CHAPTER 3

UDK 621.311(497.1)"1919/1952" DOI 10.29362/2023.2794.hei.67-88

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The Electrification of Yugoslavia 1919–1952: Ideas, Plans, Realities

Introduction

This paper focuses on the electrification of Yugoslavia, beginning shortly after that country's foundation as the Kingdom of Serbs, Croats, and Slovenes in 1918, or more specifically, after the establishment of the Ministry of Trade and Industry (*Ministarstvo trgovine i industrije*) in April of 1919, and over the 1920s and 1930s, until the establishment of the new Ministry of electrical industry (*Ministarstvo elektroprivrede vlade FNRJ*) and the first Yugoslav five-year plan, lasting from 1947 until 1952, which represents the infrastructural basis for the future industrialisation of the country.

While this paper is not the first one dealing with the electrification of Yugoslavia, even in the late Yugoslav period most historians were focused on their respective republics and took little interest in Yugoslavia as a united economic space. Important works include, in the case of Serbia, the exhibition catalogues "Life in Serbia Vis-à-Vis Electrification"[1] and "From Dusk till Dawn: 120 Years of Electrification in Serbia",[2] both by Zorica Civrić. Of great importance to large-scale electrification were foreign investors, and the publication "A Step Ahead of Time: 125 years of Siemens in Serbia" contains valuable insights into their operation.[3] With regard to Montenegro, one must note the work of Živko Andrijašević and his colleagues, and in Slovenia Gregor Novak has recently written a thesis on electrification at the Drava.[4]

In the case of Croatia, a brief overview is provided in Dragutin Feletar's "Development of Electrification in Northwestern Croatia until WWII".[5] With

[1] Zorica Civrić, *Живот у Србији уочи електрификације* (Beograd: Српска академија наука и уметности, 2008). [Exhibition catalogue].

[2] Ibid., *Од сумрака до свитања: 120 година електрификације Србије* (Beograd: Српска академија наука и уметности, 2013). [Exhibition catalogue].

[3] Predrag J. Marković, Čedomir Antić, Danilo Šarenac, *Korak ispred vremena. 125 godina Simensa u Srbiji* (Beograd: Институт за савремену историју, 2012).

[4] Gregor Novak, *Zgodovina dravskih hidroelektrarn med Dravogradom i Mariborom*. (Maribor: Univerza v Mariboru, Master´s thesis, 2016). Online: https://dk.um.si/IzpisGradiva.php?id=57204&lang=slv

[5] Dragutin Feletar, "Razvoj elektrifikacije sjeverozapadne Hrvatske do Drugog svjetskog rata – s posebnom osvrtom na Koprivnicu", *Ekonomska i ekohistorija* 2:1 (2006), 104-148.

regards to Zagreb, an important contribution is the paper "Modernization of Zagreb in the First Half of the 20th century through the Prism of Electrification", by Tomislav Anić, which is also one of the few papers in English.[6] Older works on the topic are still valuable, such as "Pioneering Ventures of Public Electrification in Croatia",[7] published by the journal *Energija* in 1995, which itself is based on the older two-volume "Development of Electrification of Croatia" by Markovčić et al., published in the 1980s.[8]

Only more recently, Tijana Rupčić has looked beyond the scope of individual republics and connected the electrification of Yugoslavia and the construction of a united power grid in the interwar years to the Yugoslav nation-building project.[9] Nonetheless, new work focuses predominantly on the cases of Croatia, Serbia, and Montenegro.

This paper seeks to examine the interrelationship of ideas circulating among experts, plans made, and policies implemented. It looks for differences and continuities between the first and second Yugoslavia, and aims to be a contribution for future research, in not only the field of infrastructure history, but also industrialization and the general economic and social history of Yugoslavia at large.

To achieve this, the paper uses two main groups of sources aside from the literature mentioned above. The first is the *Tehnički list* magazine, which was the main Yugoslav journal for engineers and architects during the interwar years, and which did quite regularly write about the development of the electric industry in Yugoslavia and abroad. The second group of sources consists of documents from the Archive of Yugoslavia (*Arhiv Jugoslavije*, AJ) in Belgrade, particularly those from the Ministry of Trade and Industry (*Ministarstvo trgovine i industrije*) for the period lasting until 1941, and the different ministries responsible for the years from 1945 until 1952.

Electrification – Some Considerations

A concept necessarily connected to infrastructure history is the question of path dependence.[10] The case of a country as economically heterogeneous as Yugoslavia appears to be an example *par excellence* to study the effect of positive feedback loops created by differences in development in the earliest years and

[6] Tomislav Anić, "Modernization of Zagreb in the first half of the 20th century through the prism of Electrification", *Review of Croatian History* 16:1 (2020), 59-75.

[7] Marijan Kalea, Boris Markovčić, Ivan Deranja, Zdravko Plander, Karlo Ožegović, "Pionirski pothvati javne elektrifikacije u Hrvatskoj", *Energija* 44:1-6 (1995), 5-6; 239-253.

[8] Boris Markovčić et al.: *Razvoj elektrifikacije Hrvatske*. *I dio* (Zagreb: Institut za elektroprivredu, 1984); Boris Markovčić et al.: *Razvoj elektrifikacije Hrvatske*. *II dio* (Zagreb: Institut za elektroprivredu, 1987).

[9] Tijana Rupčić, *The Illumination of Yugoslavia. Electric Networks and Nation-building (1918-1941)* (Budapest: Central European University, Master´s thesis, 2020). Online: https://www.etd.ceu.edu/2020/rupcic_tijana.pdf

[10] Paul Pierson, "Increasing Returns, Path Dependence, and the Study of Politics", *American Political Science Review* 94:2 (2000), 251-267.

decades of industrialization. The question of to what degree this can be also applied in the realm of electrification will be answered on the following pages.

But what does electrification mean? According to Zorica Civrić, "Electrification is the process of introducing electricity into public use."[11] This process involves many different parts – the construction of power plants to produce electricity in the first place, the construction of power lines to connect producers and consumers, and the various means used by consumers, be they private citizens or large industries, to make use of the new power source. This paper will focus mainly on the production of electricity, meaning the construction of new power plants, and that electricity's socio-political importance, as it is a prerequisite to all other steps. Other important aspects of electrification, such as the construction of power lanes, will be mentioned only briefly.

Early Attempts at Electrification and Lack of Data

In modern day Serbia, the beginning of electrification is usually dated to October 6th of 1893, when the first power plant was opened at Dorćol in Belgrade. Coincidentally, in then-Hungarian Vojvodina, the first plant was put into operation at Stara Pazova in the same year. While in both territories the number of electrified cities and towns grew, the differences between the Kingdom of Serbia and Vojvodina were significant. In the Kingdom of Serbia, Valjevo and Užice were electrified in 1899, Vučje and Leskovac in 1902, Šabac in 1906, and by 1915, another 15 towns had been connected to a local power grid, with 5 towns and cities, among them Niš, being electrified in 1909 alone, thus bringing the complete number of electrified Serbian towns and cities up to 21 by 1915. Despite these efforts, the Kingdom of Serbia was significantly lagging behind the territory of Vojvodina, where, despite its smaller size and population, 42 towns and cities had been electrified by 1915. However, even larger was the difference between the Sandžak region and Kosovo. Both territories, which had become part of Serbia after the Balkan wars, had previously been under Ottoman rule. As of 1914, there was not a single town electrified in these territories.[12]

In the case of Croatia, smaller electric generators called *munjare*, after *munja*, the Croatian and Serbian word for lightning, were installed quickly after an experimental demonstration of electricity in Zagreb in 1877. The first known generator in Croatia was used starting in 1880 to power the textile industry in Duga Resa. A second was installed in the Slavonian town of Đurđenovac in 1881, and it did not remain an isolated example. In the Istrian town of Vodnjan, a generator that had been operating since 1883 was enhanced in 1889 to provide electricity for public lighting. Completed in 1895, the first public hydroelectric plant was Jaruga, located at Skradin on the Krka River. Built for the purpose of supplying the nearby city of Šibenik with electricity, it was also connected to the

[11] Civrić, *Живот у Србији уочи електрификације*, 4.
[12] All information taken from Civrić, *Живот у Србији уочи електрификације*, 7, 76f.

first significant power line, which was 11 km long. By 1918, about 40 power plants had been completed in Croatia, the largest being Kreljevac, Manojlovac, Jaruga, Zagreb, Karlovac, and Majdan, with the Zagreb plant, which had been opened in 1907, being the only caloric power plant of these six, although among smaller plants these caloric ones were more common.[13]

Arguably the most advanced electrification in 1918 was that of Slovenia, which was home to the large Fala power plant. Fala was built mostly during WWI and subsequently connected, then enjoying a monopolistic position.[14] As shown, when Yugoslavia came into being in 1918, electrification in the different parts of the country was in a very diverse state. This was undoubtedly caused by the fact that the new Kingdom of Serbs, Croats, and Slovenes was composed of territories which had only a few years earlier been under Austro-Hungarian, Serbian, Montenegrin, Bulgarian, and Ottoman rule: the constituents of the new state had developed very differently in the previous decades or even centuries.

Thus, the ministry in Belgrade attempted to collect data about the state of electrification in the newly acquired territories. For example, in June 1922 it sent a letter to the village of Jabuka (Banat), the only letter to survive in the Archive of Yugoslavia to this day, inquiring about the state of electrification.[15]

All in all, the lack of reliable data would plague the new state for the foreseeable future, and would in fact not be remedied until WWII. Experts were well aware of the problem. In 1929, one expert noted when writing about the problems of electrification in Yugoslavia that the country did not collect any official data on the total amount of electricity it produced, hence all numbers provided for the period until 1945 should be taken with a grain of salt.[16]

Nationalisation

After WWI, the victors of the war were seeking retribution for the losses and destruction resulting from the conflict. The nationalization of property was carried out in both meanings of the word. Property was to be taken from the beneficiaries of the previous system, the nobility, and redistributed among the peasantry. But as the nobility was quite often ethnically German and Hungarian, or at least culturally germanized or magyarized, nationalization also fulfilled a second task – the transfer of property, and with it, economic power, from one ethnic group to another, especially to the titular nations of the new states.[17]

[13] See for Croatia Feletar, "Razvoj elektrifikacije sjeverozapadne Hrvatske do Drugog svjetskog rata", 104-148, 106-108.

[14] Novak, *Zgodovina dravskih hidroelektrarn*, 45.

[15] See the detailed list of question sent along with it Arhiv Jugoslavije (in further text: AJ), fond Ministarstva trgovine i industrije, fond 65, fascikla 335. Električna centrala Jabuka. Letter from the Ministry of trade and industry, section for industry and craftsmanship, to the village of Jabuka. 25.11.1922.

[16] Božidar Ribić, "Problemi elektrifikacije naše zemlje", *Tehnički list* 12:1 (1930), 1-6, here 1.

[17] For further reading see: Dietmar Müller, *Bodeneigentum und Nation. Rumänien, Jugoslawien und Polen im europäischen Vergleich, 1918–1948*. (Göttingen: Wallstein, 2020).

The transfer of property was not only restricted to land, and it was the agenda of patriotic (or nationalist) elites to establish a "national" industry, somewhat "free" from foreign ownership. This can be seen in the case of the power plant in Fala, located in Lower Styria in modern-day Slovenia.

The Fala power plant was constructed in 1913-1918 on the order of the Steiermärkische Elektrizitäts-Gesellschaft, when all of Styria was part of Austria-Hungary, and the original plans meant for the power plant to supply northern Styria (modern-day Austria) with electricity. Its construction was largely financed with Swiss capital,[18] endowed by the Schweizerischer Bankverein in Basel among others.[19] With the foundation of the SHS-State, the power plant remained on the Yugoslav side of the border, while its intended customers were on the opposite side. Fala remained in the ownership of the Styrian electricity company, but Slovene businessmen and local government representatives regarded this as an opportunity, hoping to take hold of it and use it for the development of their own industry.

With support of the local government in Ljubljana, they proposed to take it off the hands of the Austrians by paying its debts in Switzerland.[20] But the minister of finance in Belgrade, whilst sympathetic to the idea of "nationalizing" the power plant, did not fancy the notion of spending taxpayer money on the acquisition. In fact, despite the importance of Fala it was nationalized only after WWII as part of the widespread nationalization of the new socialist government in late 1946.[21]

War Reparations and Lobbying – The Cases of Ogulin and Ivanjica

Electrification was a costly endeavour, and thus it comes as no surprise that municipalities attempted to get financial aid from the central state when attempting it. Such can be seen in two examples: the towns of Ogulin and Ivanjica. Ogulin is located about halfway between Zagreb and Sušak, today a part of Rijeka (Fiume). Following the annexation of the Free City of Fiume by Italy in 1921, Sušak became Yugoslavia´s northernmost port city. Located at an important railway, Ogulin came to the idea of seeking governmental support to develop its electricity production. Officials argued that this could feed the "electricity consumption on the side of the railway station in Ogulin, which is an important intersection of the lines Split-Sušak-Zagreb and Sušak-Zagreb-Split,"[22] as well as power the local water supply.

[18] AJ-65-335. Električna centrala Fala. Pismo ministarstvu trgovine i industrije. 15.2.1920.

[19] Ibid., Zusammenstellung der Kreditoren der Steiermärkischen Elektrizitäts-Gesellschaft per 31. Dezember 1919.

[20] Ibid., Referat. Beograd, 26.04.1920. 1f.

[21] Hidroelektrarna Fala skozi čas. Paragraph "Nacionalizacija in ponovna združitev". Dravske elektrarne Maribor, online: https://www.dem.si/sl/muzej-hidroelektrarne-fala/zgodovina-hidroelektrarne-fala/. Last accessed on 11.10.2022.

[22] AJ-65-335. Ogulin. Broj 6061/1926. Stroj za pogon Električne struje, iz reparacijne zalihe – dodelenje. Pismo ministarstvu financija ministru trgovine i industrije kraljevine S:H:S. 30.7.1926. 1.

As the town wrote to the ministry, it had already invested into its own generator, and inquired as to whether another one could be provided. Unfortunately for Ogulin, the reply from the Belgrade War Damage Administration was negative, as it did not feel responsible for such an endeavour.[23] Instead, the War Damage Administration advised asking for support from the Economic-Financial Committee. Another case was the town of Ivanjica in central Serbia. In a letter sent to the minister of trade and industry in January 1921, Constitutional Assembly (*Ustavotvorna skupština*) member Manojlo Sokić pointed to the pre-existing electric power plant, which had been damaged in World War I. A loan of 100,000 dinars to repair the facility had been granted, but not paid out yet. A second problem was the lack of machinery needed to use the electricity provided by the power plant. "Considering that there are more such cases, there would be the need that Mr. minister would seek as payment of compensation from Germany also the necessary machines: for the processing of wood, wool, fruit, and others?" the MOP requested.[24] It might have been helpful that Sokić had managed to secure support from the president of the Constitutional Assembly, Ivan Ribar, who kindly asked the minister to look into the matter.[25]

Potential Energy Sources

One of the main questions to answer was which power source Yugoslavia should primarily focus on as its main electricity source. As nuclear power did not yet exist at the time, and renewable energy sources like wind energy were only just being developed,[26] other sources had to be found.

In smaller towns, delivering a small amount of electricity was a task which could be at least initially fulfilled by generators fueled by oil or diesel. This was the case in the above-mentioned town of Ogulin, but this approach could not feed an ever-growing appetite for electricity. Large-scale electrification would require a cheaper and less import-dependent source of electricity.[27] Two main

[23] Ibid., Ogulin. Industrija. 12.8.1926.

[24] Ibid., Električna centrala Jabuka. Ivanjica. Letter from Manojlo Sokić to the minister of trade and industry, 12.1.1921.

[25] Ibid.

[26] One of the rare mentions of wind energy appears in 1941 in the *Tehnički vjesnik*, which was published in the German satellite, the Independent State of Croatia (NDH) as a replacement for the Yugoslav *Tehnički list*. "Električne centrale: Iskorišćenje vjetra za proizvodnju električne struje", *Tehnički Vjesnik. Glasilo Hrvatskog Društva Inženjera* 1:7-12 (1941). 279-281.

[27] Whilst requiring relatively little initial investment when compared to other sources of energy, the cost of the use of diesel generators to produce larger quantities of electricity was significantly higher than alternatives like hydroelectric plants or steam turbines and was, when calculated with 8000 operating hours, with a price of roughly 140 Para per kWh about twice as expensive as the Fala hydroelectric plant. See: G. Gulić, V. Turnšek, "Preskrba mesta Ljubljane z električnim tokom", *Tehnički list* 7:7 (1925), 97-102, here 101. The article sparked a debate with Ing. Josip Rohshaendler, the founder of Fala, who questioned the calculations according to which the use of a gas turbine burning coal would be even cheaper than the electricity provided by the Fala power plant, as he claimed, that these did not take into account the high installation costs

sources were quickly identified: coal, to be used in thermal (in historical sources sometimes also called *caloric*) power stations, and water flows, used to actuate hydroelectric plants. But which would be the one to choose?

In its November issue of 1924, the publication *Tehnički list* informed its readers of the first meeting of the World Power Conference (renamed World Energy Conference in 1968), which had taken place in London, and presented the translation of the report by Eduard Kürschner, an engineer from Zagreb, who had put forth some thoughts about the possibilities for Yugoslavia in the realm of power production.[28]

According to Kürschner there had been some petroleum deposits found at Bujavica, near the railway between Zagreb and Pakrac. Traces of petroleum had been found in Međimurje, Slavonia, and north-eastern Croatia, as well as in the southern parts of Macedonia, but the quantity of those deposits had not yet been calculated. With regards to the lack of domestic petroleum exploitation, he mentioned spiritus as a potential substitute for oil and gas, noting that spiritus was "a fuel whose quantity does not diminish," as it was produced from a variety of field fruits.[29]

Water or Coal?

Kürschner called coal and water "the most important" energy sources, though he identified water as the main source of energy for the new state. "Even as Yugoslavia owns great supplies of coal, which will last for many hundreds of years, and even though it has tremendous complexes of forests, which also constitute an important source of energy, still it cannot be compared to the importance of hydraulic energy, with which Yugoslavia disposes," he stated.[30]

He categorized coal deposits as belonging to three coal areas – the Western, including Slovenia and Croatia (the region, not the state); the Central, including Bosnia, Hercegovina, Slavonia, and Dalmatia; and the Eastern, which included Serbia, Montenegro, and Macedonia.[31] According to the map attached, the most intensely mined deposits of brown coal and lignite could be found between the Sava and Drava Rivers to the north of Zagreb in Croatia and Slovenia, where 17 out of 42 coal and lignite mines were located. Other important mining clusters lay in Bosnia: one in the area of Zenica–Kakanj–Breza, another near Banja Luka and Maslovare, and the last in the northeast close to Tuzla (Bukinje

for new turbine-based plants, as for example the construction of chimneys. See: Josip Rohshaendler, "Je li elektrifikacija Jugoslavije ugrožena?", *Tehnički list* 7:15 (1925), 231. In the same issue, Gulić replied to the criticism by Rohshaendler. See: G. Gulić, "Je li elektrifikacija Jugoslavije ugrožena?" *Tehnički list* 7:15 (1925), 233.

[28] Eduard Kürschner, "Općeniti pregled prirodnih snaga u Jugoslaviji, njihovo iskorištenje i mogućnost njihovog razvitka u budućnosti", *Tehnički list* 6:22 (1924), 280-293.

[29] Ibid., 286.

[30] Ibid., 281 and 286.

[31] Ibid., 281.

and Ugljevik). In Serbia, coal mining efforts were focused on the deposits east of the Morava River, where not only brown coal, but also higher-quality bituminous (black) coal was being mined (in Rtanj, Srpski Balkan, Dobra Sreća, Podvis, Tresibaba). Smaller deposits of brown coal were being mined in the Dalmatian hinterland (Siverić and Velušić), in Mostar, and in the region of Syrmia (Srem/Srijem) at Vrdnik. Given the relative scarcity of bituminous (black) coal, the yet untapped deposits in Kosovo and Macedonia were also worth mentioning.[32]

Despite the beneficial conditions for hydroelectric energy in Yugoslavia, as of 1924, only a few larger hydroelectric plants were operational. These were the Fala plant (on the Drava River), the Završnica (on the Sava), the Ozalj (on the Kupa), the Jaruga plant at Skradin (on the Krka), the Miljacka (on the Krka), the Kraljevac plant in Zadvarje (on the Cetina), and the Jajce (on the Vrbas), all of which lay in formerly Habsburg territory. But it was not only the field of large power plants in which experts wished for more action. In his 1928 article, Josip Ledvinka from Sarajevo called for more decentralization of electricity production, pointing to small Petersen aggregates which were working "to the complete satisfaction of the customers from Iceland to Patagonia," but "[i]n our country, and in the Balkans in general, not a single facility of this type has been installed so far."[33]

According to a map accompanying Kürschner´s article, there were about 36 potential locations projected for the construction of hydroelectric power plants.[34] The locations lay almost exclusively – with the exception of the Macedonian plants in Ohrid, Prespa, and Treska, and two plants in Serbia on the banks of the Sava and Drava River – in the western part of the country. Maribor, Varaždin, and some other plants would be constructed on the Drava River in the northwest, and a great number of plants would have been, according to the map, constructed on the Croatian coast and in Bosnia and Herzegovina.

But how can the significant differences between the different parts of Yugoslavia be explained? In part, they may have stemmed from the economic advantage of the post-Habsburg territories, which could rely on older plans and ideas originating in the time of Austro-Hungarian rule. This was, for example, the case of the Krško hydroelectric power plant, which had been planned already before WWI.[35] Another aspect was mere geography, as it was the western and

[32] Nalazišta ugljena u Jugoslaviji [map]. In: Ibid., [here no page number, located between page 284 and 285].

[33] Josip Ledvinka, "Iskorišćavanje malih vodnih snaga", *Tehnički list* 10:9 (1928), 135-139, here 139.

[34] Those were: Brezno, Sv. Ožbolt, Maribor, Varaždin, Dubrava dol., Krško, Ostrežac, Banja Luka, Bosna, Koviljača, Kupinovo, Treska, Prespa, Ohrid, Jablanica, Rama, Nova Sela, Ombla, Slano, Sujica, Prisoja, Vinko, Ričica, Jezero Blato, Pastranje, Peć, Vitina, Rastok, Matica, Kravica, Zmanja, Švica, Kosinj, Sv. Juraj and Ogulin. Vodene snage u Jugoslaviji [map]. In: Kürschner, "Općeniti pregled prirodnih snaga u Jugoslaviji" [here no page number, located between page 284 and 285].

[35] J. Stipetić et al.: "Mišlenje udruženja jugoslavenskih inženjera I arhitekta – sekcije Zagreb o pitanju izgradnje hidroelektrične centrale kod Krškog i opskrbe grada Zagreba električnom

southernmost parts of the country, rather than the east, which were considered most suitable for the construction of this type of power plant, thanks to the rapid flow of the streams in the Dinaric mountains in the west and the lakes of Ohrid and Prespa in the south. Kürschner even went so far as to claim the possibilities of hydroelectric power in the south to be "of particular importance to Yugoslavia."[36] The relatively late exploitation of the hydroelectric potential in Macedonia however can be seen as proof that geography alone did not determine the success of hydroelectric projects.

At the First Electrotechnic Congress, which took place in 1934 in Zagreb, engineer Momčilo Petrović from Belgrade identified two main tasks: the electrification of the villages, as "all towns here are electrified," and "in the interest of the defence of the country," the construction of a large remote power plant, be it at a coal mine or a river.[37]

In fact, electrification and industrialization were more than once connected to the interests and needs of the military industry. An interesting case can also be seen in the project of a power plant at the Treska River, a tributary of the Vardar in Skopje, which originated from German plans made during the occupation in WWI. "During that time, while that region was occupied by the German army, the German military authorities made a plan for the use of the river Treska, one of the tributaries of the Vardar," explained Kürschner.[38] This pattern would repeat itself during WWII. Beyond the havoc and destruction caused by the invasion of the Axis forces and their attempt to suppress the Yugoslav resistance movements, the occupying forces attempted to make use of the economic potential of the occupied regions. As such, the Germans began the construction of the power plant at Mariborski otok in modern-day Slovenia in 1942, but did not manage to finish it by the end of the war.[39] On the other hand, Yugoslav electrification was hampered by wartime destruction as well as requisitions and sabotage carried out during the German retreat.

strujom", *Tehnički list* 9:6 (1927), 90-95, here 91. However, this was disputed by Stjepan Szavits-Nossan, who with regard to his visit of the 1926 World Power Conference in Basel criticized the unfavourable view of the authors towards the Krško power plant. He claimed that the new project had "nothing in common" with the pre-war plans and the opinions of the authors "conflict with the principles upon which all in Basel represented nations had unanimously agreed". See: Stjepan Szavits-Nossan, "Projekt hidroelektrične centrale kod Krškoga na Savi", *Tehnički list* 10:7 (1928), 101-106, here 101.

[36] Kürschner, "Općeniti pregled prirodnih snaga u Jugoslaviji", 291.

[37] Momčilo Petrović, "Elektrifikacija Jugoslavije s obzirom na nacrt zakona o elektrifikaciji ministarstva građevina", *Tehnički list* 16:22-23 (1934), 330-333, here 332.

[38] "Za vrijeme, dok je onaj kraj bio okupiran po njemačkoj vojsci, njemačke su vojne vlasti izradile plan za iskorištenje rijeke Treske jednog od pritoka Vardara." Kürschner, "Općeniti pregled prirodnih snaga u Jugoslaviji", 291.

[39] AJ-11-15. Izvještaj kapitalne izgradnje 1946. Izvještaj o stanju izredbe projekata za objekte savezne elektrifikacije. 15-118; respectively: Kapitalna izgradnja 1946. Hidroelektrične centrale. H.E. 1131 – Mariborski otok. 2. 15-18.

Results of Electrification in the First Yugoslavia

Overall, Yugoslav yearly per capita electricity consumption reached on average 71 kWh in 1939. However, those numbers were highly disproportionate between the different *banovinas*, with a clear advantage seen in the northwestern regions. In the case of Slovenia (Dravska Banovina) over 70% of the population did use electricity, compared to a meagre 12% in Zetska Banovina (Dubrovnik, eastern Herzegovina and Montenegro). On the territory of Montenegro, only 28, or 2.15%, of all settlements even had access to electricity, although these were the largest towns such as Cetinje, Kotor, Nikšić, or Podgorica.[40] The total output was about 1 million kWh – about 0.6% of the Fala power plant in Slovenia, which had an output of 170 million kWh.

Particularly positive when compared to the previous period was the development in Serbia, where all cities (*gradovi*) had been electrified by 1931, and most larger towns (*varošice*) by 1945.[41] Civrić even goes so far as to call the 1918-1931 period the "phase of intensive electrification" in the region.[42] However, in the words of Tijana Rupčić, electrification in the first Yugoslavia remained just as it was in the Austro-Hungarian Empire, "sporadic and without a unified plan"[43] – something which would change drastically only after the Second world war.

After World War II – The New Institutional Organization

With the victory of the Yugoslav partisan movement in WWII, significant changes were made to the very structure of the state and its institutions. The once centralist government in Belgrade was decentralized, and socialist republics, one for each nation,[44] replaced the previously existing banovinas. At the same time, the electrification of the whole country was given new weight. Whereas in the interwar period, matters of the electric industry had been part of the Ministry of Trade and Industry (*Ministarstvo trgovine i industrije*), or more specifically, its Department of Industry and Craftsmanship (*Odeljenje za industriju i zanatstvo*), now a new organization would be created. The country was meant to be industrialized rapidly following the Soviet model,[45] and electrification was a necessary tool for doing so.

Under the slogan "*Elektrifikacija + Industrijalizacija = Socijalizam*"[46] (electrification plus industrialization equals socialism), an adaptation of the

[40] See for Slovenia as Montenegro Živko Andrijašević et. al., *Istorija crnogorske elektroprivrede* (Nikšić: Eketroprivreda Crne Gore, 2020), 38, 46.
[41] Civrić, *Живот у Србији уочи електрификације*, 6.
[42] Ibid., *Од сумрака до свитања*, 24.
[43] Rupčić, *The Illumination of Yugoslavia*, 145.
[44] The sole exemption was Bosnia and Hercegovina, where Serbs, Croats and Muslims (the term Bosniaks wasn´t used at the time) were all equally constitutional nations.
[45] Marie Janine Calic, *Geschichte Jugoslawiens im 20. Jahrhundert* (München: C.H.Beck, 2010), 185.
[46] Civrić, *Од сумрака до свитања*, 43.

Soviet "collectivization plus electrification equals socialism", electrification became one of the priorities in the postwar reconstruction of the country. The new regime did not merely want to *reconstruct* Yugoslavia as it had been before the war – rather, it was going to *re-construct* it as a socialist state, and electrification was going to be an integral part of that re-construction.

In September of 1944, the *Povereništvo za trgovinu i industriju* took over the agenda of the former ministry, and the section for heavy industry (*odsek za tešku industriju*) became responsible for both electric energy and metallurgy. This did not last long – in February 1945 in a decision made by the Anti-fascist council of the peoples of Yugoslavia, (AVNOJ) a separate section for electrification (*odsek za elektrifikaciju*) was established. In March of the same year, the *povereništva* were renamed into ministries, and shortly afterwards, the section (*odsek*) was reorganized into a department (*odelenje*), with minister Andrija Hebrang (1889 -1949) stating that "This department will soon grow even further."[47] This became a reality in July 1947, when the whole department was again reorganized into the Ministry of Electricity Industry of the Government of the FPRY (*Ministarstvo elektroprivrede vlade FNRJ*). However, this ministry did not last long – in 1950 it was officially abolished, with most of its competences transferred to the individual republics.[48]

In a strange way, despite Yugoslavia as a whole being less centralized, the short period until 1950 meant more centralization of infrastructure planning. Municipalities or private investors had previously held much sway over the initiative to construct power plants, but now this initiative was taken over by the new institutions in Zagreb, notably the *Glavna uprava elektroprivrede* belonging to the *Ministarstvo industrije FNRJ.*

The most notable change, however, was that the state had become the leading actor in the realm of electrification. When in 1929 the Zagreb section of the Association of Yugoslav Engineers and Architects (*Udruženje Jugoslavenskih Inženjera i Arhitekta*) together with the Zagreb Chamber of Engineers (*Zagrebačka Inženjerska Komora*) held a poll on the planned law on electrification (*zakon o elektrifikaciji*), and its result said that, "The principle of etatization of electrification will not be implementable, because for now our country cannot take on the duty of raising large capital in the amount of several billions for the investments needed in order to implement the systematic electrification of the country."[49] This changed with the new regime. Following the nationalization of large industries and banks, the state could, in a dirigiste manner, dictate where resources had to be allocated to achieve its political goals. While this model was

[47] See, also regarding the citation, Saša Ilić, *Инвентар Архива Југославије. Фонд 11. Министарство електропривреде владе ФНРЈ* (Beograd: Arhiv Jugoslavije, 2003), 8f.

[48] Ibid., 15, 18f.

[49] "Princip etatizacije elektrifikacije neće biti provediv, jer zasada ne može naša država primiti na sebe dužnost, da namakne velike kapitale u iznosu od nekoliko milijardi za investicije potrebne u cilju sprovadanja sistematske elektrifikacije zemlje." See "Razne Vesti. Projekat zakona o elektrifikaciji", *Tehnički list* 11:24 (1929), 348-350, here 348.

certainly not efficient in the long term, in the short term the socialist takeover enabled the government to push through its priorities.

The 1946 Concept

In 1946, a first draft of a conceptual plan, the *Koncept za Idejni plan elektrifikacije F.N.R. Jugoslavije*, was created and presented by the planning section of the Ministry of Industry's main administration of electric economy, and by December of the same year, the final plan for the electrification of Yugoslavia was completed.[50]

The first draft foresaw the construction of 44 new power plants (23 hydroelectric and 21 caloric), 66 transformer stations, and 1375 km of 110kV power lines.[51] It probably comes as a surprise to no one that no large projects were planned in the yet contested territory of Istria. Nonetheless, the final plan was extremely ambitious. The number of power plants in Yugoslavia was set to more than double in just five years. As of 1946, the total number of power plants generating over 3 MW in Yugoslavia was 38.[52] While the hydroelectric plants were located at suitable rivers, such as the Vrbas (Jajce I & II) or the Neretva (Jablanica), most thermal plants were located close to coal mines, which had been mentioned already by Kürschner, as in the case of Kakanj and Zenica.

The same number of power plants (11) would be built in Croatia, with a heavier focus placed on the construction of seven caloric plants (Borovo, Brod, Varaždin, Zagorje, Zagreb, Raša, and Split), while four hydroelectric plants would be constructed (Vinodol, Jariga, Manojlovac, and Zavrelje). In Montenegro, a single hydroelectric plant (Glava Zete) was planned. Macedonia would see the construction of 5 plants: one caloric plant at Skoplje (Skopje), and 4 hydroelectric ones (Bregalnica, Došnica, Mavrovo, and Sapunčica). In both Slovenia and Serbia, 8 plants were envisioned. In the case of Slovenia, there would be five new hydroelectric plants constructed (Dravograd, Mariborski otok, Mavčice, Medvode, and Moste), and three caloric plants which would be located at Maribor, Trbovlje, and Velenje. In the largest republic, Serbia, the share of caloric and hydroelectric plants was inverted: out of 8 plants to be completed by 1951, 5 were caloric and 3 were hydroelectric. The caloric plants would be located

[50] AJ-11-13. Koncept za Idejni plan elektrifikacije F.N.R. Jugoslavije. 13-1.; AJ-11-13. Ministarstvo industrije. Glavna uprava elektroprivrede, plansko odelenje. Plan elektrifikacije F.N.R. Jugoslavije (in further text: Plan elektrifikacije). Zagreb 1946. 13-113.

[51] AJ-11-13. Koncept za idejni plan elektrifikacije FNR Jugoslavije, 10.

[52] "In Croatia, there were 12, in Bosnia and Hercegovina 3, in Macedonia one, in Slovenia 9 and in Serbia 13. The smallest republic of Montenegro did not even have a single larger power plant. Eleven power plants would be built in Bosnia and Herzegovina, among them five caloric (Kakanj, Lukavac, Mostar, Sarajevo, Zenica) and 6 hydroelectric plants (Bogatići, Jablanica, Jajce I, Jajce II, Peručac, Rama)." AJ-11-13. Pregled električnih postrojenja. Pregled elektrana iznad 3 MW u NR Hrvatskoj. 1946. 64.]; otherwise, see the corresponding report for each republic in AJ-11, Pregled električnih postrojenja.

in Beograd (Belgrade), Ćuprija, Kostolac, Vreoci, and Kosovska Mitrovica, whilst the hydroelectric plants would be located in Medjuvršje (sic), Ovčar Banja, and Vlasina Vrla.[53]

The "New" Old Plan

The authors of the conceptual plan did not hide the fact that most of the ideas it put forth were based upon designs from the interwar years. In the "Explanation for the Concept of the Conceptual Plan of the F.P.R. Yugoslavia" (*Obrazloženje koncepta za idejni plan elektrifikacije F.N.R. Jugoslavije*) from November 1946, they stated: "Since the time for the implementation of electrification is very short, we have had to rely primarily on such projects that are at least to some extent tested and known. However, there are also important new elements in our conceptual plan. The Rama-Neretva complex was solved in a completely different way from that which all the plans from 1932 until today had predicted. There are also completely new buildings, such as 'Mavrovsko Polje' and two levels of Bregalnica. Where, however, we did not even have conceptual solutions, we did not foresee anything in the first place, considering 'planning' of this kind not only frivolous, but also harmful work."[54] Nonetheless, the authors claimed a couple of novelties: "Otherwise, we assumed (and this is also a novelty of our plan) the complex utilization of all energy sources."

The *Obrazloženje* is an especially interesting source, as it provides explanations as to why certain decisions were made, and at times documents the creation of the conceptual plan even better than does the plan itself. "This principle in the use of water power has led to the demand for careful water management solutions, while for the location of each caloric power plant we have calculated with the possibility of the chemical-energetic use of coal, and in addition, in some larger cities, we have predicted one smaller thermal-electric power plant," claimed the authors.[55]An interesting guiding principle was also the reform of the construction process, which was meant to be simplified: "We have finally established the principle that each facility (this is especially true for medium and large hydropower plants) must be built at once. Construction in stages, which are further apart in time, would mean a new organization of the construction site every time, and more total hours of supervision and project work than will be spent if the buildings are built in one go from start to finish."[56]

For planning purposes, Yugoslavia was divided into four raions – West, Center, East, and South. The raions did not respect the borders of the new republics. Raion North included Slovenia and northern Croatia with Slavonia, Central

[53] See for mentioned republics AJ-11-13: Pregled električnih postrojenja.
[54] AJ-11-14. Obrazloženje koncepta za idejni plan elektrifikacije F.N.R. Jugoslavije (in further text: Obrazloženje). Beograd, 29.11.1946. 1. 14-2.
[55] Ibid.
[56] Ibid.

Bosnia and Herzegovina, Dalmatia, and Montenegro. Raion East included Serbia with Vojvodina, but without Kosovo, which together with Macedonia belonged to raion South.[57] Interestingly, raion North was the only one without exact borders – the border between Yugoslavia and Italy had yet been determined, as Yugoslavia claimed Istria and Trieste, which had become part of Italy at the end of WWI.[58] Therefore, the border between both countries was omitted completely on the maps drawn by the planners, although both Trieste and the power plants on the Isonzo (Soča) River were included on the map.[59]

Also, the Yugoslav planners had thought about integrating neighbouring Albania into the Yugoslav power grid (and possibly even the Yugoslav state). Even though Albania was not one of the Yugoslav republics, chapter IX. of the 1946 plan was labelled "Addendum: The Electrification of Albania" (*Dodatak: Elektrifikacija Albanije*) and plans on where to construct power plants and power lines were drafted.[60]

In the end, just in time to be included into the first five-year plan, the Plan of the Electrification of the F.P.R. of Yugoslavia was completed in December 1946.[61]

The New Purpose of Electrification

Had one of the main reasons to seek electrification in the interwar period been the wish to use electricity to enlighten the public space during dark hours, the communist regime would have had quite different ambitions. The 1946 conceptual plan clearly laid out the potential main industrial consumers of the electricity produced, and set the share of electricity to be used for the purposes of mining, the electro-chemical, and electro-metallurgic industry at 70%, compared to 30% allocated for private consumption and all other (light) industry.[62] Electricity was, first and foremost, a tool for the rapid industrialization of a country, which was seen as lagging behind not only the western powers, but also the (at this time still friendly) Soviet Union. Already included in the concept was a consumption plan that foresaw the largest consumers and the main transformer stations responsible for their supply.[63] In the case of Karlovac, for instance, consumption was

[57] AJ-11-13. Idejni plan elektrifikacije F.N.R. Jugoslavije. Tok energije u mreži najvišeg napona. Zima. List C. 13-102. [map].

[58] For the Yugoslav-Italian dispute after WWII see: Federico Tenca Montini, *Trst ne damo. Jugoslavija i Tršćansko pitanje 1945-1954* (Zagreb: Srednja Europa, 2021).

[59] AJ-11-13. Idejni plan elektrifikacije F.N.R. Jugoslavije. Tok energije u mreži najvišeg napona. Zima. List C. 13-102. [map].

[60] Ibid., Plan Elektrifikacije Jugoslavije, 60, 13-175.

[61] Ibid., Ministarstvo industrije. Glavna uprava elektroprivrede, plansko odelenje. Plan elektrifikacije F.N.R. Jugoslavije (in further text: Plan elektrifikacije), Zagreb 1946, 13-113.

[62] "Od proizvedene električne energije odbivši gubitke od $550x10^6$ kWh, predpostavlja se slijedeći raspored raspoložive energije: 70% za potrebe rudarstva, elektro-kemijske i elektro-metalurške industrije 30% za opće potrebe i ostalu industriju." AJ-11-13. Plan elektrifikacije, 3, 13-118.

[63] AJ-11-13. Koncept za Idejni plan elektrifikacije F.N.R. Jugoslavije. Tabele uz finansijski plan. Konzumni plan, 13-92.

estimated to be for "general electrification, textile, leather, and light metal industry." The transformer station Matulja would be responsible for Rijeka and Sušak, where it would power "general electrification, shipbuilding, and light industry."[64] Another example is the transformer station in Lukavac (Bosnia), which would supply the chemical industry in the town, the coal mines in Banovići, and the general electrification of Tuzla.[65]

All this was a significant difference from what was seen in the interwar years. In his December 1929 speech at Zagreb about the problems of electrification in Yugoslavia, engineer Božidar Ribić had argued that electrification should primarily serve four purposes: 1. The cities, 2. Industry and craftsmanship, 3. The villages, and 4. The railroads.[66] As Ribić estimated, Yugoslavia's yearly production in 1929 lay in the realm of 460,000,000 kWh, of which 125,000,000 kWh came from about 90 hydroelectric plants of various sizes.[67] As he stated, Yugoslavia was using only about 3.6% of its hydroelectric potential. About 20% of the electricity produced was used by the eleven larger cities with a population of above 25,000 inhabitants. With those numbers, Ribić estimated the average per-capita consumption at 38 kWh, compared to 20 kWh in "Russia" (the Soviet Union),[68] 24 kWh Romania, 96 kWh in "Czechia" (Czechoslovakia), 176 kWh in "England" (UK), 197 kWh in Italy, 260 kWh in "German Austria" (sic) and France, 365 kWh in Germany, 1040 kWh in Switzerland, and a stunning 1910 kWh in Norway.[69] Just like Kürschner, Ribić also hinted at the possible use of electricity in metallurgy and the production of iron and aluminium.[70]

By 1939, 37.3% of the population of Serbia had access to electricity, and household consumption had on average reached 11.7 kWh per month, or about 140.4 kWh per annum.[71] Civrić does not specify whether these numbers include only Serbia or all of Yugoslavia, but as the GDP per capita (and probably electricity consumption as well) of later Serbia was roughly equivalent to the Yugoslav average, they may be somewhat representative of the general state of the country.

But why did the focus shift from things like public lightning towards industry? Apart from ideological reasons (the importance of the proletariat in legitimizing the ruling socialist government) and the wish to "modernize" the country, which was at the time synonymous with industrializing it, one reason might have been that the initial goal had largely already been achieved, as all cities and most towns, at least in Serbia, had been electrified by 1931 or 1945, respectively. A second reason obviously lies in the new decision-making process. As the municipalities were now far less important than they were in the interwar period,

[64] Ibid., 13-93.
[65] Ibid., 13-94.
[66] Ribić, "Problemi elektrifikacije", 1.
[67] This number includes very small plants which are not included in later statistics, such as those used in the 1946 Electrification Concept.
[68] As it appears, Ribić had a propensity to call other states by their largest constituent part.
[69] Ribić, "Problemi elektrifikacije", 1.
[70] Ibid., 2.
[71] Civrić, *Од сумрака до свитања*, 6.

their wishes and priorities mattered to a smaller degree than had been the case before. Instead, the 1946 concept did not seek to focus on one particular city, but instead attempted to approach electrification as a process of nationwide importance.

Levelling Regional Differences

Since the foundation of Yugoslavia, the country was heterogeneous not only with regards to its ethnic and religious composition, but also in economic terms. This difference was particularly strong between the highly developed northwest, especially Slovenia, and the less developed south of the country, especially Macedonia, Montenegro, and Kosovo.

Despite all attempts to level the differences, progress was limited. Out of the 260 municipalities electrified on the territory of the later People's Republic of Serbia by 1931, "100 [were] in the territory of today's Serbia, 154 in Vojvodina, and 6 in Kosovo and Metohija," states Civrić.[72] The huge economic differences between the individual republics were hardly compatible with the idea of a united Yugoslavia. Furthermore, the less developed south was economically hindered by a lack of infrastructure, less dense rail, and inadequate telephone and telegraph connections, all of which posed a significant obstacle for economic growth in the southern regions and meant that significant potential remained untapped. Thus, the 1946 concept did call for a reduction in the differences between the republics, and all of the construction in the 1947-1952 period was financed through the federal budget.[73]

In 1946, Croatia was the largest producer of electricity in Yugoslavia, with over half of all large-scale electricity production originating in the republic (see chart below). In second place, the small but highly-developed Slovenia followed, which produced a quarter of all electricity in 1946. Compared to that, all of Serbia, Bosnia and Herzegovina (BiH), Montenegro, and Macedonia produced the same amount of electricity as was produced in the small republic in the northwest.

Especially low was the progress of electrification in the South. The southernmost Republic of Macedonia produced only 0.7% of all electricity, and in Montenegro not even a single larger power plant was located. In between lay Bosnia and Herzegovina (BiH) and Serbia. According to the 1946 concept, this was set to change quite rapidly. Even though electricity production in all republics was to grow significantly, the differences between the individual republics were substantial. Production in Croatia, already significantly ahead, would grow by a "meager" 44% in five years, whilst production in Macedonia would grow by almost 3000%, increasing from 0.7% to 5.7% of nationwide production. The largest increase in absolute numbers would be seen in Bosnia and Herzegovina,

[72] Ibid., *Живот у Србији уочи електрификације*, 78.
[73] Ibid., *Од сумрака до свитања*, 43.

whose output was meant to grow from 4.5% to 27.9% of all Yugoslav production and surpass even that of Croatia, which according to 1946 calculations would by 1951 come in third with 21.1% of all production, falling behind both BiH and Serbia (28.1%).

However, this must be seen not only in the context of a conscious attempt to level the economic playing field in Yugoslavia, but also as a decision driven by questions of practicability. Bosnia and Herzegovina with its many rivers was highly suitable for the construction of hydroelectric plants, a potential which had largely not been tapped in the interwar years. Also, production did not necessarily equal consumption. The electricity produced in BiH could be still used to satisfy the needs of Serbia and Dalmatia, to which its plants would be connected.

Table1: The [planned] growth of electricity production in Yugoslavia[74]

		1946		1951		Growth from 1946 until 1951 in %
		kWh x 10^6	%	kWh x 10^6	%	
1	Bosnia and Herzegovina	92	4.5	2,078	27.9	2,159
2	Montenegro	-	-	20	0.3	
3	Croatia	1,094	53.9	1,575	21.1	44
4	Macedonia	14	0.7	423	5.7	2,924
5	Slovenia	506	24.9	1,258	16.9	149
6	Serbia	326	16.0	2,099	28.1	544
7	F.N.R. Yugoslavia	2,032	100.0	7,453	100.0	267

As this chart shows, the planners calculated a nationwide increase in annual production amounting to 267%, compared to 1946 levels. For unknown reasons, the text of the final plan gives a somewhat lower number of 6 billion "usable" kWh per year, which was still 4.5 times higher than the pre-war level.[75] One explanation may be that this figure does not include expected losses, although these were estimated to be about 10% of the electricity produced, compared to a difference of 20% between both figures.

[74] AJ-11-14. Porast godišnjeg proizvodnog kapaciteta elektrana iznad 3 MW u pojedinim republikama. 14-8.

[75] Among other things it was stated: "Predloženi plan elektrifikacije je i uradjen kao maksimalno posmatrano mogući program iz naše današnje perspektive. Planom se predvidja proizvodnja električne energije na kraju petog godišta u visini od 6 milijardi kWh, što predstavlja povećanje proizvodnje električne energije 4,5 puta prema predratnoj." See: AJ-11-13. Plan elektrifikacije, 2, 13-117.

Table 2: Annual [planned] production capacity of power plants above 3MW at the end of 1951 distributed by regions (rayons)[76]

	Rayon	Production capacity	
		kWh x 10^6	%
I	West	2,092	28.1
II	Centre	2,839	38.1
III	East	1,954	26.3
IV	South	558	7.5
F.N.R. Jugoslavija		7,453	100.0

Nonetheless, even the 1946 final plan had to admit that Montenegro, Sandžak, and parts of Macedonia could not be connected to the federal power grid and that the further construction of local power plants was necessary.[77]

Mapping Progress

Plans for new power lines connecting the regions producing and consuming electricity were made as well, as those lay at times a significant distance apart, a hardship well known even today from the current German attempt to transition to renewable energy.

Maps were an important tool in the planning process. A map titled "Overview of Explored Coal Deposits and Placement of Thermal Power Plants"[78] compared the locations of known coal deposits and thermal power plants. Out of 12 caloric power plants, 11 were located near local coal or lignite deposits (e. g. Lukavac, Kakanj, Zenica, and Trbovlje), with the only exceptions being Rajhenburg, Slovenia,[79] where a great number of significant coal deposits sat in very close proximity, and Macedonia's largest city of Skopje. Somewhat different was the case of the 10 combined heat and power (CHP) plants (*toplinsko-električne centrale*), which were usually located at larger cities, where they could provide not only electricity, but also central heating for the inhabitants. Out of the ten CHP plants in Belgrade, Split, Osijek, Brod, Maribor, Varaždin, Sarajevo, Crvenka, Duga Resa, and Borovo, none was in the immediate vicinity of a larger coal deposit.

One interesting source is a chart labelled "Increase in Electricity Production per Inhabitant and Year for Yugoslavia and Some European Countries,"[80] which serves as a useful tool not only to see the ambitions of the new program, but also to compare them to the goals of interwar Yugoslavia and multiple other

[76] AJ-11-14. Godišnji proizvodni kapacitet elektrana iznad 3MW krajem 1951 godine rasporedjen po rajonima, 14-9.
[77] AJ-11-13. Plan elektrifikacije,12, 13-127.
[78] AJ-11-14. Pregled istraženih nalazišta ugljena i smeštaj termičkih elektrana. 14-534 [map].
[79] Renamed to Brestanica in 1952.
[80] AJ-11-15. Porast proizvodnje električne energije po stanovniku i godini za Jugoslaviju i neke evropske zemlje. 15-370 [map].

European countries. The plan called for an almost incredible expansion, expecting exponential growth. During the fastest growth in 1951–1952, the pace of expansion of electricity production per capita was meant to surpass that not only of the USSR in the 1920s and 30s, but also of Nazi Germany and Britain in the 1930s, and in not only relative, but also absolute terms. In 1948, Yugoslavia wanted to produce 100 kWh per capita, but by 1950, this number should have climbed to 160 kWh, and in 1952, 350 kWh per capita was the goal.

Water and Coal – Developments after 1950

The 1946 plan had found a clear answer to the old question of whether water or coal should be the primary technology to rely upon. 74% of Yugoslav electricity was to be provided by hydroelectric power plants after the completion of the plan, compared to 40% in 1946. However, as some coal plants would also provide heating, the total share of power provided by hydro would be somewhat lower, at 59%.[81]

But what would come of those plans? In short, much less than was anticipated. In 1950, 48.8% of large-scale electricity production, or 1,175 kWh, would come from hydroelectric power plants, compared to 51.2% (1,233 kWh) from thermal plants (neither these numbers nor the 1946 plan include minor production from diesel and oil generators). In 1951 this number would grow to 1,357 kWh, or 53.2%, for hydro, and 1,193kWh, or 46.8%, for thermal plants, respectively, with the absolute production of thermal plants dropping slightly before growing significantly again in the following years. The total electricity production in 1951 reached 2,550 million kWh,[82] less than half of the 6 billion kWh expected in 1946.

Civrić claims that one of the reasons for the delays was the resolution of the Cominform in 1948, which had halted all industrial aid to Yugoslavia from the side of the Soviet bloc and imposed an economic embargo on the country. One of the difficulties following this lay in constructing or importing the necessary machinery.[83] Another reason might have been that despite all efforts, socialism did not provide a solution to scarcity. The high costs in the interwar period were caused by real scarcity, which did not go away with the strike of a pen. While under socialism the state could dictate artificially low prices, this did not make scarce resources appear out of thin air.[84]

By 1952, 1,423 kWh (hydro) and 1,277 kWh (thermal) of electricity would be produced, and this production would only continue to grow. The 1955

[81] AJ-11-13. Plan elektrifikacije, 2, 13-117.

[82] Peter Feith, Lucia Feith, "Electrification in Yugoslavia – a progress report", *Energy Policy* 8:2 (1980), 165-169, here 167.

[83] Civrić, *Од сумрака до свитања*, 45.

[84] A report from 1947 complains, among others: "The work of capital construction in the first half of 1947 was hindered by: 1. An abnormally strong and long winter […]. 2. Lack of materials. […] 3. The relationship of construction sections to basin sections. […]." AJ-11-15. Ispunjenje obračuna plana za 1947 godinu. I polugod, 15-142.

production levels reached 2,610 kWh and 1,730 kWh, respectively, and in 1960, 5,984 kWh would be produced by hydroelectric plants alone, with a further 2,944 kWh to be provided by caloric plants. The original target for 1951 would be reached and surpassed in 1959 (8,106 million kWh).

Beyond the scope of this paper, the share of water power plants would continue to grow during the 1950s, reaching an all-time high in 1960 with 67% of all large-scale electricity production coming from hydroelectric plants, and only 33% coming from thermal (coal) plants. However, it must be noted that the 1960 data show output not only significantly below the production numbers seen in later years, but also those in 1958 and 1959. Most problems seem to have been fixed over the 1950s, and electricity production would grow by a record 23.9% in 1957, although the period after 1952 is in need of further study. In the years after 1960, the share of hydroelectric energy would hover around 57%, and drop under 50% in 1973 (46.8%), and then again in 1975 (47.2%) and 1976 (47.2%).[85]

Conclusion

The electrification of Yugoslavia shows some interesting cases of path dependencies, stemming both from prewar and interwar ideas and plans, which were realized over the following years. Despite two violent World Wars and many upheavals, including the creation of the nation itself, the first time as a parliamentary (but increasingly authoritarian) monarchy, the second as a socialist dictatorship, Yugoslavia did not completely break with the past.

Sometimes, this was for non-ideological reasons: the locations of rivers, coal deposits, or population centres. But quite often, and especially in the years after WWII, older plans had to be relied upon to deliver quick results. Whether, and if so to what degree, this changed after 1952 is a question worth further study. However, plans are not realities, and for a variety of reasons, the ambitious goals set forth in 1946 could not be realized in the expected timespan. Nonetheless, the 1950s would become a period of increasingly rapid industrialization, and the goals set for 1951 would be reached a few years later.

A clear continuity can be seen in the decision to prioritize water over coal plants, a choice whose reasoning can be traced back into the 1920s. Here we have to see not only internal processes and debates, but also the influence from abroad – be it that which originates from experts at conferences or that which was established through the military administrations of occupying powers, particularly Germany, in both World Wars. Nonetheless, when looking for continuities, one should not overlook the huge differences between the two Yugoslavias. The main distinction being the fundamentally different approach of the state to the economy in general and electrification in particular. This was especially true in the first years after 1945, before the Tito-Stalin split and the Yugoslav attempt to find its own road to socialism.

[85] Feith, "Electrification in Yugoslavia – a progress report", 167.

While there had existed no central plan for electrification before 1945 and despite the federal structure of socialist Yugoslavia, planning in the first years after WWII became much more centralized.

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