

# ESSO — Electrification of the Central Labe Districts between 1916 and 1950

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## Abstract

Elektrárenský svaz středolabských okresů, LLC (in English “The Power Plant Union of the Central Labe (Elbe)” districts, which will be referred to here as “ESSO”), came into existence in 1916 in response to growing interest in electrification of the surroundings of Kolín. The Union was an extension of Křížík’s earlier activities. Most of the power was produced by Křížík’s power plant, which was extensively refurbished between 1919 and 1923. In 1919, the hydroelectric power plant in Poděbrady was connected to the mains.

Between 1924 and 1935, the Union gradually took over the hydroelectric power stations in Nymburk (1924), Kolín (1931), and Přelouč (1935). The Union’s most extensive project for a new steam power plant located in Kolín was initiated in 1929. The first stage of construction of the power plant was completed in 1932. It should be noted that the structure was designed by the well-known architect Jaroslav Fragner.

The Union significantly influenced the electrification process for the central Labe district and its surroundings. The Union also successfully extended the number of electricity users. In addition, its activities raised the standard of living of the local citizens. The Union, which had already been nationalized, ceased to exist in 1950.

**Keywords:** Elektrárenský svaz středolabských okresů, ESSO, Kolín, power plant, hydroelectric power plant, electrification.

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## 1 The role of the Union in the systematic electrification of the Czech lands

At the time of the Austro-Hungarian Empire, modernization of the central Labe district formed advantageous conditions for establishing new kinds of power systems, mainly electricity systems. The rapid development of Kolín was closely linked with this. At first, attempts to electrify the region fully were unsuccessful, due to the unsatisfactory legal code. Up to 1919, electro-technical businesses could only obtain a concession on the basis of the government order issued in 1883. Based on a recommendation from the Vienna electro-technical association, safety regulations were added to the government order in 1919. Despite all attempts to define limits for electrification (e.g. the work done by Vladimír List), which were inspired by German attempts that often reached beyond the borders of the Austro-Hungarian Empire, no breakthrough was made until Czechoslovakia was founded.

The state administration subdivided the new state into regions, which were to be administered by so-called “energy associations for the benefit of all” within Act no. 438 on electrification, issued on 22th July, 1919. These associations needed government support. The stake held by private subjects could not initially exceed 40% of the total capital. In

1921, this stake was increased to 75%. The electrification itself was carried out and supervised by the electro-technical departments of the relevant ministries, along with subordinated provincial committees and provincial administrations. At the same time, the Ministry of Public Works established the national electricity board, which was in charge of establishing an electrification plan for the country.

ESSO, the main architect of electrification in the central Labe district, was declared a company for the benefit of all on 18th February, 1921. After this, it began to administer one of the 25 electricity regions during the interwar period of the first Czechoslovak Republic. However, the newly-founded state recognised the need for these companies to have a concession. Their representatives gathered in panels, subsequently known as associations, which established their headquarters in 1929 (later known as the Union). Nevertheless, some progress in electrification of the central Labe district (centered on Kolín) had been achieved before the First World War.

## 2 Electrification of the central Labe district

Since 1910, the town of Kolín had been influenced by František Křížík, who established a foundry, a pattern-shop, a locksmith’s workshop, and an electro-technical materials warehouse. These buildings re-

District/subject	A year of joining	Deposit (in crowns)
Čáslav	1916	1 360 000
Český Brod	1916	900 000
Chlumeck nad Cidlinou	1916	540 000
Kolín	1916	1 380 000
Poděbrady	1916	760 000
Kostelec nad Černými lesy	1916	300 000
Kouřim	1916	940 000
Městec Králové	1916	600 000
Nymburk	1916	800 000
Nový Bydžov	1917	1 020 000
Habry	1918	360 000
Uhlířské Janovice	1919	340 000
Bohemia	1920	1 800 000
Czechoslovak Republic	1920	1 800 000
Total	1920	12 900 000

**Table 1:** Year of joining the Union, and the deposits made by districts and other subjects, as of 1920.

placed the former Weissberger distillery, located near the railway station, by an arrangement with the town council. After building the first steam power station nearby (1911–1912), Křížík began to spread the power distribution network throughout the town. The steam power plant first provided a power supply for town lighting and for small engines, and a primary power-distribution network extending to neighboring towns, e.g. Čáslav and Přelouč, was gradually built up. However, the first public street lighting in Kolín was not established until 1916.

## 2.1 ESSO

The first attempts to unify the central Labe districts were made as early as 1913–1914. An interim board of central Labe electricity unions was established under the leadership of Bohumil Novák, mayor of the Český Brod district and a landowner in Přistoupim. However, the approaching war put a stop all efforts. Nevertheless, through an initiative of the board a meeting was arranged in Prague on 13th July, 1916. The meeting was attended by representatives of the central Labe districts and members of the Provincial Administrative Commission of the Kingdom of Bohemia. ESSO was established at this meeting. In addition, all preparatory works were authorized, and


a social contract was signed. A sum of 2 650 000 crowns was fixed as the authorized capital. In the same year, the Union purchased a steam power plant and a power-distribution network, including transformers, for 2 222 854 crowns from the Křížík Company.

During the First World War, there were harsh times for the Union's activities because, among other problems, copper was commandeered for military purposes. Thus the power distribution systems had to be made from iron, which led to high electricity losses. In 1917, the total number of electricity users consisted of 1100 residents of Kolín, 800 villagers, and over 100 industrial companies. Additional connections were disallowed by the government, with the exception of offices, food production companies, various kinds of suppliers, and companies that were significant for the war effort.

In addition, there was a lack of qualified workers and a decline in the standard of living, as well as an insufficient supply of resources for operating the power plant. These factors raised the price of electricity. In addition to a lack of oil, a critical lack of coal proved to be a major problem at the end of 1917. Despite all these problems, the company showed an annual profit of 42 611.94 crowns in 1917. As soon as the war was over, copper wires came back into use.

ZDARMA A FRANKO.

# ELEKTRÁRENSKÝ SVAZ středolabských okresů v Kolíně



zásobuje elektrickou energií tyto okresy: *Č. Brod, Nový Bydžov, Čáslav, Habry, Čblumec n. C., Uhl. Janovice, Kolín, Kostelec n. Č. l., Kouřim, Městec Král., Nymburk, Poděbrady, Přelouč, Kutná Hora* a podporuje průmyslové a živnostenské podnikání výhodnými cenami elektrické energie,

propaguje elektrifikaci domácností mimořádně levnými byt. sazbami. Informujte se u nás!

## Pecte, vařte, perte, žehlete elektricky!

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Figure 1: ESSO advertisement in the local press.

However, from 1919 until 1921, copper wires were again temporarily replaced by iron wires. In 1920, the government became one of the Union partners. A couple of months before this milestone, on 22th July, 1919, the Union was proclaimed for the benefit of all on the basis of a Ministry of Public Works decree from 18th February, 1921.

This provided new opportunities for the Union, e.g. the possibility to make compulsory purchases of lands from landowners, even against their will. Wiring was therefore no longer dependent on road links, and electricity could be distributed to users via the shortest and most favorable routes. The decree also allowed brackets to be attached to houses and garden columns. At first, the government also granted tax and financial concession. The owners' capital of the Union, which was raised to 4 850 000 crowns (in the new Czechoslovak currency) in 1919, was increased again as soon as the government began to participate in the operations of the Union. This increase was held until the beginning of the German occupation of Czechoslovakia. After these events, the construction work was completed. ESSO established its offices, garages and flats in the cooperation of the former distillery.

Bohumil Fiala, a former employee of the Kolben engineering works, was appointed as the first direc-

tor of the union. In 1923, he was replaced by Josef Smola, who was a director until the late 1920s, when Václav Budil, a former vice-chairman, replaced him. Among several chairmen of the secretarial committee, Ladislav Radimský, an aristocratic chamber member for life and mayor of the Kolín district, and Pavel Zedník, a farmer from Bošín and mayor of Nymburk district, are considered to have been the most important.

A profit of 780 426.94 crowns was made in 1920, and a profit of 636 121.69 crowns in 1930. Even during the German occupation, ESSO showed a profit of 1 238 733.77 protectorate crowns in 1940. In 1914, the Union produced 1 300 000 kWh, which rose to 40 000 000 kWh by the end of 1939. In 1916, ESSO owned 270 kilometers of high-voltage distribution network (15 kV) which increased to roughly 1300 kilometers in 1930, out of which 14 kilometers consisted of cable lines. From 1927 to 1929, the power-distribution network was built up at a very fast pace. This was due to the relatively favourable economic situation in the countryside and in industry. In addition, the laws in support of electrification of the countryside led to sizeable investments.

Out of the 553 villages and 193 settlements in the region covered by ESSO, 431 villages and 75 settlements were electrified by the end of 1933. Only small

Year	Output in kVA
1911	1 070
1919	4 600
1933	35 106
1940	48 000

**Table 2:** Tagged value of transformer outputs.

villages and settlements remained to be electrified. Later, 21 towns, 21 townships, 448 villages, and 69 settlements were electrified through a different distribution network, meaning that a large majority of dwellings at that time were covered by ESSO's services. In addition to the districts covered by ESSO, 20 villages and settlements in the Kutná Hora district and one village in the Brandýs nad Labem district were electrified by the end of 1933. At the same time, 16 villages were taken away from ESSO and re-assigned to other power stations that could better provide a service for them. 70 kilometers of 100 kV wiring, 48 kilometers of 35 kV wiring, and 20 kilometers of 315 kV wiring were installed during the German occupation. Finally, 3 kV wiring was installed in Kolín itself. This enabled seven more villages and four more settlements to be connected to the Union.

ESSO sold electric energy to wholesalers, villages, cooperatives, and even to retailers. The capital needed for constructing new power stations, electric wiring, transformation stations, etc., was borrowed from financial institutions, villages, districts, or directly from electricity consumers, who received principals in return. The money needed for building up local power-distribution networks was usually obtained from the villages that would benefit from the work, or from cooperatives of electricity consumers.

It should be mentioned here that ESSO was not one of the largest electricity Unions in Czechoslovakia. For example, ESSO produced 9 705 029 kWh of electric power in 1922, and occupied 19th place out of 25 electricity regions in Czechoslovakia. Moravskoslezské elektrárny (Moravian-Silesian power stations) produced 264 202 757 kWh in the same year.

In 1932, the Union set up its own electrometer calibration station, which was dissolved by Pražské energetické závody (Prague energy works) in 1950. In cooperation with neighboring electricity producers, a 110-kilo-volt wiring project was set up. A new project to construct a steam pipeline in Kolín was prepared in 1918, but work on it was not started until the German occupation. In 1938, non-local power distribution systems were reconstructed. During this process, wooden columns were equipped with a small column that doubled the operating life of impregnated wood

columns. During the 1920s, ESSO embarked on selling electrical household appliances, e.g. electric chandeliers and Elektrolux absorption refrigerators. Hair dryers, electric irons, hotplates, cookers, and a variety of other kitchen equipment, most of it made by Siemens, were sold to customers. After the tariffs were regulated, it became possible to use electricity not only for driving engines but also for lighting and for cooling systems (e.g. cooling systems in breweries, public houses, butcheries, etc.) Last but not least, electricity started to be applied in agriculture (e.g. in incubators and in cold frames).

In 1933, ESSO issued a statement that its "intention is to make electricity available to the whole population of the region for reasonable prices, and by doing so, to improve standard of living. The fact that households and buildings in Kolín are fully electrified shows that this Objective has already been accomplished." [4, p. 89].

### 3 ESSO power stations

In the original power station designed by Křižík there were two older horizontal two-cylinder 1 000 HP, 125 rpm compound steam engines made by První brněnské strojírny. Both engines, equipped with condensation vacuum pumps, directly powered the connected three-phase generator (750 kVA, 178 rpm, 3 300 V) manufactured by Křižík Company. Later, a vertical Breitfeld-Daněk steam engine (350 HP, 178 rpm) directly connected to a generator manufactured by the Křižík Company (280 kVA, 3 000 V) was installed. It was initially used only at night, when the electricity consumption rate was low.

The boiler room consisted of four Steimmüller vertical steam water-tube boilers that had to be fed with coal manually. The operational steam pressure in the boilers was 11 atmospheres. The water used for the steam boilers was obtained from a small pond near the boiler room. The pond had earlier been deepened by Křižík. Wells and also water tanks drawing water from the Labe at a location near to the railway station served as water supplies. While the primary electric power distribution system in Kolín was established using 3 kilovolt cable lines, towns that were more distant from Kolín were supplied with electric power using 15-kilovolt wires.

#### 3.1 Expanding Křižík's power plant

However, even after these structures had been added the high demand for electricity could not be satisfied. A boiler room with four water-tube steam boilers having excess pressure 15 atm. and steam temperature 350°C behind the superheater were constructed between 1918 and 1923. First, a Carbe steam boiler

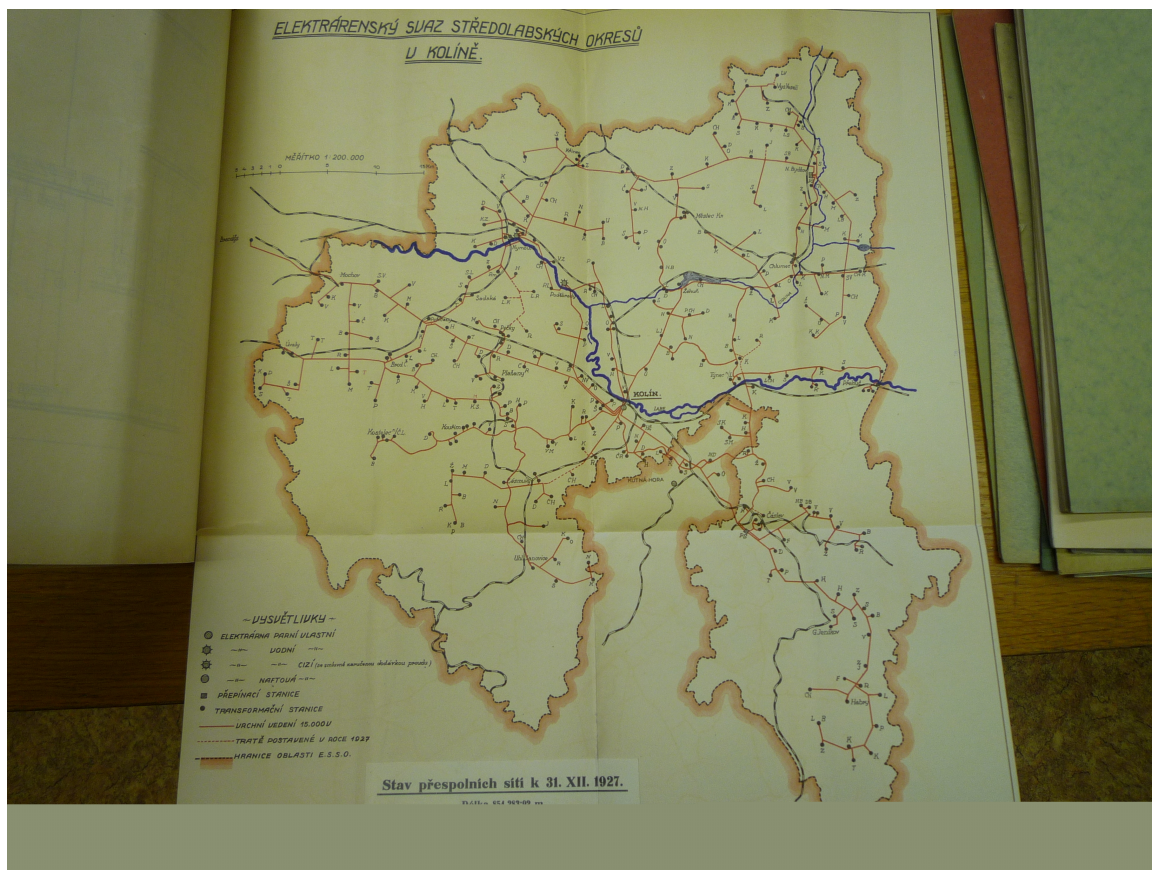


Figure 2: State of electrification on 31st December, 1927.

with a 400 m<sup>2</sup> heating surface made by the Breitfeld-Daněk Company was bought in 1918. In 1924, a grate used for coal-dust and coal-waste combustion was added to the existing steam boiler.

The design of the grate was based on Lomšák's patent. Another two Oschatz-type steam boilers with movable grates were bought from Škoda in 1922. Each had a 460 m<sup>2</sup> heating surface. The last steam boiler to be bought was another Oschatz type steam boiler of the same size as the previous two; however, it was equipped with a Pluto-Stocker type grate. Coal was transported through the goods lift and the conveyor belt to the hoppers that were placed in front of the steam boilers. A new water supply was also constructed. The two original horizontal engines and one vertical engine, together with the power generators, were dismantled and sold.

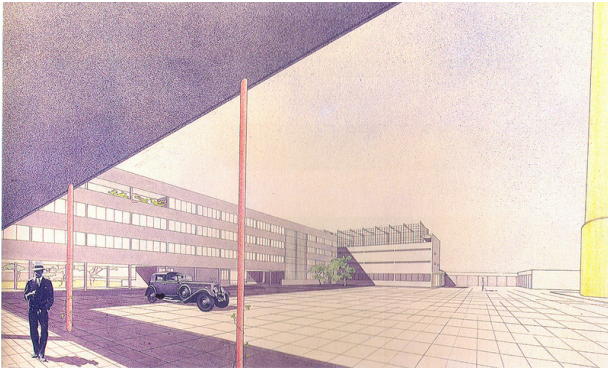
A new Breitfeld-Daněk steam turbine was installed in the engine room in 1921. Its output was as follows: 3000 rpm generating 3500 HP, the temperature reached 320°C, and the steam pressure was 14 atm. This machine was equipped with a three-phase Siemens & Schukert turbine generator designed to generate 3000 kVA and 3150 V output. A spare steam turbine (4750 HP, 3000 rpm, steam pressure 14 atm., temperature 320°C), manufactured by Škoda in Plzeň, was added in 1924. It was equipped

in a similar manner with a three-phase turbine generator, but it had a different output (4750 kVA, 3150 V) and was made by Českomoravská-Kolben Company. The steam used in the steam turbines was cooled down after condensation in two cooling towers. The first tower had an output of 250 m<sup>3</sup>/h, while the output of the second tower was 750 m<sup>3</sup>/h.

The unsatisfactory old-fashioned transformers constructed by Křižík were improved by expanding the engine room and establishing an extra 140 km of 15 kV wiring. A new switchboard (3 kV) and switching station (15 kV) were added, with an electromagnetic control system installed by Českomoravská-Kolben in a separate building near the power station. However, this was destroyed when the area was bombed in 1944.

### 3.2 The new ESSO power plant in Kolín

Owing to growing demand from a wide variety of industrial enterprises, newly-built villages, and the increasing number of electricity consumers, it became necessary to build an additional large steam aggregate. Since it was impossible to expand the existing power station due to lack of space and lack of cooling water, ESSO bought a former sugar refinery lo-



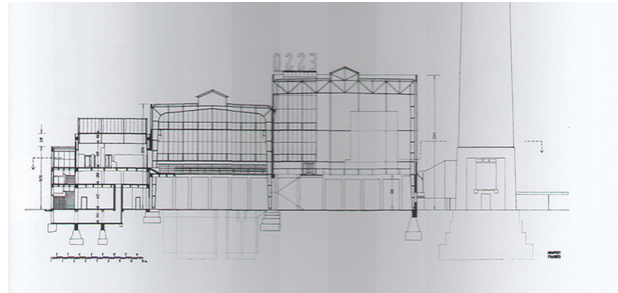
**Figure 3:** A bird's eye view of the centre of the ESSO power station in Kolín.

cated in the Labe suburbs that had belonged to the Horský family. As soon as the sugar refinery had been demolished, ESSO began preparatory works on its most significant project—a new steam power station in Tovární Street. The Union entrusted the new steam power station project to the famous Czech architect Jaroslav Fragner. His work was later considered to be one of the finest pieces of architecture in the functionalist style.

In 1928 and 1929, Jaroslav Fragner constructed a villa for Václav Budil, who would be a long serving director of ESSO. After this, Fragner started work on projecting the new steam power plant complex. The architect then constructed not only two more Union houses, administrative buildings and switching stations for his highly important client, but also a summer villa in Kostelec nad Černými lesy.

It was of importance that the chosen building site was situated on the right bank of the Labe and near the northeast track. In addition, it was placed high enough above the level of the Labe not to be flooded even in the most extensive floods. It should be mentioned that the complex was situated in such a way that coal could in future be delivered either by rail or by water. The water required for the cooling systems could be obtained directly from the river. The size of the plot and the abundance of cooling water along with the expansion of the engine room enabled the output of the new power plant to be raised to 60 000 kW, and at the same time enabled the coal depot to be extended to contain 10 000–12 000 tons of coal. Powdered coal was unloaded by conveyor belts on top of large heaps of coal, and was then transported on other conveyor belts to the steam boilers. However, the heaps of coal smouldered, and the surroundings of the power station were quite often polluted by suffocating smoke.

The construction of a chimney and of new buildings was commenced in 1930. The boiler rooms, turbines, and other indoor equipment began to be assembled in 1931, and the power station complex was put into operation in mid 1932. The whole con-



**Figure 4:** Profile of the switching station, the boiler room and the engine room of the ESSO power plant in Kolín.

struction process was divided into several phases. In the first phase, a boiler room, an engine room and the chimney were built to be able to generate output of 30 000 kW. The addition of a switching station, a pumping room, supply pipes and drainpipes for transporting the cooling water, and coal feeding plants doubled the maximum output to 60 000 kW. Mainly for political reasons, however, the Union was not able to construct subsequent phases of the power station complex. Some adaptations and supplementary work on the site were still in progress in the first years after the Second World War.

Two vertical-bent-tube boilers, made by Škoda, were installed in the boiler house. They were equipped with three forged drums and steam collectors, each having 27 t of steam output per hour, excess pressure 45 atm. and steam temperature 450°C behind the superheater. In addition, the boilers provided with Weck system chain grates enabled even coal dust to be combusted. Each boiler had a coal bunker with a capacity of 90 t. Another boiler was installed in 1942. A 120-meter-high chimney with 5 m clear diameter was the highest chimney in central Europe in the interwar period. It is still the highest brick chimney in the Czech Republic. It was designed to have an output of 30 000 kW.

Two turbo-sets made by Českomoravská-Kolben-Daněk, were installed in the engine house. One turbo-set had an output of 9 400 kW, and the output of the other was 11 200 kW. The following technical parameters applied to both turbo-sets: 3 000 rpm and 4 100 V. The engine house was planned to be equipped with three assemblies with the output ranging from 7 500 kW to 15 000 kW. The feeding pumps and the pumps used for pumping the cooling water were powered by electric motors and were also equipped with small spare steam turbines.

Each generator had its own a transformer situated in front of the switching station. Each had the same output. They increased the voltage output of the generator from 6 600 V to 15 700 V (the voltage of the power-distribution network). The switching house was made from ferroconcrete, and it contained

the following equipment: a switchboard, a switching room (15 kVA), a central switchboard, an accumulator battery and a laboratory. The new exchange switching room was connected to the switching room of the old steam power station with three parallel cables. Another cable connected it to the hydroelectric power plant switching room. In addition, the power plant was connected to other power stations in Přelouč, Poděbrady and Nymburk by 100 kV wires. It was later also connected to other power stations nationwide with 500 kV wires.

In the interwar period, steam was distributed throughout Kolín for heating and manufacturing purposes. Steam pipes were laid in concrete channels beneath the pavement in the town, except on Masarykův Bridge, where they were laid beneath the sidewalks. It is worth mentioning that heat production later became an essential element in the operation of the power plant. The hydroelectric power plant merged into a thermal power plant in the course of the 1960s.

### 3.3 Hydroelectric power stations

Besides steam power plants, ESSO also owned several hydroelectric power plants. Like other hydroelectric power plants, they were in public ownership. Hydroelectric power plants were then rented to private companies such as ESSO, which gradually owned up to four hydroelectric power plants. The hydroelectric power plants were in public ownership for reasons connected with regulation, canalization, and amelioration works. Regulation works on the central Labe began shortly before the First World War, after a long period of inactivity, and continued until after 1950, the end of the period monitored here.

The hydroelectric power plant in Poděbrady was the first to be added. Within the work carried out, the Labe riverbed was turned aside so that it would be further away from the town, and so that a new hydroelectric power plant could be built by the government on the left bank, next to the weir. This power plant was constructed between 1915 and 1923 on the basis of a project designed by Antonín Engel, a famous native of Poděbrady. In 1919, the government laid the foundations, and ESSO finished building the upper part of the structure and installed two Francis turbines. With an output of roughly 1 300 kVA, the hydroelectric power plant was connected to the mains before the end of 1919. In 1923, the Union rebuilt the former wood building into a masonry building and installed two more Francis turbines in the engine room. In the service room, there were two switchboards and a transformer, which was topped off by a 13 m high tower used for electric power distribution. This path-breaking building is still in great condition, and was

nominated in 2003 to be listed in the central cultural heritage register.

The second hydroelectric power plant rented by the Union was in Nymburk. As soon as ESSO finished constructing a new lock in Nymburk as part of the works to regulate the Labe, in addition to construction of a lock on the left bank, the company began to construct a hydroelectric plant on the right bank, too. It was finished in 1924. Four Francis turbines and one Kaplan turbine were installed in its engine room, with a total maximum output of 1640 kVA. The three-floor service room situated on the adjacent island completed the hydroelectric power plant complex.

Another hydroelectric power plant was built under one of the arches of Kolín Bridge between 1923 and 1931. The construction of Kolín Bridge was begun in 1913 as part of the process of canalizing the central Labe; however, it was not finished until 14 years later. The newly-built hydroelectric power station was meant to replace the old stable weir, already closed, that was located between Formánkův and Radimský mills. Unlike other mill owners in the Central Labe region, the owners of these mills had not bought out the water rights. The government therefore built this hydroelectric power plant to make up for the lack of water power. Like the new bridge, its construction had been initiated before First World War, but it was not completed until the early 1930s. The water to propel the four Francis turbines had to be raised by three drums under three other bridge arches. The original machines had an output of 110 kVA up to 220 kVA until 2010. In 2011, the Kolín power station was taken out of operation for good.

The hydroelectric power station in Přelouč, built by the government for 12 000 000 crowns, was rented by ESSO with written permission from VČES (the East Bohemian power station union) in 1927. This hydroelectric power plant generating an output of 1500 kVA, was connected to the Union mains in 1935.

## 4 Disbanding the Union, and the importance of the Union

ESSO played a significant role during the electrification of the central Labe district. Although it was disbanded, it undeniably contributed to the complete electrification of the region. The Union lost its relative independence as early as 1941, when it was forced by the German commissioners into a merger with the joint-stock company VČE (East Bohemian power stations), based in Hradec Králové.

As soon as the war was over, the Union power stations were nationalized in accordance with presidential decree no. 100 from 1945. The power stations

were subsequently placed under ČEZ (Czechoslovak Energy Establishment). In 1946, Ministry of Industry regulation no. 1230 integrated the Kolín power station into the national enterprise VČE. ESSO was permanently disbanded as a part of the reorganization of the Czechoslovak energy industry on 1st January, 1950. Two thirds of ESSO was apportioned to Pražské energetické závody, which subsequently formed the Kolín and Nymburk district administrations, and the remaining one third was integrated into RPA (the Hradec Králové electric energy distribution establishment) and RČB (the Budějovice electric energy distribution establishment). There were certain changes in the organization of the power plants and power distribution systems after this time, but they lie beyond the scope of this paper.

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