks to the generosity of Count Frigyes Wenckheim. [*Vasárnapi Újság,* Sept. 10, 1893]

1893 TOPLEȚ/CSERNAHÉVIZ (AC)

In this Caraș-Severin County village, the Schmidt brothers used the power of their watermill on the Cerna River to generate electricity for their workshop and the village lighting.

1894 SIGHETU MARMAȚIEI/ MÁRAMAROS-SZIGET (AC, 42 Hz, 1 ph, 2100V/105 V)

In the county seat of Maramureș, the city council established a joint-stock company to introduce electricity. Director Ignác Dénes chose alternating current, and Ganz was commissioned to build the power plant.

1896 SIBIU/NAGYSZEBEN/HERMANNSTADT (AC, 42 Hz, 1 ph, 4500V/110 V)

In 1896, a large hydroelectric power plant was built on the Sadu River near Sibiu, designed by German electrical engineer Oskar von Miller. This was the 5th hydro plant in Europe, and the first large one in Eastern Europe (Transylvania already had two smaller ones in Caransebeș and Băile Herculane).

The Sibiu plant used a Girard turbine and an AC generator built by Ganz. It produced 42 Hz alternating current at 4500 volts. The electricity was transmitted 17 kilometers to Sibiu along a high-voltage line, also tested by von Miller in Munich.

The plant was built so well that it is still operating today—130 years later!

1897 ARAD/ARAD (AC, 42 Hz, 2100V/110 V)

From 1891, city leaders considered introducing electric lighting, but the contract with the gasworks (lasting until 1895) prevented this, so gas lighting remained. Only in some places was permanent electric lighting achieved, such as in the Royal High School's laboratory. The wagon and machine factory, built in 1891, had its own plant to light its halls and workshops.

By 1897, a municipal power plant was built on the road toward Radna, outside the city limits. Three Simonis-Lanz steam boilers powered three steam engines (125 HP each), each driving a Ganz generator that produced alternating current for public and private lighting.

1897 REȘIȚA/RESICABÁNYA (AC, 20.8 Hz, 3 ph, 5500V/110 V)

In Reșița, the ironworks built a power plant to drive its machines, and from this electricity was also supplied for the city's public lighting.

1898 TÂRGU MUREȘ/MAROSVÁSÁRHELY (AC, 42 Hz, 3 ph, 3200V/110 V)

The public lighting contract was not won by the Egger Company or Ganz, but by entrepreneur Mendel Farkas, in partnership with brewer Albert Bürger. On December 17, 1897, they signed a 50-year contract, stipulating 400 light bulbs of 16-candlepower (50 W each) and four arc lamps for the main square. Lighting ran at full power until midnight, then at half power until dawn.

1899 ORĂȘTIE/SZÁSZVÁROS (AC, 50 Hz, 2100/120 V)

Here too, the city council struck a deal with a local entrepreneur for electric lighting. Rudolf Kaess, a Saxon businessman with a gypsum factory and steam mill, produced electricity for his factory and also supplied the town's public lighting:

Since entrepreneur Rezső Kaess began installing the Orăștie power plant in earnest, and now only a few weeks separate us from its start of operation for lighting and motor use, interest in electric lighting has grown, with more and more citizens approaching the company to have the

bright white light installed. [*Szászváros,* Aug. 19, 1899]

1899 ALBA IULIA/GYULAFEHÉRVÁR (AC, 42 Hz, 3 ph, 2000V/110 V)

In the 1890s, the demand for modern urban lighting also arose in Alba Iulia. A concrete step was taken in 1898, when the Alba Iulia Council signed a contract with the Budapest-based Ganz Works "Company for Electric and Transport Enterprises" to bring electricity to the city. The city opted for AC. With an investment of 595,000 crowns, a power plant and public lighting system were built.

If we look at the years when electric lighting was introduced, we see that Transylvania was in no way lagging behind Europe. Timișoara was the first city in Europe where public electric lighting extended not only to the main streets but to the entire city. And the Sibiu hydro plant began operating the same year as the world-famous Niagara Falls plant in America—showing that Transylvania at that time stood on a world-class level in the Third Industrial Revolution.

3.2. From 1900 until the First World War

In the 19th century, steam engines were still in use in Transylvania; power plants generated electricity either by steam or, where possible, by water. At the start of the 20th century, gasoline and Diesel engines also began to spread in Transylvania, making it easier to drive generators. This opened the way for smaller settlements and private companies to introduce electricity. The adoption of electric lighting in Transylvanian towns sped up significantly.

However, the "war" between electric lighting and gas lighting also continued.

1900 LUGOJ/LUGOS (DC, 160 V)

Although Lugoj belonged to the sphere of influence of Timișoara, oddly enough, in 1900 the ELIN company introduced direct current. The town only switched to alternating current in 1938.

1901 CÂMPENI/TOPÁNFALVA (AC)

Two local entrepreneurs in Câmpeni used water power to generate electricity, with an investment of 36,000 crowns.

1902 TURDA/TORDA (DC, 220 V)

In 1894 a civil movement started in Turda to introduce electric lighting.

The time has come for us to wake up as well; because up in the mountains in Câmpeni, the shepherd is already milking his goat by electric light. [*Aranyosvidék,* Turda, July 26, 1902]

The town invested 80,000 crowns to build a power plant, using direct current. Soon after, in 1911, it switched to alternating current (AC, 50 Hz, 3100V/120 V).

1902 DETA/DETTA (AC, 50 Hz, 1 ph, 2000V/100 V)

1903 ORADEA/NAGYVÁRAD (AC, 42 Hz, 3 ph, 3000V/150 V)

Oradea had gas lighting since 1873; in 1903 the contract expired. The gas company almost convinced the city council majority to sign another 30-year contract. A decisive role was played by a priest and physics teacher, Iréneusz József Károly, whose persistent advocacy led the city to reject the gas company and switch to electric lighting, choosing alternating current.

This is the only recorded case in Transylvania where a public comparison between DC and AC appeared in print, written by Károly, in favor of AC:

I know well that fuel consumption is lower with direct current, but the investment costs are higher, and maintenance is more expensive; in the end both systems probably balance out to the same yearly expenses. Yet the simplicity of the equipment and operation favors alternating current. [*Tiszántúl,* Oradea, March 7, 1902]

1903 GHEORGHENI/GYERGYÓSZENTMIKLÓS (AC, 50 Hz, 3 ph, 2000V/210 V)

Gheorgheni was the first town in Szeklerland to introduce electric lighting. Planning began as early as 1893. Neighboring towns like Miercurea-Ciuc and Odorheiu-Secuiesc were envious of Gheorgheni's progress:

If our city council quickly approves the contract—as there is no doubt they will—it may happen that next winter we will already have decent lighting, and then tiny Gheorgheni, where the contract for electric lighting is already signed, will not outshine us. [*Székely Nemzet,* Székelyudvarhely, Jan. 30, 1895]

The town chose alternating current, the "rotating current system," as it was considered "more practical".

1903 SIGHIȘOARA/SEGESVÁR/SCHÄBBURG (DC, 150 V)

Following Sibiu, Oskar von Miller also took on the electrification of Sighișoara. At the site of a former watermill on the Târnava Mare river, a hydroelectric plant was built, equipped with machines from Ganz. Oddly, they chose direct current generators. For security, a steam engine (Lang, 180 HP and a 107 kW dynamo) was also installed, to supply electricity when water flow was low in summer. [1].

The city only switched to three-phase alternating current (3150V, 3 phase, 380V/220V/0V) in 1926.

1903 DEVA/DÉVA (AC, 42 Hz, 3ph, 2100V/110 V)

The local "Deva Loan Cooperative" built a small power plant, where a steam engine drove two generators (100 kVA).

1903 NEUDORF/TEMESÚJFALU

Neudorf was fortunate in 1903, when the royal headquarters for autumn military exercises was set up in the Zselénszky castle:

For the king's arrival, the castle was fitted with running water from a 150-meter-deep artesian well, powered by a huge wind engine. Electric lighting was also installed—covering the entire village. [*Vasárnapi Újság*, 1903, p. 592].

1904 CAREI /AGYKÁROLY (DC, 215 V)

After 10 years of attempts, mayor István Debreczeni decided to introduce electric lighting. The city assembly created a joint-stock company and chose direct current. Two steam engines (300 HP) drove two generators (total 215 kW), in daylight charging a 270-cell battery (309 Ah each), which supplemented lighting in the evening [2].

1905 SEBEȘ/SZÁSZSZEBES/MÜHLBACH (AC, 50 Hz, 3 ph, 5000V/110 V)

In Sebeș, Oskar von Miller also designed a hydroelectric power plant on the southern edge of town, on the Sebes stream. The plant utilized a 12-meter waterfall with a flow rate of 8 m³/s. This drove two Voith turbines (388 HP) powering two alternating current generators (360 kVA) [1].

1905 SÂNNICOLAU MARE/NAGYSZENTMIKLÓS (AC, 50 Hz, 3000V/150 V)

In 1905, the Nákó estate built a small thermal power plant, though little is known about it. This supplied electricity, including public lighting, to Nagyszentmiklós before World War I.

1905 BORSEC/BORSZÉK (AC, 3f, 3100V/120 V)

The settlement was one of Transylvania's most famous spa and holiday towns, known for its mineral waters since the 16th century. For the convenience of guests, electric lighting appeared early (1896), though only in a few villas and not as public lighting.

In 1904, a new lessee of the spa decided to introduce public lighting. By the summer of 1905, public lighting was indeed in operation: a steam engine (80 HP) drove an AC generator (65 kVA), producing three-phase current at 3100 V. This was distributed around the spa, stepped down to 120 V, and connected to 50 incandescent lamps and 9 arc lamps for public lighting.

1905 ZALĂU/ZILAH (DC, 250 V)

The idea of electric lighting in Zalău first arose in 1890, inspired by Satu-Mare, but was abandoned for financial reasons. In 1901, acetylene lighting was considered, but two years later, following Oradea's example, the city decided on electric lighting. The "Hungarian Siemens-Schuckert Works" company undertook the construction of the power plant, the installation of street lighting, and interior lighting of key institutions.

The city switched to alternating current in 1936.

The city switched to AC only in 1936.

1906 CLUJ/KOLOZSVÁR (AC, 42 Hz, 3 ph, 15 KV/3000V/150 V)

The burning of Vienna's Ring Theatre in 1881 first raised the issue of electric lighting in Cluj. In the early 1880s, temporary electric lighting was introduced at several places (ice rinks, various events).

However, the gas company "bought off" the city council, blocking the introduction of electricity [3]. Several civic movements arose, the first in 1882 under instrument maker Nándor Süss, and another led by Professor Rudolf Fabinyi. After two decades of struggle, electric lighting was finally introduced in 1906—much later than in many smaller Transylvanian towns.

By 1906, the Ganz company had built a hydroelectric plant on the Cold Someș River: 2.5 m³/s of water falling from 50 meters drove two giant turbines (total 2400 HP). A backup steam engine (425 HP) was also installed. Three generators (total 1600 kVA) produced three-phase AC at 15,000 V, 42 Hz, transmitted by a 32 km high-voltage line to Cluj. The total investment was 1,900,000 crowns. The hydro plant remains operable today. [2]

1906 MĂNĂSTIRENI/SZENTBENEDEK (AC, 42 Hz, 3 ph, 6000V/150 V)

Count Károly Korniss III (1869–1918) inherited the estate of Mănăstireni near Dej, including its mill. In 1906, with an investment of 670,000 crowns, he built a power plant that supplied electricity to his estate and mill.

That same year, he expanded the facility by building a hydro plant on the Little Someș River. A 30-meter-long, 3.8-meter-high dam created a 3-meter waterfall. The abundant water drove a second generator, providing electricity to his entire estate, including one of Transylvania's finest Renaissance castles. His joint-stock company also donated electricity to the village of Mănăstireni, providing free public lighting with 54 incandescent lamps, and even giving villagers free bulbs and electric irons.

1906 FĂGĂRAȘ/FOGARAS (DC, 220 V)

In 1905, the company "Rösler and Fischer" reached an agreement with the town of Făgăraș to build a power plant supplying direct current for public lighting. In 1948, the system was abandoned and the town was connected to the Transylvanian Electricity Company (SETA) 15 kV network.

1907 ABRUD/ABRUDBÁNYA (AC, 42 Hz, 3 ph, 2500V/120 V),

In Abrud, electricity for street lighting was supplied from the gold mine at Gura Roșiei, 8 km away, using alternating current. In 1910, electricity production was expanded with a small hydro plant, taking advantage of the mountainous terrain.

1907 HAȚEG/HÁTSZEG (AC, 50 Hz, 1f, 230 V)

In 1907, Budapest merchant Dezső Vértes financed the construction of the town's power plant. It consisted of a Diesel engine (100 HP) driving a generator (80 kVA), which produced three-phase alternating current (50 Hz) directly at consumer voltage, 230 V.

1909 BAIA MARE/NAGYBÁNYA AND BAIA SPRIE/FELSŐBÁNYA (AC, 42 Hz, 3 ph, 10000V/110 V)

The two mining towns jointly built a power plant in Baia Mare (with Ganz) producing electricity at 5000 V. This was transmitted to Baia Sprie, where it was stepped down to 110 V for lighting and domestic use. Kerosene lighting became a „thing of the past".

1908 ȘIMLEU SILVANIEI/SZILÁGYSOMLYÓ (DC, 220 V)

The town agreed with the owner of the "Lajos" steam mill (Salamon Weisz and partners) to establish electric lighting.

1908 ODORHEIU SECUIESC/SZÉKELYUDVARHELY (DC, 220 V)

The town wished to introduce electric lighting early. On January 24, 1895, an agreement was signed with the Ganz company to replace 125 kerosene lamps with electric lamps, hoping to illuminate the town for the millennium celebrations. But the plan failed, as the Târnava River lacked sufficient power to drive the machinery.

After further attempts and negotiations, talks resumed in 1905, and by 1908, the Ganz company had completed a power plant. Two suction gas engines drove DC generators, which charged batteries during the day; the batteries supplemented evening lighting.

1908 SFÂNTU GHEORGHE/SEPSISZENTGYÖRGY (DC, 220 V),

The idea of electric lighting first appeared here in 1893:

> *It was the initiative of József Potsa, chief county head of Háromszék, to establish an artesian well, steam bath, and electric lighting in our town.* [*Székely Nemzet,* July 26, 1893]

No plan was realized. Mayor Ferenc Gödri raised the issue again in 1896, without result. In 1905, another attempt led to accusations of corruption and appeals reaching the Ministry. Finally, the mayor's persistence paid off in 1908, when the Ganz company built a plant similar to the one in Odorheiu Secuiesc.

1909 OCNA SIBIULUI/VÍZAKNA (AC, 10 KV/220 V)

Salt deposits under the town had been mined since Roman times. By the 19th century, salt mining had declined, and abandoned shafts filled with water, forming salty lakes. Initially used by locals, they later became popular among Sibiu residents. The first bath opened in 1846, and in 1898 it became state property.

Development of the spa was due mainly to Ignác Darányi (1849–1927), Minister of Agriculture and member of the Academy:

> *We cannot conclude without mentioning Darányi's work in developing spas and resorts. He expanded two state baths, Băile Herculane*

and Ocna Sibiului, into major resorts. [*Pesti Napló,* April 10, 1908].

Electric lighting began in 1908 with the completion of a grand Art Nouveau spa hotel (designed by Zoltán Bálint and Lajos Jámbor). The solution was to connect Ocna Sibiului to the Sadu hydro plant near Sibiu, via a 10 kV high-voltage line.

1909 AIUD/NAGYENYED (AC, 42 Hz, 3 ph, 3100V/110 V)

In 1901, the town planned to replace kerosene lamps with acetylene lighting, but it never materialized. In 1906, they invited tenders for electric lighting. Ganz won the bid:

Aiud's central power plant, which will supply not only lighting but also significant industries, a water supply, and an ice factory, will be built by the Ganz company for 428,000 crowns. [*Pesti Napló,* March 10, 1909].

Two Diesel engines (280 HP) drove two generators. The town was lit by 220 40-candlepower filament lamps and 8 12-amp arc lamps.

1909 JIMBOLIA/ZSOMBOLYA (AC, 42 Hz, 3 ph, 3000V/110 V)

In 1906, the town reached an agreement with the steam mill company on electrification, but work proceeded too slowly, so a tender was announced.

Ganz won and completed the power plant in 1909. Two Diesel engines (150 HP) drove two generators (130 kVA), producing three-phase AC for lighting and industry.

1910 DEJ/DÉS AND GHERLA/SZAMOSÚJVÁR (AC, 42 Hz, 3f, 6000V/110 V)

In 1909, the two towns signed a contract with Count Károly Korniss, whose power plant had already been operating for four years at Mănăstireni with both hydro and steam power.

Three-phase AC at 6000 V was transmitted by poles 3 km to Dej and 15 km to Gherla. Nearby villages, as well as the salt mines of Ocna Dejului and their motors, were also supplied. In both towns, 6000 V was stepped down to 110 V for public lighting and household use.

1910 BARAOLT/BARÓT (DC, 230 V)

In Baraolt, a small tool factory built its own power plant. A steam engine (Ridder, 30 HP) drove a dynamo (20 kW), generating DC at 230 V. The town also received electricity for street lighting.

1911 MIERCUREA CIUC/CSÍKSZEREDA (AC, 42 Hz, 3 ph, 3000V/110 V)

The idea of electric lighting first arose in 1897, but the project stalled for a few years. As the press wrote:

In Miercurea-Ciuc, such issues are not taken seriously; rather, in Gheorgheni, where the energetic leadership strives to keep pace with the times and does not shy away from major expenses. [*Csíki Lapok,* October 9, 1901]

In 1902, Baron János Bánffy unsuccessfully sought permission to build a hydro plant on the river Mureș. In 1904, J. Keller, a Budapest entrepreneur, tried to sell the town "aerogen" gas lighting, also without success.

The issue returned repeatedly. At last, in 1909, a tender was announced, won by Ganz. Three Diesel engines drove three AC generators. On February 11, 1911, the town's streets were lit by electricity for the first time.

1911 HUNEDOARA/ VAJDAHUNYAD (AC, 42 Hz, 3 ph, 5500V/110 V)

The Hunedoara ironworks had built a small hydro plant in 1897 at Govasdia to supply the factory. Because this supply was unreliable for the town, the municipality commissioned its own public power plant. Ganz won the tender, completing the central power station in 1911.

1911 REGHIN/SZÁSZRÉGEN/SÄCHSISCH-REGEN (AC, 50 Hz, 3 ph, 5500V/120 V)

In 1908, the town commissioned Oscar von Miller to design its power plant:

The plan relies on the fall of the Mieres River, along the mill channel. With a minimum flow of 15 m³/s and a drop of 4.7 m, 700 HP is available. The first phase would include a 150 HP turbine and a backup Diesel engine, costing 420,000 crowns. [*ElektroTechnika,* March 1, 1908]

The hydroelectric plant on the Mureș, equipped with Ganz machinery, was completed in 1911, providing electricity for the town's lighting and households.

1911 ZLATNA/ZALATNA (DC, 120 V)

A small DC system was introduced in Zlatna. In 1911, a small plant with two Diesel engines (50 HP) driving two dynamos (36 kW) was installed, supplying 120 V DC to the town. This operated until 1934, when Zlatna switched to AC by replacing the dynamos with two AC generators (35 kVA).

1913 SALONTA/NAGYSZALONTA (AC, 50 HZ, 3 PH, 3100V/120 V)

In 1908, the concrete possibility of introducing electric lighting arose for the first time. This attempt was unsuccessful. Within the representative body of Salonta, a movement was launched for the introduction of electric lighting. The second attempt took place in 1910. The final solution was the announcement of a public tender:

Salonta signed a contract with the Hungarian Siemens-Schuckert Works for the construction of the power plant. [*ElektroTechnika,* November 1, 1911].

„Fegyvergyár-Budapest" Diesel engines drove Siemens generators, producing three-phase 210V/120V electricity.

1913 TÂRGU-SECUIESC/KÉZDIVÁSÁRHELY (AC, 42 Hz, 3 ph, 3000V/110 V),

On the occasion of the inauguration of the electric lighting established in neighboring Sfântu-Gheorghe in 1908, the people of Târgu-Secuiesc viewed the entire installation. The following year, Târgu-Secuiesc decided to do the same. A tender was announced, which was won by the Ganz factory over the Hungarian Siemens-Schuckert Works. By 1913, the power plant was built: two Lang Diesel engines drove the alternating current generators made by Ganz. A network with a total length of 12 km distributed the 110 V voltage throughout the town for lighting and for driving work motors.

1913 BISTRIȚA/BESZTERCE/BISTRIZ(NÖSEN) (AC, 50 Hz, 3 ph, 5200V/120 V)

After Bistrița learned about the electric lighting in Dej and Gherla, they inspected Count Kálnoky's electrical system. The city announced an interesting tender, which also addressed the driving force:

*Driving engines of thermal machines were to be designed, taking into account the natural gas sources to be developed near the city. As an alternative, a hydroelectric plant was also to be designed, considering the water power found within the city's boundaries. Only complete offers would be taken into account; the city reserved the right to contract out the construction part separately. [ElektroTechnika, A*ugust 1, 1911, p. 228]

As can be seen, Bistrița was the first city which, after the discovery of natural gas (1909), immediately thought of its practical use. But no company was prepared for this.

The plans for the hydroelectric part were drawn up by Oskar von Miller of Munich. The high-voltage alternating current generated there was transported to the city by 7.5 km of copper wires, and in various parts of the city, 25 transformer stations converted it to 120 volts for public lighting and consumers. [1].

1913 TĂȘNAD/TASNÁD (DC, 210 V)

In 1910, the municipal council decided to introduce electricity. The local mill set up a power station, supplying DC for public lighting.

1913 RUPEA/KŐHALOM (DC, 240 V)

The town used DC until 1940, when it switched to AC by connecting to the 15 kV SETA high-voltage network.

The data clearly show that, even into the early 20th century, electric lighting still had to compete with the continually modernized gas lighting. At the same time, there was also an internal struggle: alternating current (AC) versus direct current (DC). By the early 20th century, it was already clear that AC was superior in many respects. Unfortunately, little information survives on what arguments influenced municipal councils when deciding which type of electricity to adopt. Further research may aim to find out these conditions.

3.3. After the First World War

The outbreak of the First World War halted the electrification of settlements. This happened not only because of wartime priorities, but also because petroleum and gasoline needed for operating the machines had to be sent to the front.

After the war ended, Transylvania became part of Romania. For the new administration, developing Transylvania was not a priority, but rather exploiting it. Thus, it was only well after the end of the war that electrification of Transylvanian settlements began again.

1923 MIERCUREA NIRAJULUI / NYÁRÁDSZEREDA (DC, 220 V)

1924 MARGHITA/MARGITTA

1925 SOVATA/SZOVÁTA (AC, 50 HZ, 1200V /110 V),

1926 BUZIAȘ/BÚZIÁSFÜRDŐ/BUSIASCH (AC, 50 HZ, 220 V)

1926 BLAJ/BALÁZSFALVA (AC)

1927 TUȘNAD/TUSNÁDFÜRDŐ (AC, 220 V)

1927 AGNITA/SZENTÁGOTA/AGNETHELN (AC, 50 HZ, 220 V)

1928 MEDIAȘ/MEDGYES/MEDIASCH (AC, 3 PH, 220V)

1928 DUMBRĂVENI/ERZSÉBETVÁROS (AC, 50 HZ, 220 V)

1928 NĂSĂUD/NASZÓD (AC, 220 V),

1928 PÂNCOTA/PANKOTA (AC,42HZ, 190V)

1929 COVASNA/KOVÁSZNA (AC, 50 HZ, 1 PH, 220V)

At the beginning of the 20th century, Covasna did not have great industrial significance, and for that reason, the electrification of the town was neglected, and petroleum lighting was used. In 1927, a few private entrepreneurs came together and, with their own money, purchased a 25-horsepower Deutz diesel engine and a small "Wien" brand generator that produced 50-hertz, 220-volt alternating current. With this, they lit 10 houses and installed 10 lamps for public lighting. [1].

1929 JIBOU/ZSIBÓ (AC, 50 Hz, 3f, 5250V/110 V)

1930 SASCHIZ/SZÁSZKÉZD /KEISD (AC, 50 Hz, 3f, 220 V)

In 1930, the village built its own power plant, which produced three-phase alternating current of 380/220/0 V with a capacity of 45 kVA. Through a network totaling 3 km, they distributed it to 85 consumers in the village, and it also powered the village's public lighting.

1931 CURTICI/KÜRTÖS (AC)

1932 LIPOVA/LIPPA (AC, 15 KV network/220 V)

The city fell victim to the gas lighting–electric lighting battle, since gas lighting prevailed under suspicious circumstances:

> *Although seventy-five percent of the leadership voted in favor of electric lighting, it was still gas lighting that was introduced.* [*Temesvári Hírlap,* May 17, 1930]

Gas lighting was under the control of the local council, which did not want to give it up. Supporters of electric lighting had fought against the council since 1925 to introduce electricity, and only succeeded when the entire council was replaced in the 1929 elections.

1932 COPȘA MICĂ/KISKAPUS (AC, 220 V)

1933 BRAȘOV/BRASSÓ (AC, 50 Hz, 220 V)

In Brașov, the largest Saxon industrial city, factories had been introducing electric power for machinery and lighting since the 1890s. In 1903, when the contract with the gasworks expired, the latter somehow convinced the council, and the city signed another 30-year contract for street lighting.

Although later councils tried several times to introduce electric street lighting, they always failed. Finally, only in 1933, when the contract expired, were the streets of Brașov illuminated with electricity. It seems Brașov did not have its own Károly Iréneusz József to convince the council to switch to electric lighting, or a Fabinyi Rudolf to launch a civic movement.

1935 LUDUȘ/MAROSLUDAS (AC, 50 Hz, 3 ph, 230 V)

In Luduș electric lighting also came late. In 1934, a local plant started up a small private power station (a 41 HP diesel engine driving a 30 kVA generator), which produced three-phase alternating current at 400/230 V. Besides covering its own use, the plant also supplied the town, and 150 households used the electricity.

1935 RADNA/MÁRIARADNA (AC, 15 KV/220 V)

At this pilgrimage site, residents were perplexed. If Lipova had been supplied with electricity from Arad—through transmission lines that passed via Radna—then why could Radna itself not have received electricity at the same time, in 1932, especially since the local council had already voted to introduce it? Contemporary journalists explained it as follows:

> *At that time, however, the 'opposition' marched forth. Part of the village's population—namely the part that, thanks to political distribution of roles, had the decisive word—started a fight against electric lighting.* [*Brassói Lapok,* Oct. 26, 1934]

The so-called "electricity bloc" did not retreat in this political struggle. They joined forces, eventually prevailed in the vote, and the "miracle" occurred: in Radna too, the electric lamps were lit.

3.4. During the Second World War

The Second World War once again brought electrification to a halt. Moreover, new and more effective weapons inflicted damage on strategic points within cities, including power plants.

> *In Transylvania, however, a glimmer of hope appeared when, following the Vienna Award, Northern Transylvania was returned to Hungary. The extent of economic and industrial backwardness was described as "astonishing," particularly in the field of electrification: "In*

post-Trianon Hungary, 41 percent of villages had electric lighting, whereas in Transylvania only 4 percent did. [*Székely Nép,* June 19, 1942; *Ellenzék,* Cluj, June 27, 1942].

Following the introduction of Hungarian administration, planning in Northern Transylvania began with great enthusiasm:

Székely Land can be turned into a second Switzerland! Within three to four years electric lighting will be introduced into every Székely village. [*Ellenzék,* Cluj, Nov. 6, 1942].

3.5. After the Second World War

This vision, however, was never realized. After the war, Transylvania once again became part of Romania, where a communist system soon took hold. With Soviet-style centralization, local councils and mayors were largely excluded from decision-making. Electrification—like all major initiatives—was now dictated by socialist planning from Bucharest .

4. Conclusions

When viewed through the lens of conflicts such as gas versus electric lighting, or alternating versus direct current, each Transylvanian town presents a unique and revealing case of how, from whom, and under what circumstances electric lighting was (or was not) introduced. The so-called "third technological revolution" was revolutionary in the historical sense as well, for electricity triumphed over steam and illuminating gas through competition in the marketplace.

Comparing electrification efforts in Hungary and Transylvania with those elsewhere in Europe reveals broadly similar timelines. While Transylvania lagged behind the more developed West in many respects (the Second Industrial Revolution—steam power, factories, transportation, urban infrastructure, etc.), it was not left behind in the Third Industrial Revolution. In fact, in some instances it led the way (for example, public lighting in Timișoara and the construction of hydroelectric plants). How could such a relatively underdeveloped region suddenly surge forward in a particular area?

Steam engines gave rise to large factories, leaving small entrepreneurs and cottage industry at a disadvantage. Electricity reversed this situation: small entrepreneurs could acquire relatively inexpensive and compact electric machinery, allowing them to compete with large factories:

The only escape for small industry is to acquire the tools that enable it to compete with factory industry. For this, electric power transmission is exceedingly suitable: it is not tied to a location like other engines, its purchase price is significantly lower than that of any other machinery, and its operation does not require expertise. [Székely Nép, Sfântu Gheorghe, May 2, 1908]

The introduction of public lighting also carried an important lesson. Cities learned the drawbacks of signing long-term contracts with a single company (gas companies often for 30–50 years): rapid technological advances were contractually excluded. Such arrangements became obstacles to urban development. Avoiding this required foresight, knowledge, and courage—as well as political strength to act against convention and majority opinion.

This clash between "old" and "new" also highlighted a weakness of democracy: majority decision-making can sometimes slow progress. Research in the history of science and psychology alike demonstrates that people are reluctant to abandon familiar paths—their "comfort zones"—and equally hesitant to embrace the unknown, especially when it appears risky. This tendency directly affected urban development through the democratic mechanism of voting:

The city council is mostly made up of such old-fashioned peasant farmers, who say: 'what is the use of this electric lighting when we can see just fine with kerosene as well!' Naturally, with such arguments everything collapses, every proposal promoting progress: the old uncles vote everything down, for after all, they hold the vote! And this is the greatest lord in the whole world! [*Ellenzék,* July 16, 1906]

The history of electrification demonstrates that one possible way out of this impasse was the presence of a strong and determined political leader (a mayor or lord lieutenant), who—sometimes by exploiting his authority—was able to push through electrification projects. Yet to generalize such a solution is dangerous, for it risks legitimizing authoritarian approaches.

Indeed, any decision-making context provides fertile ground for corruption **[4]**.]. Transylvania was no exception, particularly in disputes over electric versus gas lighting, or direct versus alternating current. If corruption occurred, it most likely happened behind closed doors, in ways designed to avoid detection—making it all the more difficult to identify a century later. Beyond the few documented cases in Cluj and Lipova, what

remain are unanswered questions that suggest decisions which may have disadvantaged the city while serving the interests of certain companies.

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