The Illumination of Yugoslavia: Electric Networks and Nation-building

(1918-1941)

By

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Abstract:

The new Yugoslav state emerged in December 1918, after the Great War, when Serbia and Montenegro proclaimed unity with the South Slavic provinces of the former Austro-Hungarian Empire. This new state was named Kingdom of Serbs, Croats, and Slovenians, and each of these groups was at a different stage of nation-building as well as technological, urban, and economic development. The idea of a Yugoslav nation had a long history before 1918 and throughout the end of the 19th and beginning of 20th century, had a central position in political, cultural, and intellectual life in lands of future Yugoslavia.

The integration of the country in national terms after 1918 was followed by advances in technology, especially in terms of electric power, which was perceived as one of the more modern technologies at the time. Both the territories which belonged to the previous Kingdom of Serbia and the Habsburg Monarchy had their paths of electrification. However, while parts of Croatia and Slovenia developed their electric networks in terms of the framework of the Empire, Serbia was developing their projects in electrification in some of the major cities like Belgrade, Užice, and Niš with the help of foreign, mostly German technology. However, with the process of the unification into a common South Slav state, there were some attempts at building a national electric grid, and also at modernizing electric capabilities. Belgrade was the most famous example with the thermoelectric power plant *Strength and Light*, which was to replace the outdated power plant built during the fin de siècle period. This, in turn, led to the expansion of coal mining and river transport. The first attempt of a unified electrical system came during

the 1930s with the building of a thermo-electric power plant *Vreoci*. Due to the massive coal deposits near Obrenovac, this site was chosen as the center for the new electric system, which would unite the whole country under the unified electric grid. This first attempt was limited due to the economic hardships and the eventual breakout of the Second World War. However, the project survived, and it became the biggest producer of electric energy in the post-war Yugoslavia.

These cases demonstrate that the state had the most significant say in the development of large-scale electrical grids, while the local electricity production was left to local governments and capitalists during the interwar period, while the territory of Serbia enjoyed more significant privileges and more investment opportunities, which goes to accord with the centralized form of government in the interwar period.

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List of Abbreviations

DC – I	Direct	Current
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- AC Alternating Current
- Hp-horse power

AEG - Allgemeine Elektrizitäts-Gesellschaft

BBC - Brown Boveri & Cie

- Hz-Hertz
- kV-kilovolt
- KWh kilowatt per hour
- MW megawatt
- GWh gigawatt per hour
- HVDC high voltage direct current

HV - high voltage

Č.K.D - Českomoravská Kolben-Daněk

ELIN - Aktiengesellschaft für elektrische Industrie

Introduction

The new Yugoslav state emerged in December 1918, after the Great War, when Serbia and Montenegro proclaimed unity with the South Slavic provinces of the former Austro-Hungarian Empire. This new state was named the Kingdom of Serbs, Croats, and Slovenes. Each of these groups was at a different stage of developing national identity and technological, urban, and economic development. The idea of a Yugoslav nation had a long history before 1918 and, at the end of the nineteenth and early twentieth century, had a central position in the political, cultural, and intellectual life of the lands of the future Yugoslavia.

The integration of the country in national terms after 1918 was followed by advances in technology, especially in terms of electric power, which was perceived as one of the more modern technologies at the time. Both the territories which belonged to the erstwhile Kingdom of Serbia and the Habsburg Monarchy each had their distinct paths of electrification. While parts of Croatia and Slovenia had developed their electric networks within the framework of the Austro-Hungarian Empire, Serbia was developing electrification projects in major cities like Belgrade, Užice, and Niš with foreign help, mostly German technology and firms. However, with the process of unification into a common South Slav state, there were novel attempts at building a national electric grid, and also at modernizing electric capacities. Belgrade was the most famous example with the thermoelectric power plant *Strength and Light*, which was to replace the outdated power plant built during the fin-de-siècle period. This, in turn, led to the expansion of coal mining and river transport. The first attempt at a unified electrical system came during the 1930s with the building of a thermo-electric power plant *Vreoci*. Due to the

massive coal deposits near Obrenovac, this site was chosen as the center for the new electric system, which would unite the whole country under the unified electric grid. This first attempt was limited due to the economic hardships and the eventual breakout of the Second World War. However, the project survived, and it became the biggest producer of electric energy in the post-war Yugoslavia.¹

The main research question is how nation-building and the electric system development are entangled in a complex case study such as Yugoslavia, a country with different technological backgrounds. The over-arching problem is the question of an integrated electric grid, i.e., why there were no attempts before the 1930s in its development. Finally, what was the role of domestic and foreign experts and capital in the development of the electric system in Yugoslavia?

I hypothesize that the state, through its fiscal and educational policy, dictated the pace of the electric grid development. By transferring or withholding funds, various state structures were able to expand, slow down, or completely stop some efforts in electrifying the country. For example: why was Montenegro excluded from the initial electric unification of the grid? State structures also implemented experts in the field when it was suitable for the state to conduct a national unification, even if the prerequisites were not met at the time.

¹ This facility is still the biggest producer of electricity in Serbia under the name TENT (Thermoelectric Power Plant Nikola Tesla).

Literature Overview

Regarding the literature on the history of electrification, there is a substantial number of studies in the field of history of technology considering network-building and electrification. In this chapter, I will give a short overview of the most important books and studies in this field as an example of concepts that will be useful in my case study.

The existing literature regarding Yugoslav national ideology and nation-building of the Yugoslav Kingdom is well-studied in the historiography of South Slavic languages and those outside Yugoslav space. The idea of nation-building in Yugoslavia is widely explored in historiography. It is part of more general histories and works concentrating on specific processes and phenomena in the history of the Yugoslavian Kingdom.² Most of the literature is focused on political or cultural discourses, and the spatial aspect of the Yugoslavian national question³ has become attractive for researchers just now.⁴ In more recent studies, Jovo Bakić

² For more detailed information to the history of a Yugoslavian idea: Mavro Orbini, *Kraljevstvo Slavena* (translated by Snježana Husić; The Kingdom of Slavs), Zagreb 1999; Jovan Skerlić, "Istočno ili južno narečje?" *Srpski književni glasnik* ["Eastern or Southern Dialect?" Serbian Literary Herald], no. X, 1913; Ferdo Šišić. *Dokumenti o postanku Kraljevine Srba, Hrvata i Slovenaca 1914–1919* [Documents on the Establishment of the Kingdom of Serbs, Croats and Slovenes 1914–1919], Zagreb 1920; Josip Šipuš. *Temelj žitne trgovine* [Foundations of the Wheat Trade, edited by Ivan Erceg / translated by Mijo Lončarić], Karlovac 1993; Dragovan Šepić. *Pisma i memorandumi Frana Supila 1914–1918*[Letters and Memoranda of Frano Supilo 1914–1918], Beograd 1967; Jovan Cvijić. *Balkansko poluostrvo i južnoslovenske zemlje* [The Balkan Peninsula and the South Slavic Countries], Beograd 1987.

³ See also: Ivan Božić, Sima Ćirković, Milorad Ekemečić, Vladimir Dedijer, *Historija Jugoslavije* [History of Yugoslavia], Beograd 1972; Marie-Janine Ćalić. *Geschichte Jugoslawiens im 20. Jahrhundert* [History of Yugoslavia in the 20th Century], München 2010; Vasa Čubrilović. *Istorija političke misli u Srbiji XIX veka* [The History of Political Thought in 19th Century Serbia]. Beograd, 1958; Dimitrije Đorđević. *Ogledi iz novije balkanske istorije* [Essays in Recent Balkan History]. Beograd, 1989; Mirjana Gross. *Vladavina Hrvatsko-srpske koalicije 1906–1907* [The Government of the Croatian-Serbian Coalition 1906–1907]. (Beograd 1960.); Egidio Ivetic. *Jugoslavia sognata. Lo jugoslavismo delle origini* [Yugoslavia Dreamed. The Origins of Yugoslavism]. Milano, 2012; John Lampe. *Yugoslavia as history. Twice there was a country*. (Cambridge University Press, 1996.); Viktor Novak. *Antologija jugoslovenske misli i narodnog jedinstva 1390–1930*[Anthology of Yugoslav Thought and National

presented the argument that Yugoslavism can be analyzed as a form of pan-nationalism, as a form of a competition between ethnic nations of South Slavic lands.⁵ Furthermore, Dejan Đokić offered a new approach considering the study of interwar Yugoslavia, arguing that the Yugoslav nation cannot be studied through Serbian and Croatian national ideologies. In his view, it is oversimplifying to concentrate exclusively on this dichotomy between the Serbs and Croats.⁶

Andrew Wachtel offers an interesting viewpoint on why the idea of the Yugoslav nation failed in his book *Making a Nation, Breaking a Nation*. In his book, Watchel focuses mainly on cultural processes and connections with developing the idea of the Yugoslav nation. The book still offers some interesting views on the question of Yugoslavism.

Studies by Nielsen and Dobrojević offer exciting new perspectives on how the Yugoslav project started and became centralized. Christian Nielsen, in his book *One State, One Nation, One King: The Dictatorship of King Aleksandar and His Yugoslav Project, 1929-1935,* gives insight on how Yugoslavian project differed in time before 1929 and after.⁷ Ivana

Unity 1390– 1930]. (Beograd 1930.); Janko Pleterski. *Nacije Jugoslavija revolucija* [Nations, Yugoslavia, Revolutions]. (Beograd 1985.).

⁴ Vedran Duančić wrote notable studies focused on the spatial aspect of the Yugoslav nation-building (Learning about Politics through Science: Popular Science in Early Socialist Yugoslavia, 1945–1950. *Historyka: Studia Metodologiczne* 49 (2019); Nationalist Geographies in Interwar Yugoslavia: Manoeuvring Between National and Transnational Spaces, *European Review of History: Revue européenne d 'histoire*, 2018)

⁵ Jovo Bakić. *Ideologije jugoslovenstva između srpskog i hrvatskog nacionalizma* [Ideology of Yugoslavism in between the Serbian and Croatian nationalism]. Zrenjanin: Žarko Zrenjanin, 2004, 49-50.

⁶ Dejan Đokić. (*Dis*)Integrating Yugoslavia: King Alexander and Interwar Yugoslavism.|| Yugoslavism: Histories of a Failed Idea, 1918-1992. Ed. Dejan Djokić. London: Hurst & Co, 2003. 136-56.

⁷ Christian Nielsen. One State, One Nation, One King: The Dictatorship of King Alexander and His Yugoslav Project, 1929-1935. Ph. Diss., (Columbia University, 2002.)

Dobrivojević presents arguments on how repression on political life affected the idea and development of Yugoslavism.⁸

There is a gap in the literature since no one has explored the role of experts (engineers and architects) and their relation to state politics in different spatial terms. This study aims to be one of the few that will analyze Yugoslavia in this aspect. Existing studies related to either electrification or nation-building are focused on the successor states of former Yugoslavia. Therefore my research will contribute to the broader understanding of discourses of nationbuilding from within and to the dissemination and employment of knowledge in the case of electrical networks. Thus, the aim is to substantiate the pre-existing knowledge by employing methods and new documents that are not in use to this day.

As a groundbreaking work in this field, one should mention Thomas Hughes' book *Networks of Power*, which inspired an entire generation of historians.⁹ Hughes gave a new definition of electrical networks describing them as both technical and social systems constructed by system builders who could be both individuals and institutions. In his opus, Hughes defined the new field of study of so-called Large Technical Systems (LTS). Moreover, Hughes argues that these large electrical systems were one of the central factors in the building of modern nations of the twentieth century. This idea is well-argued throughout three stages: the invention of systems, their spread, and the emergence of enlarged systems and reactions to these systems. An essential part of his methodology is the introduction of "system-builders" embodied in either people (entrepreneurs, engineers, architects) or institutions. These system-builders were, in Hughes's opinion, the cornerstone of the modern nations. Furthermore,

⁸ Ivana Dobrivojević. *Državna represija u doba diktature Kralja Aleksandra, 1929-1935*. [State repression during the dictatorship of King Alexander, 1929-1935]. (Belgrade: Institut za savremenu istoriju, 2006.)

⁹ Thomas P. Hughes. *Networks of Power: Electrification in Western Society, 1880-1930*. (John Hopkins University Press, 1983.)

Hughes argues that two concepts that he developed – load factor and economic mix – are crucial in network building.¹⁰

At the same time, there were critiques that these two concepts are a universal approach in the field of history of electrification. Van der Vleuten argued in his study of the history of Denmark's electrification that both centralized and de-centralized systems existed at the same time.¹¹ Coopersmith pointed out that Hughes concentrated on Western states that were already industrialized and, compared to the rest of the world, were an exception, not the rule. Also, Coopersmith criticized Hughes overstressing inventions and neglecting the technology and network transfer.¹²

One must mention the remarkable work of David Nye *Electrifying America* when speaking of the works that continued Hughes's networks and systems approach. In his study, Nye developed a systems approach by introducing the cultural aspect of the electrification process.¹³ Another notable contribution to the field of history of electrification is the work of Jonathan Coopersmith *Electrification of Russia*, where he argued that the state uses technological development as a means of achieving specific political goals. Coopersmith's study provides an excellent starting point for my study, given that it explores the development of the electrical network in Europe's eastern parts.¹⁴

Some studies provide fresh approaches in studies of histories of electrical networks and national identities. In her *Radiance of France*, Gabriele Hecht devised an approach of

¹⁰ Wiebe E. Bijker, Thomas Parke Hughes, and T.J. Pinch, eds., "The Evolution of Large Technical Systems," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*. (Cambridge: MIT Press, 1987), 51-52.

¹¹ Van der Vleuten, Electrifying Denmark: A Symmetrical History of Central and Decentral Electricity Supply until 1970. (University of Aarhus, 1998.)

¹² Jonathan Coopersmith. *The Electrification of Russia, 1880-1926*. (Cornell University Press, 1992), 3.

¹³ David E. Nye. *Electrifying America : Social Meanings of a New Technology, 1880-1940*. (MIT Press.)

¹⁴ Jonathan Coopersmith. *The Electrification of Russia, 1880-1926*. (Cornell University Press, 1992.)

connection between nuclear power and national identity in France after the Second World War.¹⁵ In Hecht's view, technological structures were tools that served specific aims in designing the political goals of the nation. She describes nuclear reactors in France as "modern heirs of the Eiffel Tower and the Arch de Triumphe".¹⁶ With such a comparison, Hecht is making a direct connection between technological development and past accomplishments.

Vincent Lagendijk, in his book *Electrifying Europe*, focuses on transnational networks and the building of an electrical grid in Europe. However, this study provides a significant number of approaches by investigating how engineers, business people, and politicians use the idea of a united Europe to build a European electric grids system.¹⁷

Reasonable grounds on how the research of such phenomena is conducted could be found in a wide range of such literature on case studies in western parts of Europe, such as the works of Millward¹⁸ or Kaijser.¹⁹ In his study of networking technology, Van der Vleuten argued that the development of the network system tied the Netherlands together and enabled its "utilization, industrialization and cultivation".²⁰ This approach of technological development is tied to the national identity that is not new. In his famous work *Peasants into Frenchmen: The Modernization of Rural France*, Eugene Weber argued that spreading the railroad network was crucial in modernizing the rural areas of France and making inhabitants of

¹⁵ Gabriele Hecht. *The Radiance of France: Nuclear Power and National Identity After World War II*. (Cambridge: MIT Press, 1998.)

¹⁶ Hecht, *The Radiance of France*, 256-257.

¹⁷ Vincent Lagendijk. *Electrifying Europe : The Power of Europe in the Construction of Electricity Networks*. (Technology and European History Series: 2. Aksant. 2008.)

¹⁸ Robert Millward. *Private and Public Enterprise in Europe: Energy, Telecommunications and Transport, 1830-1990.* (Cambridge: Cambridge University Press, 2005.)

¹⁹ Arne Kaijser. "Trans-Border Integration of Electricity and Gas in the Nordic Countries, 1915-1992." *Polhem* 15 (1997): 4-43.

²⁰ Erik Van der Vleuten, "Introduction: Networking Technology, Networking Society, Networking Nature," *History and Technology* 20, no. 5 (2004): 195.

these parts of country French.²¹ In the case of Yugoslavia, the aspect of connecting rural areas and bringing electricity in parts where there was no such thing, electricity became an essential aspect of the nation-building process. The works mentioned are great examples of how electric network infrastructure affected nation-building, and are useful for investigating the unfolding of the process in Yugoslavia.

In the United States and large parts of Western Europe, works on histories of electrification from both national and broader perspectives are available. However, such works are very scarce regarding Central and Eastern Europe. In the historiography of Yugoslav successor states, there are several works regarding electric systems.²²

These works provide a good starting point for my research in an attempt to explain how building and integrating national networks affected the building of the Yugoslav state's national identity. In doing so, I will combine the literature from the fields of science, technology, and nation-building. With this approach, I will have an opportunity to show how technology and nation-building are mutually connected. Science and technology provide new approaches and inventions, and by enlarging the scientific knowledge, society is further developed.

²¹ Eugen Joseph Weber. *Peasants into Frenchmen: The Modernization of Rural France, 1870-1914*. (Stanford University Press, 1976.)

²² Boris Markovčić. *Razvoj elektrifikacije Hrvatske: Od početka elektrifikacije do 1945. g.* (Zagreb, 1984); Živko M. Andrijašević. *100 godina crnogorske elektroprivrede*. (Nikšić, 2010); Predrag Marković. *Korak ispred vremena*. (Beograd, 2012.)

Theoretical Framework

To investigate the processes and relations between the spread and integration of the electric network and nation-building in the Kingdom of Yugoslavia, this study will use the concept of system-builders developed by Hughes and further expanded by Van der Vleuten (and in some respects by Lagendijk).

The emergence of Yugoslavism was a unique attempt by South Slavic nations to create an entity beyond the regional areas and secure a future for their own needs. Regardless of their stage of development, they were already established as modern nations to a certain degree. They had one thing in common - all of the South Slavic states were at the periphery of the modernization process of the "long nineteenth century". In the terminology of Reinhart Koselleck²³ in newly established Kingdom of Yugoslavia, there are two different processes to focus on, *Erfahrungsraum* (experience), or in other words previous experiences of a new state that joined the new nation, and *Erwartungshorizont* (horizon of expectation), the question of expectations of the states that were joining the new nation. The process of modernization and integration of nation-states is even more complicated in the case of Yugoslavia because of the experiences and heritage of the Habsburg Monarchy and the Ottoman Empire that shaped South Slavic nations before Yugoslavia. Similarly, the states' expectations of joining the newly established Kingdom of Serbs, Croats, and Slovenes were significantly different. Diversity of expectations was especially evident in the question of whether the new state would be of a federal or centralist character.

²³ Reinhart Koselleck. *The Practice of Conceptual History: Timing History, Spacing Concepts*. (Stanford University Press, 2002.)

In the aspect of nation-building phenomena, this study will use some parts of the methodology recently developed by Wimmer in the so-called "relations perspective," which he combined with elements of exchange theory with an emphasis on the theory of nation-building throughout delivering of public goods. In his work, *Nation Building* Wimmer is revisiting the question of nation-building and offers some new approaches to this issue.²⁴

Nation-building as a concept came to the spotlight in the 1960s with the emergence of newly independent countries which drew the attention of many scholars.²⁵ From that time to the present day, there are a significant number of models and approaches to nation-building. The initial intention in the study of the nation-building concept was to establish a difference between the "real states" and "aspirant" ones. This notion of comparison is present in works of Deutsch and Foltz²⁶, pioneers in defining nation-building.

There is no consensus regarding the definition of "nation-building". Notwithstanding, the majority of scholars agree that nation-building encompasses national identity. In other aspects, scholars diverge in their opinions. Stein Rokkan²⁷ argued that democracy and the welfare state are the essential tools when it comes to nation-building. Reinhard Bendix²⁸ presented nation-building as a process of the peculiar relationship between the state and its citizens thought the political admittance.

²⁴ Andreas Wimmer. *Nation-building: why some countries come together while others fall apart*. (Princeton: Princeton University Press, 2018.)

²⁵ Mainly postcolonial countries of Africa.

²⁶ Karl W. Deutsch and William J. Foltz, ed. *Nation-Building*. (Atherton Press, New York 1963.)

²⁷ Luis Moreno. Flora, Peter (Con Kunhle, Stein and Urwin, Derek) (Eds.). State Formation, Nation-Building, and Mass Politics in Europe. The Theory of Stein Rokkan. Oxford, Oxford University Press, 1999." *Revista Internacional de Sociología*, no. 27 (2018): 202.

²⁸ Reinhard Bendix. *Nation-Building and Citizenship : Studies of Our Changing Social Order*. (University of California Press, 1964), 18-19.

Many scholars, such as Karl Deutsch and Clifford Geertz²⁹ presented studies on why the nation-building process is something to be studied by arguing that all aspects of the independent nation-state (such as flag, anthem, or army) did not guarantee that the citizens of such countries would identify themselves with the nation. Moreover, Deutsch and Geertz made a clear distinction between nation-building and political authority. These scholars pointed out that insufficient economic development and poverty were essential factors that slowed the integration of the new nation-states. Deutsch argued that "a nation can be built according to different plans, from various materials, rapidly or gradually, by different sequences of steps".³⁰ Wimmer³¹ revised these approaches and made new fresh concepts regarding the economic development, troubling past and the notion that nation-building means "progress" in continuum with Cohen's notion "from tribe to nation".³² Wimmer incorporates Foucault's notion of power relations in the state-building process between the state and its citizens. Furthermore, Wimmer focuses his argument "that long-term, slower-moving processes of political development are crucial for explaining ethnopolitical inclusion and nation identification".³³

In his, work Wimmer distinguishes three main factors of nation-building: voluntary organizations, language homogeneity, and public goods provision.³⁴ Even though voluntary organizations and language homogeneity and integration are essential aspects of nationbuilding, especially in the case of Yugoslavia, this study will focus mostly on the aspect of public goods provision. A significant number of studies are dedicated to organization and

²⁹ "The integrative revolution: Primordial sediments and civil politics in the new states" in Clifford Geertz, (Ed.), Old Societies and New States: The Quest for Modernity in Asia and Africa, (New York: Free Press): 105-157. ³⁰ Deutsch and Foltz. *Nation-Building*. 3.

³¹ Wimmer, *Nation Building*, 23-45.

³² Ronald Cohen and John Middleton. *From Tribe to Nation in Africa: Studies in Incorporation Processes*. (Scranton: Chandler, 1970.)

³³ Wimmer, *Nation Building*, 23-37.

³⁴ Ibid. 23-45.

language aspects in the Yugoslavian case, but public goods provision is unjustly overlooked in Yugoslav historiography. In my study, I am thus delving into what Thomas Misa and Johan Schot have aptly named "hidden integration," the neglected part of the role of infrastructure and technology in the integration processes.³⁵ The vast literature dedicated to the nation-building of the Yugoslav case sorely lacks studies incorporating these processes.

³⁵ Thomas J. Misa and Johan Schot, "Inventing Europe: Technology and the hidden integration of Europe. Introduction," *History and technology* 21, no. 1 (2005): 1-22; Johan Schot and Vincent Lagendijk, "Technocratic Internationalism in the Interwar Years: Building Europe on Motorways and Electricity Networks," *Journal of Modern European History* 7, no. 2 (2008): 196-217.

Technology, National Ideology, and Economic Policy

From the aspect of technology development, the end of the nineteenth century was marked by the beginning of electrification on a global scale. The steam engine's application in the eighteen century marked the beginning of the first industrial revolution, and introducing electricity into public use began the second industrial revolution. Innovations are always connected with societal needs and inevitably lead toward the further development of society. For any innovation to be widely used, it must be socially purposeful, meaning that it will fulfill specific public interest or perhaps initiate one. The electrification process demanded not only the support of the political and government structures but educated scientists and engineers and immense amounts of capital and industrial potential.

Electrification is immensely dependent upon technological knowledge. Toward the end of the nineteenth-century emerging field of engineering was inextricably linked with the building of the electric power grids. In studies of the history of science and technology, many authors suggest that engineers can offer an excellent source for explaining certain national ideologies.³⁶ As was already mentioned, Gabrielle Hecht illustrated this point of view in her *Radiance of France* connecting the engineers and government into the so-called "technopolitical regime".³⁷ Historian of technology, Mikael Hard, pointed out the connection of engineering discourse and sense of national identity by studying how German engineers aimed to improve their position in German culture and society. In this case, engineers

³⁶ Judith Schueler. *Materializing Identity. The Co-construction of the Gotthard Railway and Swiss National Identity.* (Amsterdam University Press, 2008): 36.

³⁷ Hecht. *The Radiance of France*. 5-8.

employed an already existing image of the German intellectual elite into the modernization of the national culture and identity.³⁸ In the study of nation-building practices and national identity, Günter Dinhobl used an example of Semmering Tunnel constriction.³⁹ In the case of Yugoslavia, engineers played a significant role in the process of electrification. Unlike mentioned examples where cooperation between engineer associations and state officials was successful, this was not the case in Yugoslavia. Despite numerous associations and institutions of engineers, architects, and electrical companies, the ruling government has wholly neglected their efforts in the advancement of electrification.⁴⁰ The following chapters will demonstrate how engineers and architects tried to influence the government to pay more attention to the building's interconnected electric grid but failed in their attempts. The reasons for this are numerous. However, the government's shortcomings to give more space to the expertize in questions of the electrification and political stubbornness to keep new state centralized as much as possible are the two main reasons why the Kingdom of Yugoslavia failed to build an integrated electrical network. In the coming chapters, these shortcomings will be carefully analyzed.

For building electrical power gird technology is essential, notably for the range of the transmissions of the electrical power. In the early stages of the electrification range of the direct current (DC) was only a few kilometers. With the introduction of the alternate current (AC)

³⁸ Mikael Hard. "German Regulation: The Integration of Modern Technology into National Culture" in Mikael Hard and Andrew Jamison (eds.), *The intellectual appropriation of technology: discourses on modernity, 1900-1939.* (Cambridge, Mass.: MIT Press, 1998.)

³⁹ Günter Dinhobl and Ralf Roth. *Across the Borders: Financing the World's Railways in the Nineteenth and Twentieth Centuries*. (Aldershot, UK: Ashgate, 2008).

⁴⁰ Maxmilián Čížek (Ed.). Elektrotechnika v Československu, Jugoslávii a v Rumunsku. In XX. Sjezd ESČ. Congrès électrotechnique. Elektrotechnický svaz československý. Praha, 1938, 38.

range, distances became longer, but the transmission still depended on voltage.⁴¹ In the early days of electrification for people to have electricity in their homes, they needed to be located in or near the cities that were already electrified. Nikola Tesla considered that this was one of the main reasons why electrification did not spread as much as he wanted and that the main obstacle to progress was distance, not the state border. In the article "The Wonder World to be Created by Electricity" published in 1915, Tesla idealistically wrote that with the full development of water as an energy source and with an advanced system of wireless transmission of energy to any distance, people could solve "with its full development and a perfect system of wireless transmission of the energy to any distance man will be able to solve all the problems of material existence. Distance, which is the chief impediment to human progress, will be annihilated in thought, word, and action."⁴²

⁴¹ Maury Klein. *The Power Makers. Steam, Electricity, and the Men Who Invented Modern America*. (New York: Bloomsbury Press, 2010): 257.

⁴² Nikola Tesla, "The Wonder World to be Created by Electricity." *Manufacturer's Record*, September 9, 1915.

Economic aspects of electrification

The first stages of electrification are usually pushed by personal initiative and entrepreneurship and confined to the local supply systems. Until the end of the First World War, neither of the electrical systems, both in former parts of the Austro-Hungary or Kingdom of Serbia and Montenegro, were interconnected. The DC generator much more supported electrification efforts. Examples of usage of AC generators (single-phase, two-phase or threephase) are rare. The capacity of first power plants ranged from 10 to 100 kW (kilowatt) and kVa (kilo-Volt amps). These power plants were mostly thermal and equipped with steam piston engines, and to a smaller extent, with diesel and gas engines. Hydroelectric power plants were still in small numbers in that period. In all Yugoslav lands, in 1918, there were 241 power plants, and according to one data, in 1920, 460 million hp of electricity were produced.⁴³ Electricity was used by 10-15 % of the population. Throughout the first decade of the new state's life, nothing was done by the state administration on the subject of planned electrification, except along the railways.⁴⁴ However, compared to Austria, which had 358 power plants in 1914 (this number reduced after First World War), the situation in the newly formed Kingdom of Serbs, Croats, and Slovenes is not that bleak as it first seemed. However,

⁴³ *Statistički godišnjak Kraljevine Srba, Hrvata i Slovenaca* [Yearly Statistic of the Kingdom of Serbs, Croats and Slovenes] Beograd, 1920.

⁴⁴ Smiljana Đurović. "Razvitak železničkog saobraćaja i njegov uticaj na socijalne strukture u Jugoslaviji između dva svetska rata" [Expansion of the railways and its influence on the social structures in interwar Yugoslavia]. *Acta istorico-economica Yugoslavia*, Vol. II, Zagreb (1987): 86.

by 1928 this situation will change when Austria will have 627 power plants in a territory significantly smaller than the Kingdom of Yugoslavia.⁴⁵

Public electrification followed the usage of electricity in the private sector. In the territories of the Yugoslav Kingdom, public electrification appeared in the mid-nineteenth century. Public interest in electrification was increasing and even encouraged by demonstrations of public lighting. Alongside lighting, public use of energy included tramways as well.⁴⁶ In the beginning, the same source was used both for industrial needs and public lighting. However, towards the end of the century, there was an appearance of the power plants that were set up exclusively for the generation and sale of electricity for the public electric supply.

After the First World War, two large-scale improvements took place.⁴⁷ In the first place, AC prevailed, and there was increasing usage of high voltage transmission lines. This change enabled the transfer of electricity at longer distances without losses. Secondly, there were outsets of "supercentrales" that could distribute electrical power beyond the local levels.⁴⁸

⁴⁵ Roman Sandgruber, "The Electrical Century: The Beginnings of Electricity Supply in Austria", in: Mikulas Teich and Roy Porter (Ed.). *Fin de Siècle and its Legacy*. (Cambridge University Press, 1991): 47-48.

⁴⁶ Wolfgang Schivelbusch. *Disenchanted Night: The Industrialization of Light in the Nineteenth Century*. (Berkeley: University of California Press, 1995.)

⁴⁷ Lagendijk. *Electrifying Europe*. 40.

⁴⁸ Peter Lundgreen. "Engineering Education in Europe and the USA, 1750-1930: The Rise to Dominance of School Culture and the Engineering Professions," *Annals of Science* 47, no. 1 (1990), 58.

Legal and Infrastructural Issues

In most European countries in the period before and after the First World War supported this development, engaging legislative measures. This mainly targeted the increasing hydroelectricity by laws that protected watercourses, making them "national".⁴⁹ This was also the case with the Kingdom of Yugoslavia, where new legislation included watercourses.⁵⁰

As the use of electricity became more frequent, so did the involvement of the state grow.⁵¹ Foreign influence was strongly present in these small electric ventures, not only in Yugoslavia but also in Europe. Alfred Chandler named General Electric, Westinghouse, Allgemeine Elektrizitäts Gesellschaft (AEG), and Siemens- "the Big Four," as they were most influential in the field of the electric utilities.⁵² Unlike Russia, which shifted to cooperating with Edison Enterprises after the First World War, Yugoslavia continued to be influenced by the Siemens enterprise even after the War.⁵³

It should be mentioned as well that in the beginning, there was a deep distrust towards electricity. It was perceived as dangerous, and society often engaged in resistance towards the

⁴⁹ Lagendijk. *Electrifying Europe*. 44.

⁵⁰ "Regulation on the establishment of Water cooperatives on the territory of the Kingdom of Serbs, Croats, and Slovenes." *Službene novine Kraljevine Srba, Hrvata i Slovenaca* [Official Gazette of the Kingdom of Serbs, Croats and Slovenes], (1921) III, 53, 9.03.1921. See also: "Concession of water exploitation of the river Rama." *Službene novine Kraljevine Srba, Hrvata i Slovenaca* [Official Gazette of the Kingdom of Serbs, Croats and Slovenes], (1920), II, 270, 3.12.1920.

⁵¹ Millward. *Private and Public Enterprise in Europe*. 77.

⁵² Alfred D. Chandler. *The Visible Hand: The Managerial Revolution in American Business*. (Cambridge: Belknap Press, 1977): 463-473; 538-549.

⁵³ Wilfried Feldenkirchen. "Siemens in Eastern Europe: From the End of World War I to the End of World War II" in Christopher Kobrak and Per H. Hausen, (eds.), *European Business Dictatorship and Political Risk, 1920-1945*. New York: Bergahn Books (2004), 122-145.

new habits.⁵⁴ In the newspaper article from 1900 named "I sinu videlo iz rijeke" [A light from the river], there is a glimpse of awe of people first encountering electricity everyone was talking about. In the city of Valjevo, on the Gradac River, in Serbia, a newspaper reporter wrote the following words:

"Valjevo represents magic in the night ... From that day (April 20, 1900), Valjevo practically floats in a sea of light. Especially magical is Beogradska Street. It has a vast number of lamps in the length of one kilometer, and all of those lamps are in one line. In the evening, when it is lit up, one can see only one fire line that looks much more beautiful when the line is crossed or the other light lines from other streets. It is an unusually delightful view from the Brđani area where many people climb to enjoy the beautiful scene⁵⁵ ...³⁵⁶

In more developed countries, electrification usually replaced investments into the building of the railroads.⁵⁷ This was not the case in Yugoslavia. Southern parts of the country were still deeply undeveloped in every infrastructural sense. Unlike Western countries, territories of the Yugoslav Kingdom were either on the outskirts of the Empires (Austro-Hungary and the Ottoman Empire) or as independent states were underdeveloped. The Kingdom of Serbia, Kingdom of Montenegro, and parts of Bosnia and Herzegovina and Macedonia were not urbanized and had minimal or no industry. The industry that existed in Yugoslavia relied largely on foreign capital, which dominated domestic production. One of the characteristics of the industrial development of the Kingdom of Yugoslavia was the uneven use of technology. At the time Yugoslavia was created, the northwestern parts were in the phase of

⁵⁴ Zorica Civrić. *From Dusk till Dawn*. (Belgrade: Museum of Science and Technology, 2013): 10-11.

⁵⁵ All translations are my own unless stated otherwise.

⁵⁶ *Trgovinski glasnik* [Traders Gazette], 96, 5. 05. 1900.

⁵⁷ Schueler. *Materializing Identity*. 38.

electrification of industry, but most of it was still going through the agrarian phase of industrial production.⁵⁸

Generally, turn towards the electrification represented an effort of the new government to distinguish itself from the old regimes and achieve political and economic goals by investing in new technology.⁵⁹ The electric power industry is a critical sector of every national economy, both based on its structural share in macroeconomic aggregates (social product, fixed assets, investments, foreign trade), and based on multiple direct and indirect effects on other economic sectors and overall socio-economic development.⁶⁰ This study focuses on the technological construction to shed light on a more profound understanding of how our technology and development of society are intertwined. In modern historiographies, technology is perceived as something that is not given but acquired in various efforts. This process is often referred to as a "seamless web," meaning that it is in every part of the development of modern societies.⁶¹ Coopersmith argues that differentiation between technology, economy, and society is creating "false dichotomies".⁶²

Infrastructural projects of any kind are challenging tasks, and policymakers often view them as a fundamental instrument for defining the modern nation-state. A significant number of the historiographical studies already demonstrated that building of the nation-state is reflected

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⁵⁸ Smiljana Đurović. *Sa Teslom u novi vek. Nova sinteza istorije. Izabrani članci iz ekonomske istorije Srbije i Jugoslavije 1918-1941* [With Tesla into the new century. Selected studies from the economic history of Serbia and Yugoslavia]. (Beograd, 1997): 119; 139.

⁵⁹ Coopersmith. *The Electrification of Russia*. 1.

⁶⁰ Branko Gluščević. "Infrastruktura" [Infrastructure] in *Ekonomski leksikon* [Lexicon of Economy]. (Beograd: Savremena administracija, 1975): 96.

⁶¹ Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch, (eds.), *The Social Construction of Technological Systems*. (Cambridge: MIT Press, 1987): 10.

⁶² Coopersmith. *The Electrification of Russia*. 2.

in constructing the infrastructural networks reinforced national identities.⁶³ Many authors, such as Thomas Zeller, argued that infrastructural plans are a "mixture of professional thinking, technological utopianism, and political assessment,"⁶⁴ and, as such, made a significant impact on policymakers. This work aims to go outside the limits of traditional histories of technology and nation-building.

Most histories of technology remain in the domain of artifacts. There is a small number of studies that connect on how technology and large systems impacted nation-building. Studies on the history of electrification already made a notable break in this direction. The definition of electricity networks presented by Thomas Hughes remains relevant still. In building electrical networks, system builders sought to concentrate on "load factor" and "economic mix".⁶⁵ This proved as essential as the problem of storing electricity demanded to generate capacity at the maximum levels at all times, which sometimes proved to reduce willingness towards better connectivity. The load factor is intertwined with the importance of the economic mix. It means that building a functional network should ensure economic advantage, not the other way around, as it happened at one point in the development of the electric network in Yugoslavia, which will be mentioned in the following chapters.

Electricity became a revolutionary factor and radically transformed everyday life, environment, industry, and, finally, nations. Colin Divall and George Revill argued that the history of transportation should be studied as a history of propinquity between the social and

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⁶³ "Introduction" in Erik van der Vleuten and Arne Kaijser, (eds.), *Networking Europe: Transnational Infrastructures and Shaping of Europe, 1850-2000.* (Sagamore Beach: Mass., 2006.)

⁶⁴ Thomas Zeller. *Driving Germany: The Landscape of the German Autobahn*. (New York. 2007): 55.

⁶⁵ Hughes. *Networks of Power*. 11.

material worlds.⁶⁶ The same could be said for the history of electrification. Electricity is commonly perceived and described as a progressive narrative. The introduction of electricity is usually associated with modernity and progress.⁶⁷ If the leading provider of electricity is the state, its relationship with its citizens becomes even more profound. Wimmer argues that a stable and organized state presents an appealing partner, and the population will support it if it provides them with essential public goods.⁶⁸ An advanced and integrated electrical grid can be a very efficient tool for the consolidation of political power.⁶⁹ In this respect, the history of electrification is a social phenomenon because it brings new social relations and cultural practices.⁷⁰

⁶⁶ Colin Divall and George Revill. "Cultures of Transport: Representation, Practice, and Technology." *Journal of Transport History* 26 (2005): 99-111.

⁶⁷ Timothy Mitchell. *Carbon Democracy: Political Power in the Age of Oil*. (London: Verso, 2011): 239

⁶⁸ Wimmer. *Nation-building*. 69-73.

⁶⁹ James C. Scott. *Seeing Like a State: How specific Schemes to Improve Human Condition Have Failed*. (New Haven: Yale University Press, 1998.)

⁷⁰ Tanja Winther and Harold Wilhte. "Tentacles of Modernity: Why Electricity Needs Anthropology." *Cultural Anthropology*, Vol. 30, 4 (2005): 569-577.

Into the New Age

The relationship between society and electricity is often portrayed as central in the quest for modernity. Along with networks of transportation, communication (telegraphs), and sewage (health), electricity was a transformer of the urban environment at the end of the nineteenth and beginning of the twentieth century.⁷¹ Electrification was a significant factor in the social and economic framework as its application varied from means of simple lighting to more sophisticated uses in industry and transportation.⁷² This study argues that electricity played a significant role in the imagining and building of the Yugoslav nation as modern.

Modernization of the South Slavic territories, in historical context, refers to the process of accelerated industrialization and electrification. The emergence and process of electrification in the territories that would become part of the Kingdom of Yugoslavia were determined by various political, social, and economic conditions. Due to the different historical circumstances electrification process of these territories carried out unevenly. While some parts of the state had entered another industrial revolution (the use of electricity in industrial production, etc.), the large parts of the Yugoslav Balkans were still ruled by a natural economy and an agrarian organized society.⁷³ To the advocates of Yugoslav electrification, the differences that mattered here were not those of the first or second industrial revolutions, but rather civilizational ones. Industrial civilization was opposed to the agrarian. Relations in agriculture were very different

⁷¹ Josef W. Konvitz. *The Urban Millenium: The City-Building Process from the Early Middle Ages to the Present*. (Carbondale: Southern Illinois University Press, 1985): 135.

² Erik van der Vleuten and Arne Kaijser, "Networking Europe." *History and Technology* 21 (2005): 21-48.

⁷³ Smiljana Đurović. *Državna intervencija u industriji Jugoslavije 1918-1941. godine* [State intervention in the Yugoslav industry]. (Beograd, 1986): 24-33.

in 1918 in Yugoslavia. In most parts of the country, except Serbia and Montenegro⁷⁴ there were definite traces of the feudal system, and in some places, it played a dominant role in agrarian relations. The agrarian reform began soon after the proclamation of the unification of the Kingdom of Serbs, Croats, and Slovenes, with the proclamation of Prince-Regent Aleksandar Karađorđević in January 1919, could not solve the agrarian issue in the country even after twenty years.⁷⁵

Moreover, this clash became more visible during the great economic crisis of 1929-1934 and was articulated in the tremendous Yugoslav dilemma: For industry or agriculture?⁷⁶ The main focus of the Yugoslav economic space was always coming back to the southeast of the country. This had enormous consequences for the construction of priorities of the government.⁷⁷ Echoes of this crisis rippled in the plans of the engineers who advocated ideas of interconnected electrical grids in Yugoslavia. The King's decision to focus his efforts on the impoverished peasantry had consequences on the electrification process.⁷⁸ In the historiography of interwar Yugoslavia, this perception of the state's conservative role in preserving small estates for the sake of social peace is often overlooked.

⁷⁴ Serbia and Montenegro had a different system, unlike parts that were ruled by Austro-Hungary. More on that subject: N. Gaćeša, "Prilog proučavanju agrarnoposedovne strukture i agrarnih prilika u Vojvodini u vreme stvaranja Jugoslavije, *Radovi iz agrarne istorije i demografije*. (Novi Sad 1995): 114–115; N. Gaćeša, *Zemljišni vlasnički odnosi u Vojvodini uoči Drugog svetskog rata*. (Novi Sad 2007): 13–14; S. Šećerov, *Istorija jugoslovenske agrarne reforme i agrarnog zakonodavstva od 1919. do 1934*, Rukopisno odeljenje Matice srpske, M. 14029, 448–449; M. Erić, *Agrarna reforma u Jugoslaviji 1918–1941*. (Sarajevo 1958.)

⁷⁵ "Odredbe za pripremu agrarne reforme" [Regulations for the preparation of agrarian reform]. *Službene novine Kraljevstva Srba, Hrvata i Slovenaca* [Official Gazette of the Kingdom of Serbs, Croats, and Slovenes]. (1919), I, 11, 27.02.1919.

⁷⁶ Đurović. *Državna intervencija u industriji Jugoslavije 1918-1941. godine* [State intervention in the Yugoslav industry]. 152-176.

⁷⁷ Žarko Lazarević. "Disparities and Economic Nationhood in Yugoslavia" in: Stefan Berger and Thomas Fetzer (Ed.). *Nationalism and the Economy. Explorations into a Neglected Relationship*. (Central European University Press, 2019): 117.

⁷⁸ Nikola Gaćeša. "Agrarne reforme i kolonizacija u Jugoslaviji" [Agrarian reforms and colonization in Yugoslavia] in *Jugoslovenska država 1918-1998* [Yugoslav state 1918-1998]. (Beograd, 1999): 313-326.

The great integration process began with the creation of the Kingdom of Serbs, Croats, and Slovenes in 1918, which also triggered deep economic integration processes. These processes demanded free space, free circulation of labor, goods, and capital, as well as the free circulation of ideas.⁷⁹ Examples of the introduction of the telegraph, railways (attitudes towards building railways are often taken as an example of Serbian society's unwillingness to carry out modernization)⁸⁰, the building of an electrical network, production, and trade of armaments, shows that the modernization of Yugoslavia cannot be judged only based on economic history. Modernization of the country, such as the Kingdom of Yugoslavia, is an exciting topic for historians of imperialism and colonialism. In a way, the story of the building of the electrical network is an attempt to include such an underdeveloped country in the process of rapid modernization.

Usually, analysis of the Yugoslav historical background is concentrated around the various aspects of the political, economic, or social questions. Most historical syntheses of interwar Yugoslavia are structured according to the criteria of political history. These studies stopped at the level of stating the underdevelopment, easily overcoming all the "historical guilt" on the legacy of the past and "long-term subordination to the enemies of Slavic people in the Balkans."⁸¹ In rare publications dedicated to the history of electrification, the scope of study remained "black boxed" – altogether strictly technological with a short review of social or economic aspects.⁸² This study will concentrate on decentering the histories of the

⁷⁹ Smiljana Đurović. *Ekonomski faktor u stvaranju Kraljevine Srba, Hrvata i Slovenaca. Stvaranje jugoslovenske države 1918* [Economic factor in the creation of the Kingdom of Serbs, Croats, and Slovenes. Creation of Yugoslav State 1918]. (Beograd, 1989): 167-172.

⁸⁰ Dimitrije Arnautović, Istorija srpskih železnica 1850–1918 [History of the Serbian Railways], (Beograd 1954): 19.

⁸¹ Mijo Mirković. *Ekonomska historija Jugoslavije* [Economic History of Yugoslavia]. (Zagreb: Ekonomski pregled, 1958): 32-35.

⁸² Stephen Graham and Simon Marvin. *Splintering Urbanism: Networked Infrastructure, Technological Mobilities, and the Urban Condition*. (London, 2001): 21.

electrification of former Yugoslav lands from a one-way connection. In the process of electrification, Yugoslavia interacted with other countries as well and was deeply dependent on the foreign capital and export of utilities.

The following chapters will describe electrical development in Croatia, Serbia, and Montenegro by the end of the First World War. Different stages of economic and industrial development of these territories determined the scale of electrification. It is important to keep in mind that dichotomy between Serbia and Croatia in the political aspect overlapped with the infrastructural development. The case of Montenegro is often overlooked even in the purely political histories dedicated to interwar Yugoslavia. In the case of the electrification position of Montenegro could be used as an excellent example of how the neglect of this region in economic and infrastructural aspect had a profound impact in the sense of belonging to the Yugoslav nation.

Yugoslavism and its concepts

Yugoslavia before Yugoslavia

On December 1, 1918, a new country was created – the Kingdom of Serbs, Croats, and Slovenes. The new state consisted of former Austro-Hungarian provinces Slovenia, Dalmatia, Croatia, Slavonia, Vojvodina, Bosnia, and Herzegovina, as well as the independent Kingdom of Serbia and the Kingdom of Montenegro. Borders of the new state were determined at the Versailles Peace Conference in Paris in January 1919. Also, the Kingdom of Serbs, Croats, and Slovenes made separate peace treaties with Austria, Hungary, and Bulgaria. Signing a treaty of Saint-Germain-en-Laye, the Kingdom of Serbs, Croats and Slovenes handed over parts of Istria to Italy but kept other parts of Istria, the smaller part of Carinthia, Kranjska, Dalmatia and a part of Styria.⁸³ Treaty of Trianon, signed in June 1920 with Hungary, added to the Kingdom Serbs, Croats, and Slovenes, Croatia, Slavonia, and Vojvodina.⁸⁴ With Bulgaria, the Kingdom of Serbs, Croats, and Slovenes signed the treaty of Neuilly-sur-Seine in November 1919. The border between two states was corrected, and Bulgaria obligated to pay war damages.⁸⁵ The Kingdom of Serbs, Croats and Slovenes covered an area of 249,000 square kilometers and had over 12 million inhabitants.⁸⁶ After the First World War, Europe's political structure was profoundly distorted, and big empires such as Austro-Hungary and the Ottoman Empire no

⁸³ Erik Goldstein. *The First World War Peace Settlements, 1919-1925.* (Routledge, 2013): 23.

⁸⁴ J. A. S. Grenville. *The Major International Treaties 1914–1973. A history and guides with texts*. (London, 1974.)

⁸⁵ Margaret MacMillan. *Peacemakers: Six months that changed the world*. (John Murray, 2001): 55.

⁸⁶ Pavle Vujević. *Kraljevina Jugoslavija: geografski i etnografski pregled*. Štamparija "Davidović", 1930.

longer existed. However, legacies left behind by these two empires left a considerable mark on the territories that will make the Kingdom of Yugoslavia and, in a way, determine the course of social, political, and infrastructural development.⁸⁷

The idea of the unified South Slavs (Yugo Slavs) existed long before the formation of the Kingdom of Yugoslavia. The concept of Slavism is a coinage originating from the German concept of *Deutschtum* created in the ideas of the *Strom and Stress* movement in the seventeenth century.⁸⁸ During the nineteenth century, this idea developed further in various Pan-Slavic movements. Therefore, we can distinguish four different interpretations of Yugoslavism, mainly developed among Croats and Serbs. The first conception, developed by Vuk Stefanović Karadžić⁸⁹, considered language as a central aspect of the nation.⁹⁰ The idea of linguistic homogeneity appears in Wimmer's study of nation-building as one of the main reasons why national identities can be coordinated with language boundaries and why not.⁹¹ Secondly, Josip Juraj Strossmayer⁹² considered religion as an integral part of nationhood. In his efforts, he promoted religious unification of the Yugoslavism and stressed that the confessional divide between Croats (Roman-Catholic) and Serbs (Orthodox) remains the main hindrance.⁹³ The third approach is the understanding of Yugoslavism, which gives no attention either to religion nor language. A major advocate of this approach, Ante Starčević, propagated

⁸⁷ Marko Bulatović. "Struggling with Yugoslavism: Dilemmas of Interwar Serb Political Thought" in: John R. Lampe and Mark Mazower (Ed.) *Ideologies and National Identities. The Case of Twentieth-Century Southeastern Europe*. (Budapest: CEU Press, 2004): 254-276.

³⁸ R. Regensburger. "Deutschtum und Slawentum." *Tat*. April 1917. 83-87.

⁸⁹ Vuk Stefanović Karadžić (1787-1864) was Serbian linguist and philologist, major reformer of the modern Serbian language.

 ⁹⁰ Sabrina P. Ramet. *The Three Yugoslavias: State-building and Legitimation, 1918-2005.* (Indiana University Press, 2006): 39. See also: Vuk Karadžić. *Spomenica 1864-1964.* (Nolit: Beograd, 1966); Miljana Radovanović. *Vuk Karadžić. Etnograf I folklorist* [Vuk Karadžić. Ethnographer and folklorist]. (Beograd, 1973.)
⁹¹ Wimmer. *Nation Building.* 15.

⁹² Josip Juraj Strossmayer (1815-1905) was a Croatian politician and Roman-Catholic bishop.

⁹³ Fredo Šišić. *Biskup Strosmajer i južnoslovenska misao* [Bishop Strossmayer and South Slavic thought]. (Zastava: Beograd, 1922.)

the idea of a citizen's state. In his opinion, only by building citizenship based on the equality goal of unified Yugoslavs could be achieved.⁹⁴ Finally, the fourth notion that appeared underlined the concept of "blood and race".⁹⁵

The idea of Yugoslav nation in many political organizations of South Slavic peoples was perceived as a continuation of the separate national development that would lead to a "century-old aspiration" for final unification. However, the idea of Yugoslav nation, in order to achieve its national shape of "national unity," would have to be stronger than ideas and inclinations of separate national identities of South Slavic people.⁹⁶ Moreover, every ethnic group of the former Yugoslav territory had its versions of Yugoslavism. Among them, most dominating were Serbian and Croatian, but even they had different versions depending on the period in question.

⁹⁴ Sabrina P. Ramet. "Ante Stračević: Liberal Champion of 'Citizens' State'' in: Sabrina P. Ramet, James R. Felak and Herbert J. Ellison (eds.) *Nations and Nationalism in East-Central Europe, 1806-1948*; A Festschrift for Peter F. Sugar. (Bloomington, Ind: Slavica Publishers, 2003): 138.

⁹⁵ Ramet. *The Three Yugoslavias*. 39-40.

⁹⁶ Zagorka Golubović. *Ja i drugi. Antropološka istraživanja individualnog i kolektivnog identiteta* [Myself and others. Anthropological study of individual and collective identity]. (Beograd, 1999): 7.
Centralism vs. Federalism

Even before the official proclamation, the newly formed Kingdom faced the essential question of its political existence. The delegation of the Yugoslav Committee, a group of intellectuals from the Austro-Hungarian Empire that agitated for the unification, abandoned its instructions. One of the main requests presented by this Committee was that the new state should be based on the federal system, but when the delegation arrived at negotiations in Belgrade, it ignored this request. From the very start, unification was based on questionable constitutional grounds. Time will tell that this proved to be one of the most significant flaws in the Kingdom of Yugoslavia. The conflict of the centralist and federalist conception of state organization proved to be the leading cause of the instability of the Kingdom of Serbs, Croats, and Slovenes and the crisis of its political system. This conflict about centralism and decentralism soon turned into a conflict between the Serbs and non-Serbs (mostly Croatians, though Slovenes and Montenegrins also had factions).

Among the intellectuals debate over centralism and federalism pervaded from the ethnic aspects to the legal aspects. The idea of centralism and monarchy was supported mainly by Serbian intellectuals such as historian Stanoje Stanojević. In his publications, Stanojević elucidated the idea of unification as the finalization of historical process and justification of Serbian pretensions.⁹⁷ On the other hand, politicians Lazar Marković and Nikola Pašić recognized the idea of a "trinominal nation," but this was more of a compromise to achieve an

⁹⁷ Stanoje Stanojević. "Naše pretenzije"[Our pretensions], *Politika* (1914), 10, 23.12.1914.

ultimate idea of a single nation, which is primarily Serbian.⁹⁸ One of the leading proponents of the centralist idea in the 1920s was prominent Serbian thinker Slobodan Jovanović. He defended his arguments for the centralist position on the legal grounds.⁹⁹ In his opinion, the autonomy of provinces is potentially dangerous because of the possible difficulties of the state's law exertion giving an example of the legal difficulties of the former Austro-Hungarian Empire.¹⁰⁰

Intellectuals who supported the idea of the federalist government originated from the former Austro-Hungarian Empire, mostly Croats, and Slovenes, but there were Serbs among them as well. Among the Serbian intellectuals that propagated the federalist approach, one should mention Jovan Cvijić.¹⁰¹ In 1918 along with Ljubomir Stojanović¹⁰² and Milan Grol¹⁰³, Cvijić composed the proposal "The United States of Yugoslavia" that advocated the idea of the future state as a federal republic.¹⁰⁴

Gellner's definition of nationalism observes the concept of national ideology by conformance of the state borders with ethnical borders¹⁰⁵, it is possible to differentiate several concepts of Yugoslavism. The Croatian version implies the unification of the Southern Slavs in

⁹⁸ Lazar Marković. Serbia: The Buffer State. (New Haven: Yale University Press, 1917.)

⁹⁹ Slobodan Jovanović led an interesting debate with German lawyer, Erich Kaufmann on the subject of the Kingdom of Serbs, Croats and Slovenes represented the new country or an old one. For this debate, see: Erich Kaufmann. "Die serbisch-kroatisch-slowenische Staat ein neuer Staat." *Niemeyer's Zeitschrift fuer internationales Recht* (1923), 31, 6, 211-251.

¹⁰⁰ Slobodan Jovanović. "O federalizmu"[On Federalism]. *Srpski kniževni glasnik*, (1920), 1, 5, 435-441. See also: S. Jovanović. "Je li federalizam kod nas mogućan? " [Is federalism applicable in our country?]. *Srpski književni glasnik*, (1921), 1, 6, 424-430.

¹⁰¹ Jovan Cvijić (1865-1927) was a Serbian geographer, president of the Serbian Royal Academy of Sciences, and rector of the University of Belgrade.

¹⁰² Ljubomir Stojanović (1860-1930) was a Serbian philologist and politician, founder of Yugoslav Republican Party.

¹⁰³ Milan Grol (1876-1952) was a Serbian historian and politician, founder of the Democratic Party of Yugoslavia.

¹⁰⁴ Ljubinka Trgovčević. *Naučnici Srbije i stvaranje jugoslovenske države 1914-1920* [Sebian intellectuals and scholars in creation of the Yugoslav state 1914-1920]. (Beograd: Srpska književna zadruga, 1986): 235-236.

¹⁰⁵ Ernest Gellner, *Nations and Nationalism*, 2nd edition, (Cornell University Press, Ithaca, New York 2009.)

the Habsburg Monarchy, gathered around the Croatian idea of the state. This political unity should be organized in federations, along with strong confederate elements, and to include all the historical provinces of the southern Slavs.¹⁰⁶ Contradictory, the Serbian variant implies an independent and (ideally) unitary political community where the leading position belongs to Serbia.¹⁰⁷ Finally, Slovenes had their variation that entails a federation, with a Slovenian unit that would bring all Slovenes together.¹⁰⁸

 ¹⁰⁶ Ivo Banac. *The National Question in Yugoslavia. Origins. History. Politics*. (Cornell University Press: Ithaca and London, 1988): 70-75.
¹⁰⁷ Ibid. 141-153.

¹⁰⁸ Ibid. 340-358.

Integral Yugoslavism

Yugoslavia's idea continued to develop during the interwar period and had a central role in political and intellectual life. Following the proclamation of the Kingdom of Serbs, Croats, and Slovenes in 1918, Prince-Regent Aleksandar promulgated official manifesto addressing the nation with that act "long dream of our predecessors has been finally fulfilled".¹⁰⁹ Debates over whether the Yugoslav nation already existed or it is yet to be developed could be traced in the writings of Serbian intellectuals. Jovan Cvijić extensively popularized the idea of the Yugoslav national identity and even founded the Yugoslav Democratic League in 1918.¹¹⁰

Ljubodrag Dimić, in his notable work about the cultural life of the Yugoslav Kingdom, stressed that the idea of the Yugoslav nation in the interwar period was versatile and flexible.¹¹¹ In his view, integral Yugoslavism does not recognize any ethnic peculiarities and considers integration into the Yugoslav nation completed.¹¹² This type of Yugoslavism correlates to the unitarian form of the state with a stable centralist government, the tendency to authoritarian means, and even the use of paramilitary groups for confrontation with opponents.¹¹³

The turning point of further development in Yugoslav nation-building was incident in Parliament in 1928 when a deputy from the Radical Party killed the leader of the Croatian

¹⁰⁹ Ferdo Čulinović (Ed.). *Dokumenti o Jugoslaviji: Historijat od osnutka zajedničke države do danas*. [Documents about Yugoslavia: Historiographical sources from the conception of the state until today] (Zagreb, 1968): 298. See also: *Službene novine Kraljevstva Srba, Hrvata i Slovenaca* [Official gazette of the Kingdom of Serbs, Croats and Slovenes],(1919) I, 2, 28.01.1919.

¹¹⁰ Ranka Gašić. "Struggling with Yugoslavism in First Yugoslavia. The Belgrade Elite and the Public Debate". *East Central Europe* 42 (2015): 29-49.

¹¹¹ Ljubodrag Dimić. *Kulturna politika Kraljevine Jugoslavije 1918-1941.* Three vols. [Cultural life of the Kingdom of Yugoslavia 1918-1941]. (Beograd: Stubovi kulture, 1997.)

¹¹² Ibid. Vol 1. 55.

¹¹³ Gellner. *Nations and Nationalism*. 169.

Peasant Party, Stjepan Radić and two other Croatian delegates.¹¹⁴ This event prompted King Aleksandar I to establish the royal dictatorship. Justification for this radical move proclaimed that national unity must be kept secure, and this is the best solution to overcome the political and national crisis. After the establishment of dictatorship in the 1929 idea of integral Yugoslavism emerged. The most relevant distinction of this idea is that it departed from the notion of Yugoslav national homogeneity. Jovo Bakić argued that while integral Yugoslavism did recognize "three tribes" (Serbs, Slovenes, and Croats) as determinants of the Yugoslav nation, it did not recognize any substitute national entities.¹¹⁵ The final goal, of course, would be complete obliteration of these differences. However, differences between the "tribes" were not considered as harmful as part of nation-building.¹¹⁶ In his proclamation, King Aleksandar I, the only nation that is recognized, is Yugoslav, and this is a step further in overcoming so-called "tribal exclusivism".¹¹⁷ Moreover, interesting detail in the king's proclamation is that he claimed that the process of building of the Yugoslav nation was already over.¹¹⁸

In October 1934, during his official visit to France, King Aleksandar I was assassinated by the Macedonian and Croatian terrorists.¹¹⁹ This event proved crucial for the further development of the Yugoslav nation. In efforts to propagate the idea of the Yugoslav nation, the government painted an image of the king as a martyr. His alleged last words, "Čuvajte mi Jugoslaviju" [Keep my Yugoslavia safe], presented the king as the most devout to the idea of a Yugoslav nation. This kind of propaganda was to assure that the future generation would have a

¹¹⁴ Zvonimir Kujundžić. *Atentat na Stejpana Radića* [The assassination of Stjepan Radić]. (Zagreb: Stvarnost, 1967): 50.

 ¹¹⁵ Jovo Bakić. *Ideologije jugoslovenstva između srpskog i hrvatskog nacionalizma 1918-1941* [Idea of Yugoslavism between Serbian and Croatian nationalism 1918-1941]. (Zrenjanin: Žarko Zrenjanin, 2004): 84-85.
¹¹⁶ Ibid. 89.

¹¹⁷ *Službene novine Kraljevine Srba, Hrvata i Slovenaca* [Official gazette of the Kingdom of Serbs, Croats and Slovenes] (1929), XI, 6, 6.01.1929.

¹¹⁸ Ibid.

¹¹⁹ "Tragična smrt našeg kralja." Vreme, XIV, No. 4581, Beograd, 10.10.1934.

governing principle.¹²⁰ After the king's death, Prince-regent Pavle Karaðorðević found himself faced with growing Croatian discontent and decided to invite Milan Stojadinović, Minister of Finance, to form a new government.¹²¹ This would prove crucial in the foreordination of the Yugoslav national development.

¹²⁰ Dejan Djokić. "(Dis) Integrating Yugoslavia: King Alexander and Interwar Yugoslavism". In *Yugoslavism: Histories of a Failed Idea, 1918–1992,* Edited by Djokić, Dejan. London, 136-137.

¹²¹ Todor Stojkov. *Vlada Milana Stojadinovića, 1935-1937* [Government of Milan Stojadinović]. (Beograd: Institut za savremenu istoriju, 1985): 7-11.

Real Yugoslavism

The government formed by Milan Stojadinović consisted of politicians from the Radical Party, Yugoslav Muslim Organization, and the Slovenian People's Party. Stojadinović will gradually abandon the idea of integral Yugoslavism and concentrate his efforts on, what Dimić calls, real Yugoslavism.¹²² The idea of real Yugoslavism was formulated in the program of the Stojadinović's party, Yugoslav Radical Union, formed in 1935. Unlike integral Yugoslavism, which was authoritarian, Stojadinović propagated the idea of mutual appreciation and collaboration.¹²³ Real Yugoslavism fully recognizes ethnic peculiarities and postpones integration for a suitable moment in the future. It propagates unitarism with broad decentralization and autonomy, but also regionalism and federalism. However, the possibility of confederation is excluded.¹²⁴ Yugoslav Radical Union intended to propagate harmony among the Serbs, Croats, and Slovenes and to nourish the idea of Yugoslav nation as much as possible.¹²⁵ To simplify, in the eyes of Stojadinović's government, the Yugoslav nation was something set in the future.

In the interwar period, Bakić also distinguishes so-called minimal Yugoslavism by which he considers the political unanimity of different South Slavic nations.¹²⁶ Bakić considers that this type of Yugoslavism should be seen as pan-nationalism. In other words, this kind of

¹²² Dimić. *Kulturna politika Kraljevine Jugoslavije*. Vol 1, 329-335.

¹²³ Arhiv Jugoslavije [Archives of Yugoslavia]. Zbirka Milana Stojadinovića [Personal collection of Milan Stojadinović]. (37)-12-81.

¹²⁴ Dimić. *Kulturna politika Kraljevine Jugoslavije*. Vol 1, 329-335.

¹²⁵ Arhiv Jugoslavije [Archives of Yugoslavia]. Zbirka Milana Stojadinovića. 37-52-330.

¹²⁶ Bakić. *Ideologije jugoslovenstva*. 85-86; 91.

nationalism is subject to the rivalry between the various ethnic nationalities that existed in the South Slavic region.¹²⁷

As was mentioned before, even before the new state's official constitution, some expectations and demands were not met. This initial conflict will reflect on all aspects of the new state, mainly because the expectations of the future state were based on federalism instead of centralism. The king constantly interfered in the work of the National Assembly, and himself appointed ministers, creating an even deeper divide and the damaging potential creation of the collective identity of Yugoslavs.¹²⁸ The issue of the internal organization of the Kingdom of Yugoslavia reflected not only in political life but in every aspect of the state interrelation. This study will show how this affected efforts to build the integrated electrical network and in which ways the king's attitude prolonged and further aggravated attempts of engineers and architects to engage higher political structures in this notion.

¹²⁷ Ibid. 49-50.

¹²⁸ Ramet. *The Three Yugoslavias*. 35.

* * *

The following chapter will give a brief overview of the development of the electrification of Croatia, Serbia, and Montenegro. In spatial terms, I choose these three regions of the Kingdom of Yugoslavia for the following reasons: Croatia was part of the Austro-Hungarian Empire, and its development in an industrial, infrastructural and national sense is different that developments in Serbia and Montenegro. As much as possible, I will mention Slovenia, Bosnia and Herzegovina, and Macedonia, but the focus of this study will remain on three previously mentioned regions.

Electrification efforts before 1919

Serbia (Serbia proper), Croatia (Croatia proper, Slavonia, Baranja, Dalmatia, Istria, and the islands) and Montenegro experienced different processes of development before 1919 and creation of the Kingdom of Serbs, Croats, and Slovenes. The cultural, industrial, and economic backgrounds in these regions are highly differentiated. The experiences of these regions affected future integration in a common state in many aspects. The momentum of the national consciousness in all three regions developed in different stages as well. This chapter will briefly describe the stages of the development of electrical networks in these regions. It will not focus on the sense of national belonging as it would take away the focus of the topic too far.¹²⁹

Electrification is a process that proved not to be uniform due to different historical circumstances in which Croatia, Serbia, and Montenegro developed. In order to determine the time frame of the period called "before electrification", it is necessary to understand the difference between the process of electrification of settlements and the electrification of households.¹³⁰ The electrification of a populated place, town, or village does not simultaneously indicate the electrification of all households. This chapter will focus on the initial development of the public power plants, even though all three regions had some sort of

¹²⁹ On this subject: Wolf Dietrich Behschnitt. *Nationalismus bei Serben und Kroaten 1830-1914: Analyse und Typologie der nationalen Ideologie*. (Munich: R. Oldenbourg Verlag, 1980); Savo Brković. *O postanku i razvoju crnogorske nacije*. (Titograd: Grafički zavod, 1974); Vasa Čubrilovic. *Istorija politicke misli u Srbiji XIX veka*. (Beograd: Prosveta, 1958); *Jugoslovenski narodi pred Prvi svetski rat*. (Beograd: Naučno delo, 1967); Mate Drinković. *Hrvatska i državna politika*. (Zagreb, 1928.)

¹³⁰ On the topic of household electrification: David E. Nye. *Electrifying America: Social Meanings of a New Technology*. (Cambridge, MA, USA and London, England: The MIT Press, 1990); M. Barron and M. Torero. "Household Electrification: Short-Term Effects with Long-Term Implications", Mimeo, Department of Agricultural and Resource Economics (2014), University of California, Berkeley.

electrification in the hands of the industrial businesses used exclusively for its production purposes. This study will not address them, and the focal point will stay only on public power plants and network development in the domain of public usage.

The political, economic, and social conditions in which Serbia, Croatia, and Montenegro developed during the nineteenth century and the conditions for education, acquisition, and change of cultural needs determined the first stage of modernization of these regions. The "heroes" of this process are people whose social characteristics, cultural uniqueness, education, and the way of life have determined the speed and direction of transformation and steps into the "modern age". Entrepreneurs, scholars, and engineers initiated the first steps towards the electrification.

Serbia – Early Begginings

The Kingdom of Serbia in the late nineteenth century was one of the smallest European countries. It was located in the center of the Balkan Peninsula.¹³¹ Also, Serbia was one of the least developed European countries. During the nineteenth century, the majority of its population was engaged in agriculture. Until the end of the century, 90% of Serbian citizens lived in the countryside.¹³² The country that was created in the uprising and social revolution of free farmers had difficulties in constituting and modernizing itself. At the end of the nineteenth century, the Serbian economy, which essentially boiled down to agriculture, was remarkably unproductive. In the first half of the nineteenth-century industrial facilities practically did not exist. The industry had not taken greater hold, and what has been developed did so primarily under the influence and needs of the state. Within the framework of this emerging industry, whose scope was modest, and the growth rate high, the energy industry occupied only a secondary place. Examples of the introduction of the telegraph, railways, the building of an electrical network, production, and trade of armaments show that the modernization of Serbia cannot be judged based only on economic history.¹³³

¹³¹ Books about this subject: R. Samardžić (ed.) *Istorija srpskog naroda*, Knj. 6, "Od Berlinskog kongresa do ujedinjenja: 1878–1918", Vol. 2 [History of the Serbs, Book 6: From the Congress of Berlin to the Unification 1878-1918], (Beograd, 1994); E. Milorad, *Dugo kretanje između klanja i oranja: istorija Srba u novom veku:* (1492–1992) [Long trajectory between slaughter and farming: History of Serbs between 1492-1992], (Beograd 2011.)

M-Ž. Čalić, *Socijalna istorija Srbije 1815–1941, Uporedni napredak u industrijalizaciji* [Comparative progress in the industrialization], (Beograd 2004): 39–40.

¹³² M-Ž. Čalić, *Socijalna istorija Srbije 1815–1941, Uporedni napredak u industrijalizaciji* [Comparative progress in the industrialization], (Beograd 2004): 39–40.

¹³³ M-Ž. Čalić, Socijalna istorija Srbije 1815–1941, Uporedni napredak u industrijalizaciji. (Beograd 2004): 39–40.

An impoverished and weak Serbian elite tried to modernize themselves at the cost of great sacrifice - human, material, and political. This attempt of rapid modernization was specific to the periphery of Europe. In addition to this, Serbia has had only a more complicated situation because of the country's complex situation, which had a deeply divided nation in the religious and traditional sense. Although it was not among the developed countries, Serbia was trying to catch up with the rest of Europe. Developing electricity networks was one of the ways to do this.¹³⁴

The story of Serbia's electrification is the story of an attempt to adopt modern technology to skip developmental delay. Even in the scientific community, there is a prejudice that the Serbian elite in the nineteenth century had an attitude against modernization, but electrification of Serbia debunks this notion.

The center of the small and poorly developed industry of the Kingdom of Serbia in the second half of the nineteenth century was the city of Kragujevac. It was in Kragujevac Military Technical Institute, the largest plant in the country, for the first time electricity was used for illumination.¹³⁵ Power station supplying lighting electricity was purchased from the company "Siemens Schuckert".¹³⁶

Proclamation of the Kingdom of Serbia in 1882¹³⁷ and the appointment of Dr. Vladan Đorđević as warden of town Belgrade initiated the actual process of electrification of the new

¹³⁴ Čedomir Antić, *Kneževina Srbija i 1848. kao godina modernizacije*, (Naš trag, 2002.)

¹³⁵ A. K. Spasojević, "Pionirski period elektrifikacije Srbije (1884–1914)" [Pioneering period of the electrification of Serbia], *Elektrifikacijski glasnik*, 37 (2003): 59.

¹³⁶ Arhiv Šumadije [Historical Archive of Šumadija], F 12, 23, 156; S. von Weiher, H. Goetzeler, *The Siemens Company. Its Historical Role in the Progress of Electrical Engineering 1847–1980*, (Berlin Munich, 1984): 38.

¹³⁷ Radoš Ljušić, *Srpska državnost 19. veka*, [Serbian statehood of 19th century], (Beograd 2008): 32–33.

Serbian capital.¹³⁸ At the end of the nineteenth century, amid efforts to introduce lighting in Belgrade, there was a dispute between the two Belgrade professors: Đorđe Stanojević¹³⁹, physicists, and Marko Leko¹⁴⁰, chemist.¹⁴¹ The debate was over whether the capital should be illuminated with electricity or gas. Moreover, this debate between gas and electricity was not a "national" but a municipal one, and it is repeated in many Central European cities during this period.¹⁴² The Serbian government in 1883 sent Stanojević to Vienna for an exhibition dedicated to electric appliances and electricity production.¹⁴³ Stanojević reported:

"We need to take electric light as our light, whether for the lighting of the streets or indoor spaces. All the above examples of the prices of gas and electricity show that electric light costs cheaper; Let us say that in our country costs the same as a gas, but we still should pick electric power because it is hygienic."¹⁴⁴

¹³⁸ Dubravka Stojanović, *Kaldrma i asfalt, urbanizacija i evropeizacija Beograda 1890-1914* [Cobblestones and asphalt, urbanization and modernization of Belgrade 1890-1914], (Beograd 2008): 120–121.

¹³⁹ Đorđe Stanojević was born in 1857 in the city of Negotin. After completing elementary and secondary education in his hometown, Stanojević enrolled in Belgrade High School, where he studied physics. After receiving a scholarship, he continued his physic studies in Berlin, Paris, and London. In 1887 he started teaching physic and mechanic at the Military Academy in Belgrade. He also became the director of the Physics Institute of the Faculty of Philosophy, which, among other things, dealing with the affairs of electrification. Stanojević was the Dean of the Faculty of Philosophy from 1909 to 1913 and rector of Belgrade University from 1913 to 1921. He died in Paris in 1921.

¹⁴⁰ Marko Leko was born in 1853 in Belgrade. After elementary education, he enrolled in the Politechnical Institute in Zurich, where he received his Ph.D. He has published 52 works, mostly involving organic and analytical chemistry. Leko has solved one of the problems: a question if ammonium chloride (muriate) and its related compounds belong to the compounds of the pentavalent nitrogen, NH 4 Cl, or molecular compounds, NH3 · HCl. Worked as the chemistry professor at the University of Belgrade and was the founder of the Serbian Society of Chemists. He died in 1932 in Belgrade.

¹⁴¹ Stojanović, 121.

¹⁴² Stefan v. Fodor. "Gas oder Elektrizität?" *Pester Lloyd*. June 29, 1907, <u>http://anno.onb.ac.at/cgi-content/anno?aid=pel&datum=19070629&seite=9&zoom=33&query="Erfindung%2BAuer"~50&provider=P03&r ef=anno-search</u>, last accessed on May 23, 2020.

¹⁴³ B. Cvetković (Ed.). *Od Đetinje do Đerdapa, Elektrifikacija Srbije 1893– 1941* [From Đetinja to Đerdap, Electrification of Serbia 1893-1941], (Poslovna zajednica elektrodistribucije Srbije Beograd, 1979): 42.

¹⁴⁴ Đorđe Stanojević. *Električna industrija u Srbiji: eksperimentalna predavanja održana u Fizičkom institute Velike škole* [Electric Industry in Serbia: Experimental Lectures on the Physics Institute] Belgrade: Državna štamparija Kraljevine Srbije, 1901, 11-15.

The debate that arose over how Belgrade should be illuminated was not only among professionals but also within the political public. Belgrade established a special committee to visit thirteen European cities and decide which way of illumination would be the best for Belgrade.¹⁴⁵ The decision fell on the gas¹⁴⁶, but the implementation of this decision was delayed for five years.¹⁴⁷ Delays, greatly influenced by Đorđe Stanojević, have proved to be extremely important because, after 1888 in Western Europe, there was a preponderance of electric lighting.¹⁴⁸ An advocate of the premise that illumination should rely on gas was a chemistry professor at the High school in Belgrade, Marko Leko.¹⁴⁹ By 1891, representatives of these two positions have led a bitter fight: the gas option was criticized because of the danger of explosion or asphyxiation, while the electric current was criticized because of the danger of electric shock, fire, and because of the high prices. It turned out, however, that Đorđe Stanojević possessed excellent political skills and succeeded in convincing government officials that electrical illumination is the best solution.¹⁵⁰ In 1890, during the debate about the best energy source for the illumination in Belgrade, the United States already had 1,242 km of tram tracks with 1,239 tram cars.¹⁵¹ In one of the lectures held in the years since the electrical currents prevailed, Stanojević predicted:

"However the great importance of water vapor was in the last century, called the century of steam, the importance of electricity in this century will no doubt be even more

¹⁴⁵ Cvetković, *Od Đetinje do Đerdapa, Elektrifikacija Srbije 1893– 1941*, 41.

¹⁴⁶ Interestingly reason for prevailing the gas option was visit to city Timisoara. On the day Serbian delegates visited Timisoara, the city was cut short of electricity supply.

¹⁴⁷ "Elektricijada", *Večernje novosti*, 12.10.1894.

¹⁴⁸ Cvetković, *Od Đetinje do Đerdapa*, 117.

¹⁴⁹ Cvetković, *Od Đetinje do Đerdapa*, 118.

¹⁵⁰ M. Čemerikić, *Trgovina, zanatstvo, industrija, kreditne ustanove od 1875. do 1937.* [Commerce, artisans, industry and credit banks from 1875 to 1937]; A. Jovanović (Ed.), *Spomenica dvadesetogodišnjice oslobođenja Južne Srbije 1912–1937*, (Skoplje 1937): 718–719.

¹⁵¹ Cvetković, *Od Đetinje do Đerdapa*, 42.

significant and it will rightly bear the name: age of electricity. Moreover, its motto will be "everything electric"¹⁵²

In the end, electric current prevailed, and the second committee decided that Belgrade will be lit up utilizing electricity. The concession was given to contractors from Italy that within two years to introduce electric lighting in Belgrade. Concessionaire needed just over two years to finish the job.¹⁵³ The first power station in Belgrade was built on the Danube slope in Dorćol (a quarter of Belgrade). In this power station, three horizontal steam engines were turning nine dynamo-electric machines, which produced 443 kW DC power. This plant supplied public lighting and 3,000 lamps in private ownership.¹⁵⁴ The network was 62 kilometers long. As far as the lamps are concerned, the major streets in Belgrade were installed with arc lamps (Bogenlampen¹⁵⁵), in a length of seven kilometers, and 1,000 light bulbs in a length of 55 kilometers (Glühlampen¹⁵⁶). It proved that the power supply was inadequate, especially in the peripheral areas of the electricity grid.¹⁵⁷ When the mid-1894's network began to supply trams commuting between Terazije and Topčider (quarters of Belgrade), the situation with the electricity supply was even worse.¹⁵⁸ Councilor J. Saloman Azrijel filed an interpellation concerning the quality of electricity supply.¹⁵⁹ The delegates of the city council of Belgrade, on several occasions, objected because the street lights in peripheral parts of

¹⁵² Đorđe Stanojević. *Električna industrija u Srbiji: eksperimentalna predavanja održana u Fizičkom institute Velike škole* [Electric Industry in Serbia: Experimental Lectures on the Physics Institute] (Belgrade: Državna štamparija Kraljevine Srbije, 1901): 11-15.

¹⁵³ Spasojević, *Pionirski period elektrifikacije Srbije*, 59.

¹⁵⁴ Istorijski arhiv Beograd [Historical Archive Belgrade], F. 1 Uprava grada Beograda [Municipality of Belgrade 1825-1944], 52, 1458.

¹⁵⁵ Herbert Liman, *Mehr Licht, Haude & Spener*, (Berlin, 2000): 31.

¹⁵⁶ Vincenzo Balzani, Giacomo Bergamini, Paola Ceroni, Light: A Very Peculiar Reactant and Product. In: Angewandte Chemie International Edition 54, Issue 39, (2015): 11320–11337.

¹⁵⁷ Stojanović, *Električna industrija u Srbiji*, 128.

¹⁵⁸ Stojanović, *Električna industrija u Srbiji*, 121.

¹⁵⁹ Istorijski arhiv Beograd [Historical Archive Belgrade], F. 1 Uprava grada Beograda [Municipality of Belgrade 1825-1944], 59, 265.

Belgrade were working poorly or did not work at all.¹⁶⁰ There was a sharp criticism that the network was expensive and insufficiently reliable.¹⁶¹ It should be noted that these were complex and expensive lamps: an arc or flame lamp costs about 250 dinars (which was a high clerical salary).¹⁶² Inside these lamps were two carbon electrodes, which burned 7 cm per hour.¹⁶³ This lamp glowed on average 2,000 hours per year, for which it took 140 meters of carbon electrodes.¹⁶⁴ One reason the Nernst lamp¹⁶⁵ became so important after 1900 that bulbs still had to be changed two or three times a year, which presented a high cost in the city budget.¹⁶⁶

Serbia tried to introduce electricity by the end of the nineteenth-century in four more cities. The first electric light bulb in Šabac has been installed at the Casino hotel in 1894.¹⁶⁷

When finally built, a hydroelectric power plant on the river Nišava and reserve plant, which worked on oil, had the most extended transmission network in Serbia, which stretched to as much as 25 km.¹⁶⁸ The construction of the plant was slowed down with changing of the dynasty on the throne of the Kingdom of Serbia in mid-1903 and conditioned by large loans. When the government finally issued a bid for the construction of the hydroelectric power plant

¹⁶⁰ Istorijski arhiv Beograd [Historical Archive Belgrade], F. 1 Uprava grada Beograda [Municipality of Belgrade 1825-1944], 59, 352.

¹⁶¹ Istorijski arhiv Beograd [Historical Archive Belgrade], F. 1 Uprava grada Beograda [Municipality of Belgrade 1825-1944], 59, 355.

¹⁶² Beogradske opštinske novine, 14, 1894.

¹⁶³ "Arc Lamps-How They Work and History", http://edisontechcenter.org/ArcLamps.html, last accessed on May 19, 2020.

¹⁶⁴ Ibid.

¹⁶⁵ Nernst lamp lasted longer and had improved efficiency. <u>https://edisontechcenter.org/NernstLamps.html</u> last accessed on May 23, 2020.

¹⁶⁶ Istorijski arhiv Beograd [Historical Archive Belgrade],F. 1 Uprava grada Beograda[Municipality of Belgrade 1825-1944], 123, notes of the financial office

¹⁶⁷ Spasojević, *Pionirski period elektrifikacije Srbije*, 61.

¹⁶⁸ Istorijski arhiv Niš [Historical Archive Niš] F. 15 Uprava Fondova grada Niša i okoline 1901-1925[Administration of the Head of the Funds of the city Niš and surrounding areas 1901-1925], 11, 87.

in Niš, as the best bidder emerged, "Siemens Schuckert Werke" from Vienna.¹⁶⁹ Beside Šabac and Niš, two more distant cities received electricity before 1914.

The city of Ivanjica, which at that time was considered a "Serbian Siberia"¹⁷⁰, received in 1911 the first urban lighting. Apart from the influence of nearby Užice, a decision on the commencement of works in Ivanjica was made by the wealthy merchants who resided in Ivanjica most of the time.¹⁷¹ After many difficulties, more precisely three years after the beginning of works in 1908, equipment for the hydropower plant was ordered from the company "Siemens Schuckert Werke". Generator "Siemens Schuckert" 160 kVA was coupled with a turbocharged Francis turbine system of 205 hp.¹⁷² In addition to private and public lighting, this electrical network supplied a wool carding mill and a small saw-mill.¹⁷³

Modernization in the Kingdom of Serbia was a slow process with no lasting central plan and steady pace. However, after the Balkan wars in annexed areas of Kosovo, Metohija, Novi Pazar, and Macedonia, the Kingdom of Serbia had done a lot for its modernization. Power plants in Skopje, Gostivar, Prilep, Prizren, and Peć, were all privately owned, and plants in Kumanovo, Veles, Kočani, and Južna Vinica were parts of local factories.¹⁷⁴ Because of high prices and general underdevelopment in the southern regions of the Kingdom of Yugoslavia, electricity has been used less than in the rest of the country. In the area of what is today northern Serbia (Vojvodina) by 1905, there were five power plants, and by 1918 there were

¹⁶⁹ Istorijski arhiv Niš [Historical Archive Niš] F. 15 Uprava Fondova grada Niša i okoline 1901-1925[Administration of the Head of the Funds of the city Niš and surrounding areas 1901-1925], 11, 116.

¹⁷⁰ It was called like this because all open-minded or incompetent officials were sent there as a punishment.

¹⁷¹ Marković. *Korak ispred vremena*. 32.

¹⁷² Cvetković, *Od Đetinje do Đerdapa*, 117.

¹⁷³ Cvetković, *Od Đetinje do Đerdapa*, 117-118.

¹⁷⁴ Čemerikić, *Trgovina, zanatstvo, industrija, kreditne ustanove*, 718–719.

twenty-two. These power plants have supplied electricity for 44 settlements.¹⁷⁵ The first power plant in southern Hungary opened in 1895 in the Nagybecskerek (today Zrenjanin).¹⁷⁶ Initially, this plant was working on a steam-powered engine until 1938 when it was transferred to diesel and electric generator manufactured by the company "Siemens Schuckert Werke" from Vienna.¹⁷⁷

The first power plant that produced DC electric current was raised by Matija Mata Nenadović¹⁷⁸ on the river Gradac near the city of Valjevo.

Ninety-six days after the plant in Valjevo, in the city of Užice, a hydropower plant for the production of polyphase electricity was put into operation. This plant was built on the river Detinja near Užice. Residents of the city asked Dorđe Stanojević to submit a project for the power supply of the textile factory that operated in their city.¹⁷⁹ Interestingly, it was not possible to implement the plan to build a hydroelectric power plant given by Stanojević, and he later sent it to be made in Budapest.¹⁸⁰ Therefore, the power plant was finally designed by Aćim Stevović, an engineer from Niš.¹⁸¹ Construction of this power plant lasted a little longer than a year - from May 1899 to August 1900. This was the first power plant that produced polyphase electricity in Serbia. The fact that King Milan Obrenović attended the opening of the plant speaks about the importance it had. Užice hydroelectric plant had a 32 m long dam. The 776 m long channel had two Francis turbines installed, with the power of 50 hp, purchased

¹⁷⁵ Arhiv Vojvodine [Archive of Vojvodina] F. 86 Oblasna tehnička uprava Novi Sad [Technical department Novi Sad 1919-1929], 155, 11, 29, 113.

¹⁷⁶ Arhiv Vojvodine [Archive of Vojvodina], F. 422 Torontalska županija II [Torontál County 1849-1918], 265, 23.

¹⁷⁷ Arhiv Vojvodine [Archive of Vojvodina], F. 422 Torontalska županija II [Torontál County 1849-1918], 256, 75; 614, 11; 622, 45. See also: B. Cvetković. *Od Đetinje do Đerdapa*. 75-86; 111; 118.

¹⁷⁸ Matija S. Nenadović, who was the grandson of the famous Serbian uprising leader Aleksa Nenadović.

¹⁷⁹ Spasojević, *Pionirski period elektrifikacije Srbije*, 64.

¹⁸⁰ "All Hydropower plants of Đorđe Stanojević",

https://web.archive.org/web/20150930171728/http://eastside.rs/index.php/drustvo/762-sve-hidrocentraledorda-stanojevica-od-uzica-do-krajine, last accessed on May 19, 2020.

¹⁸¹ Cvetković, *Od Đetinje do Đerdapa*, 67-112.

from the manufacturer "Danubius Maschinen Hartmann".¹⁸² Two generators for the production of a three-phase alternating current had the powerful effect of 32.8 kW, voltage of 2,000 V, 12.4 A, 50 Hz. These generators were manufactured in the workshops of the company "Siemens and Halske".¹⁸³ Plant on the river Detinja supplied the 1,554 bulbs of public and private lighting in Užice.¹⁸⁴ By 1914 more cities in Serbia have received electricity: Leskovac, Niš, Šabac, Zaječar, Ivanjica and Veliko Gradište.

The hydro power plant "Vučje" is located a few kilometers above the town of Vučje near Leskovac and was built in 1903 on the river Vučjanka.¹⁸⁵ Hydroelectric power plant "Vučje" was built with the money of shareholders of "Leskovac electronic society".¹⁸⁶Equipment, which included the first transmission line in Serbia - from Vučje to Leskovac (16 km) - was bought for 152,700 dinars in gold¹⁸⁷, from the company "Siemens and Halske"¹⁸⁸, and its construction was entrusted to Josif Granžan, an engineer from Nagybecskerek.¹⁸⁹ The hydropower plant "Vučje" has started its work with two hydro units of Siemens and Halske of 139 kW, and in 1931 was put into operation the third hydro unit of Swedish brand ASEA¹⁹⁰ 800 kW. With this addition, this power plant had a capacity of slightly more than 1 MW.¹⁹¹

¹⁸² Danubius Machinen, which was a shipbuilding company, merged with Ganz Company from Budapest in 1911, thus creating "Ganz-Danubius&co".

¹⁸³ Spasojević, *Pionirski period elektrifikacije Srbije*, 64.

¹⁸⁴ Spasojević, *Pionirski period elektrifikacije Srbije*, 64-65.

¹⁸⁵ Đorđe Stanojević. Hidroelektrično postrojenje Vučje – Leskovac [Hydro-electric Facility Vučje]. Belgrade: Štamparija Dositeja Obradovića, 1905, 11.

¹⁸⁶ M. A. Kremić, "Elektrifikacija Srbije do Drugog svetskog rata" in: R. Ivanković, (Ed.), *Vek elektrike u Srbiji 1893–1993*, (Beograd 1993): 37.

¹⁸⁷ Đorđe Stanojević, *Jedna elektro-pravna zagonetka* [One Electro-legal Riddle] (Beograd: Štamparija "Branko Radičević", 1910): 3.

¹⁸⁸ Marković. Korak ispred vremena. 42.

¹⁸⁹ M. A. Kremić, "Elektrifikacija Srbije do Drugog svetskog rata" in: R. Ivanković, (Ed.), Vek elektrike u Srbiji 1893– 1993, (Beograd 1993): 37-39.

¹⁹⁰ ASEA was founded in 1883 by Ludvig Fredholm as a manufacturer of electrical appliances.

¹⁹¹ Istorijski arhiv Leskovac [Historical Archive Leskovac], Uprava grada Leskovca [Municipality of Leskovac 1895-1919], 42, 17.

Hydropower plant "Gamzigrad" was built with the initiative of Đorđe Stanojević. In June 1902, in Zaječar joint-stock company was established for the construction of hydropower plant on the Crni Timok River.¹⁹² Work started in 1908, and on November 1, 1909, power plant began to produce electricity. This power plant had two three-phase alternating current generators produced by "Siemens Schuckert Werke" with the power of 112 kW.¹⁹³

The hydroelectric power plant that supplied electricity in Ivanjica was built in 1911.¹⁹⁴ The decision on the construction of the hydroelectric power station was made at the time of a significant rise in the Serbian economy. Although Ivanjica has been far away from any other relevant business centers in Serbia, many wealthy business people who have had enough of strong ties with foreign countries, especially the urban centers of the Austro-Hungarian Empire, had their residence set up in this small town. Prominent trader Mališa Atanacković established the "Electroindustrial joint-stock company of Ivanjica".¹⁹⁵ Work on the construction of the power plant started in 1908.¹⁹⁶ There were many difficulties in buying the land, facilities, and financing, and this soon led to the interruption of works that were continued in 1910.¹⁹⁷ Hydroelectric equipment was delivered by the "Siemens Schuckert Werke" company.¹⁹⁸ At that time, no good roads led to Ivanjica, so the turbines with the power of 205 hp and "Siemens Schuckert" generator of 160 kVA for polyphase electricity production, were dragged by oxen to Ivanjica.¹⁹⁹ The new hydropower plant was put into operation on St. Nicholas Day,

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¹⁹² Dragomir Marković (Ed.), *I sinu viđelo iz reke* [Light shines from the river], (Beograd: Elektrodistribucija Srbije, 2011): 23–25.

¹⁹³ Marković, (Ed.). *I sinu viđelo iz reke*, 23–25.

¹⁹⁴ Cvetković, *Od Đetinje do Đerdapa*, 117-118.

¹⁹⁵ Spasojević, *Pionirski period elektrifikacije Srbije*, 32.

¹⁹⁶ Cvetković, *Od Đetinje do Đerdapa*, 117-118.

¹⁹⁷ Ibid.

¹⁹⁸ Marković. *Korak ispred vremena*.43.

¹⁹⁹ Stanojević, *Električna industrija u Srbiji*, 18.

December 19, 1911, and in the beginning, it has supplied private and public lighting. Later, the plant fed a wool carding mill and saw-mill, as it was already mentioned.

However, since the electrification was more of a private than a state initiative, the city of Niš got electricity only in 1908, nine years after the city council launched the first initiative for the construction of the power plant. The city hydroelectric power plant was built on the river Nišava in Sićevo gorge near the monastery of St. Petka, as was determined at the end of 1899.²⁰⁰ For the construction of the power plant, the city of Niš gave the administration funds for 600,000 dinars.²⁰¹ The project was developed in 1903 by an engineer Aćim Stevović. The work was slowed down by dynasty shifts and changes of government. The job was finally entrusted to the "Simens Schuckert Werke" company from Vienna. At the beginning of the 1908 transmission line was built, starching from the hydroelectric power plant to Niš in the length of 25 km and the city's power network with ten substations. The hydropower plant had two Francis turbines of 300 hp and two generators of 250 KVA.²⁰² When it opened on September 8, 1908, a hydroelectric power station "Sv, Petka" was the largest hydroelectric plant in the Kingdom of Serbia.²⁰³ By the time of the Balkan wars, a reserve power plant was built in Niš that was powered with diesel engines.²⁰⁴

The last town that had electricity before the First World War was Veliko Gradište. Its excellent position on the Danube and the government's intentions to build an essential hub for railway networks have made Veliko Gradište a natural candidate for this significant

²⁰⁰ Spasojević, *Pionirski period elektrifikacije Srbije*, 54.

²⁰¹ Istorijski arhiv Niš [Historical Archive Niš] F. 15, Uprava Fondova grada Niša I okoline 1901-1925

[[]Administration of the Head of the Funds of the city Niš and surrounding areas 1901-1925], 111, 69. ²⁰² Cvetković, *Od Đetinje do Đerdapa*, 59.

²⁰³ Spasojević, *Pionirski period elektrifikacije Srbije*, 80.

²⁰⁴ Marković. *Korak ispred vremena*. 50.

modernization progress.²⁰⁵ In the beginning, the municipality was negotiating with the company Ganz from Budapest.²⁰⁶ The municipality failed to obtain a loan from the administration, and the negotiations were interrupted. Soon a new contractor was found. It was the Viennese branch of the company "Siemens Schuckert Werke".²⁰⁷ Experts from the company suggested that the hydropower plant should be built on the river Pek. It was equipped with a power turbine of 135 hp and a generator of 120 kVA.²⁰⁸ The hydroelectric power plant began operating in mid-1914, on the eve of the World War.

The power plant that supplied Belgrade's public and private lighting and special public transport was the first public power plant on the territory of future Yugoslav countries.²⁰⁹ The total power produced by this power plant was 441.3 kW DC. It was previously mentioned that from the 62 kilometers of the city network, seven kilometers were arc lamps, bought from the "Siemens" company.²¹⁰

²⁰⁵ Marković, ed. *I sinu viđelo iz reke*, 44-51.

²⁰⁶ Cvetković, *Od Đetinje do Đerdapa*, 59.

²⁰⁷ Siemens-Archiv München, SAA 1165

²⁰⁸ Siemens-Archiv München, SAA 1165

²⁰⁹ Stojanović, *Kaldrma i asfalt*, 156.

²¹⁰ Nikola Vučo, "Beogradska električna centrala 1892-1914", ["Belgrade Electric Power Plant 1892-1914"], *Godišnjak grada Beograda* 24 (1977): 167.

Croatia – Part of the Empire

As mentioned in a previous chapter, at the time of first electrification efforts, Croatia was part of the Austro-Hungarian Empire. In comparison to other regions of the Empire, Croatia was relatively underdeveloped. By the end of the nineteenth century, the industry started to develop more rapidly, especially in the northern parts of Croatia.

The industry was building up and more investments in the electrification of industrial city centers, notably Zagreb and Osijek. Many small businesses had their own power plants, but wider electrification for the public use was rare. As the public interest in electrification grew, cities in Croatia considered more involvement in building public power plants. Before the wider usage of electricity, many cities (Osijek, Rijeka, Crikvenica, Rovinj, Zagreb, and Vinkovci) supplied public lighting with gas. Similarly to Serbia, many experts voiced introducing electric lighting because of easier maintenance and a healthier environment. Public electrification in Croatia, as part of the Austro-Hungarian Empire, can be divided into two periods: from the beginning of the introduction of electrification until the beginning of the twentieth-century and period from 1900 until the beginning of First World War.²¹¹

The idea of implementing electric lighting in Zagreb appeared at the same time as in other European cities. Professor Ivo Stožir conducted the first public demonstration of electric lighting in Zagreb in 1877.²¹²

²¹¹ A century of Hrvatska Elektroprivreda [Century of Croatian Electro Industry]. (Zagreb, 1995): 62-63.

²¹² Boris Maričković (Ed.), *Razvoj elektrifikacije Hrvatske* [Development of the electrification in Croatia], 1. dio, 11.

The history of Zagreb's electrification began on December 24, 1887, when F. Fischer from Vienna proposed to the city administration "an offer and a draft contract based on which he would build a power plant for generating electricity, which would supply to those who want electric power to drive machines".²¹³ On May 3, 1888, the Electric Lighting Committee of Zagreb sent a request to Vienna, Salzburg, and Timisoara for information on their experience with electric lighting.²¹⁴ The question of electrification of Zagreb prompted passionate debate as city administration received numerous offers. Six years after the beginning of the discussion on electrification, information about the Zagreb case was published in the journal Elektrotechnische Zeitschrift on November 3, 1893.²¹⁵ It stated that the former Croatian Member of Parliament E.F. Bothe received a concession from the City of Zagreb in 1891 for the construction of a power plant, provided that he posts the first installment and begin work within a year.²¹⁶ However, this did not happen. The city of Zagreb decided to refuse Bothe's offer and build the power plant at its own expense. Interested in the electrification of the city he lived in, famous Croatian painter, Iso Kršnjavi, submitted his report on how Zagreb should be electrified.²¹⁷

Similarly to Belgrade, Kršnjavi asked a crucial question: "Can the city introduce electric lighting in addition to gaslighting?"²¹⁸ Kršnjavi studied the case of Frankfurt, where the construction of a city power plant had been planned since 1889, but no decision could be made

²¹³ Državni arhiv u Zagrebu [State Archive Zagreb]. HR-DAZG-4 Gradsko poglavarstvo Zagreb 1850-1918, box 2457, "Ponuda Fischer-a iz Beča poglavarstvu Zagreb" 1887. See also: S. Knežević. "Urbanistički razvoj gradova kontinentalne Hrvatske u 19. stoljeću". In: Pelc, M. (Ed.), *Prvi kongres povjesničara umjetnosti Hrvatske. Knjiga sažetaka*. (2003). Zagreb: Institut za povijest umjetnosti

²¹⁴ Razvoj elektrifikacije Hrvatske, 33-35.

²¹⁵ Elektrotechnische Zeitschrift, Vol. 14, 1893. 60.

²¹⁶ Ibid. 67.

²¹⁷ Hrvatska narodna I sveučilišna knjižnica u Zagrebu, 875/1943. "Referat Prof. Dr. Kršnjavoga o električnoj razsvjeti", 1890, 1-2.

²¹⁸ Ibid. 6.

due to the choice of system.²¹⁹ In 1892, Nikola Tesla visited Zagreb and held a lecture on the advantages of Zagreb's electric lighting. In his presentation, Tesla, based on his own experience, advised the use of alternating current.²²⁰ The debate in favor of gas or electric lighting continued in the next fifteen years, and many plans and offers passed on the agenda of the city administration. Finally, Zagreb made a decision on in august 1906 to build a steam-powered thermal power plant on the location of a water pumping station in Zagreb. The power plant was built and put into operation in 1907. Engineer Rudolf Vrbanić was appointed the first manager of the power plant.²²¹ The Zagreb power plant was equipped with two steam engines "Ruston" of 800 hp, directly connected to a three-phase current generator "Ganz" 865 kVA, 100 A, 5000 V, 50 Hz and a direct current generator "Ganz" 200 kW, 333/243 A, 600/820 V.²²²

Karlovac, a town on three rivers (the Kupa, Korana, and Mrežnica), had excellent potential for the construction of a hydroelectric power plant. In 1905, it was decided to build a dam on the Ozalj waterfall and get a free fall of 9 meters. Engineer Valerian Riezner designed the power plant in Ozalj. Contractor "Payer and Company" equipped the power plant with two Francis turbines of 900 hp. The turbine is mounted on the rotor of a three-phase generator 750 kVA, 5 kV, 50 Hz. Two overhead lines were built to illuminate the village of Ozalj and the town of Karlovac. Two 1500 kVA transformers were installed in the transformer station in Karlovac.

Electrification of Čakovec in Međimurje, as in many similar places, is associated with the introduction of public lighting. True, public lighting existed in the place as early as 1842,

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²¹⁹ Ibid. 7.

²²⁰ Narodne novine, "Nikola Tesla o električnoj raszvjeti u Zagrebu"LVIII, 120, 25.05.1892.

²²¹ Razvoj elektrifikacije, 34.

²²² Ibid. 35.

when 48 rapeseed oil lamps lit the streets.²²³ In 1892 Čakovec administration considered introducing gaslighting and proper installations, initially only for experimental purposes, such as lighting. However, the owner of the mill from Gútorföld in Hungary, Lajos Molnár, made an offer to build a power plant, which would supply electricity to Čakovec - public lighting and private apartments, under the condition that the land and building materials are provided free of charge.²²⁴ On April 24, 1893, a contract was concluded between the trading municipality and Lajos Molnár, with the assignment of a parcel of 3600 hv on the site of the future mill. The Čakovec municipality undertook to pay L. Molnár 2,500 forints a year for public lighting, and L. Molnár was obliged to place four arched lamps and 80 light bulbs in the streets and squares.²²⁵ The power plant was equipped with a 2 x 175 V DC voltage generator and a propulsion machine.²²⁶ Since Lajos Molnár was over-indebted to the Čakovec Savings Bank, as early as 1897, the Paromlin and the power plant became its property. During 1901, the power plant purchased an additional 180 hp steam engine and a new 2 x 48 kW dynamo. As this has reduced the cost of electricity production, the electricity grid has expanded, and the number of consumers has increased.²²⁷

Town Sisak built a power plant in 1907 for the purposes of public lighting. In 1911, Petrinja built a power plant equipped with two "Grazer" diesel engines of 80 hp, with DC generators "Križik" of 60 kW, 240 V and a "Grazer" diesel engine with a "Siemens" DC generator of 18 kW, 240 V. Town Topusko built a power plant in 1911 equipped with two 35 hp "Leobersdorfer" diesel engines with 30kW "Ganz" DC generators.

²²³ Károly Zrínyi. *Monografija Čakovca*. (Čakovec, 1905): 11.

²²⁴ *Muraköz*, 52/IX, 25. 12. 1892, Čakovec

²²⁵ Hrvatski državni arhiv [Croatian State Archive]. HR-HDA-1421-1-10-4 Zaladska županija (Međimurje) 1858-1972. Protokol Ureda poglavarstva Zaladske županije, spis broj 9, 12.05.1893.

²²⁶ Károly Zrínyi. *Monografija Čakovca*. 17.

²²⁷ Đurđa Sušec (Ed.). *Elektra Čakovec 1893-2003*. (HEP: Čakovec, 2003): 28.

According to the data in the area of Hrvatsko Zagorje before the First World War, there was no public lighting except in Varaždin. A power plant in Varaždin provided public lighting since 1895. When built power plant had three steam engines with AC generators of 50 kVA. Moreover, in central Croatia, a significant number of small towns had public lighting before 1919, such as Pakrac in 1906, Križevci in 1912, Nova Gradiška in 1913, and Ivanić grad in 1914.

In Istria, the city of Pula got the first electric lighting in 1900. In 1893 island of Brijuni built a first power plant equipped with a 25 hp engine and 110 V DC generator. The city of Vodonjan provided electric lighting in 1889 acquired from the private power plant owned by Pietro Marchesi.

The hydroelectric power plant Kraljevac started operating in 1913. The exact date of the commissioning of the power plant is unknown. A report on the Dalmatian electrochemical industry published in Vienna in June 1913 mentions HPP Kraljevac: "Work is in full swing on the completion of the power plant and, according to all forecasts, it will be put into operation as soon as possible, perhaps in a few months."²²⁸ In the first stage of construction (1912), two units with 18,000 hp turbines and generators with a nominal power of 16,000 kVA were installed.²²⁹

On waterfalls of Krka River near Skradinski Buk, the first integrated power system in Croatia started operating with the building of hydropower plant "Jaruga I". The main propagators of ideas for building this power plant were Ante Šupuk, mayor of Šibenik, and Vjekoslav Meichsner. In 1893 Meichsner completed designs for building of power plant. In his

²²⁸ H. Lipschütz, "Ein Gang durch die Kalkstickstoffwerke Dalmatiens", *Wiener Landwirtschaftliche Zeitung*, 18. 6. 1913, 21. 6. 1913.

²²⁹ Tonko Fagarazzi, "Hidroelektrana Kraljevac 1912 u Europskom kontekstu". Omiški ljetopis 7 (2014): 5-70.

request, he stated that power plant would produce electricity for the lighting and "transfer of power".²³⁰ Municipal authorities of Šibenik issued permission to Meichsner in April 1894 for building transmission lines on the town's property. Finally, in 1895 power plant started operating with ceremonial switching of public lighting. Company "Ganz", who equipped the power plant, has not had any experience in building such a power plant so "Jaruga I" was, in a way, sort of an experiment. Jaruga power plant is historically relevant because it was a twophase plant. More developed European cities such as Frankfurt, Rome, or London had a onephase system at the time of Jaruga construction.²³¹ Krka-Šibenik power system was among the first integrated power systems not just in Europe but in the world.²³² Power plant "Jaruga I" was equipped with a Girard turbine of vertical type and two-phase alternator "Ganz" of 320 kVA, 3000 V, 42 Hz. In 1903, hydropower plant "Jaruga II" started operating.²³³

Hydropower plant in Manojlovac started operating in 1906. It was power up by four horizontal Francis turbines with a twin-rotor 6000 hp, and four 5200 kVA generators, 30000 V, 42 Hz.²³⁴ Parallel with the construction of the first three-phase system, based on the hydro plant Manojlovac, connection to the Šibenik developed as well.²³⁵

The Dubrovnik's electrification was encouraged by the Municipality of Dubrovnik in 1897 when Franjo Gondola suggested establishing a special committee for electrification. Thus, in September 1898, the city administration signed a contract with the "Gesellschaft für

²³⁰ Jure Moser. *Šibensko Munjivo*. (Juraj Sizgorić City Library, Šibenik, 1998.)

²³¹ Marko Delimar, Aleksandar Szabo, and Luka Lugarić. "First Integrated Electric Power System in Croatia". EUROCOON (2007) The International Conference on "Computer as a Tool", Warsaw, 2648-2651. ²³² Ibid. 2651.

²³³ Marijan Kalea. *50 godina organiziranog prijenosa električne energije u Hrvatskoj*. (Zagreb, 2008): 44.

²³⁴ Hugo Tenzer. "Hydroelektrische Anlagen am Kerkaflusse in Dalmatien". *Elektrotehnik und Machinenbau*. Vol. 26: Zeitschrift Des Elektrotechnischen Vereines in Wien 1908.

²³⁵ First Integrated Electric Power System in Croatia, 2650.

elektrische Industrie – ELIN" from Vienna²³⁶ and in June 1901, Dubrovnik received first electric lighting.²³⁷ What is surprising is that the local press did not pay any particular attention to this event. This attitude can be interpreted as a hint that no one was satisfied with the conditions of the concession that were determined by the contract with the company "ELIN".²³⁸

In the region of Slavonia and Baranja, electrification was tied with the wood and flour industry. In Županja, public lighting was introduced in 1883, when the city was connected to the power plant of Tannin and Barrel factory.²³⁹ Similarly, in Đakovo, first public lighting came from the saw-mill in 1885.²⁴⁰ In Đurđenovac, public supply with electricity came from the flour industry, as well. Moreover, the electricity that was used for lighting purposes in the households of saw-mill workers was free of charge.²⁴¹

The streets of Vukovar were lit even before the introduction of electric lighting in 1909. From the second half of the 19th century, permanent street lighting was maintained in Vukovar. In the archives and minutes from the sessions of the Trade Representation, it is written that lanterns lit the market place with kerosene.²⁴² Radivoje Paunović, the representative in the city council, stated in the session of May 23, 1902: "... that he is prepared to supply electric lighting for the same amount of money that municipality currently provides for lighting..." with the

²³⁶ Arhiv Jugoslavije [Arcives of Yugoslavia]. MTI, kut. 1288, br. 2272. Dopis Općine Dubrovnik br. 10538, Dubrovnik, 23.11.1925.

²³⁷ Državni arhiv u Dubrovniku [State Archives Dubrovnik] DAD.Općina Dubrovnik, Zapisnici sjednica općinskog vijeća 1922-1925, II, br. 9917: 371-372. ²³⁸ lbid.

²³⁹ Ibid.

²⁴⁰ Mirko Marković. "Đakovo i Đakovština". *Zbornik Đakovštine* 1, JAZU, Centar za znanstveni rad Vinkovci, Zagreb (1976): 262.

²⁴¹ A century of Hrvatska Elektroprivreda. 64.

²⁴² Državni arhiv u Vukovaru [State Archive Vukovar]. HR DAVU SCVK 58. Zapisnik Trgovišnog zastupstva, Vukovar, 1871.

assessment that a lucrative business is in sight.²⁴³ A year later, in 1904, the commitment to the introduction of electric lighting became clearer. We learn from "Sriemske novine" that a municipality conducted a survey to collect data on who wants to install electric lighting in their household.²⁴⁴ The electrification of Vukovar took place in 1909. Discussions lasted for many years, negotiations with "Ganz" from Budapest took a long time, and in the end, the job went to "Hungaria". The municipality of Vukovar signed a contract with "Hungaria-Hanffabrik".²⁴⁵ The power plant in Vukovar was equipped with a three-phase "Brown-Boveri" 440 kVA, 42 Hz generator. The high voltage transmission line was 3, 5 km long, and a low voltage network of 110 V connected city via 11 kV transformers. Ceremonially, first light bulbs were turned on December 19, 1909.²⁴⁶

In Našice, the first power plant was built in 1910. In the contract signed by municipality of Našice and "Našice Electric Company" it is stated that the contractor has to respect the norms and build the power plant in the given time frame of two years.²⁴⁷ Našice power plant was equipped with two steam locomotives that powered four 16 kW, 220 V generators via belts. The power plant also had a rechargeable battery with a capacity of 216 Ah, 220 V.²⁴⁸ In Beli Manastir, the city network was connected to the Dairy Factory in 1910.

In Slavonska Požega, similar to Belgrade, a debate between whether the city should use gas or electricity for lighting, was ongoing for an incredible thirty years. Finally, in 1906 a

 ²⁴³ Državni arhiv u Vukovaru [State Archive Vukovar]. HR DAVU SCVK 58 Zapisnik Trgovišnog zastupstva, Vukovar, 1902., broj 266

²⁴⁴ Sriemske novine, 1904, XVIII, 79, and 93.

 ²⁴⁵ Državni arhiv u Vukovaru [State Archive Vukovar]. HR DAVU SCVK 58. Zapisnik Trgovišnog zastupstva, Vukovar, 17.08.1908.

²⁴⁶ Sriemske novine, XXII, 102, 22.12.1909.

 ²⁴⁷ Državni arhiv u Vukovaru [State Archive Vukovar]. HR DAVU SCVK 58. Gradsko poglavarsvo Vukovar 1881-1945. Ugovor između opštine Našice i Našičke štedionice o izgradnji munjare.
²⁴⁸ Ihid.

decision was made in favor of electric lighting. Municipality of Požega hired company "Payer and Co." to build a hydropower plant in Kuzmica on river Orljava.²⁴⁹ The power plant in Kuzmica was equipped with Francis turbine with 250 hp, three-phase "ELIN" generator with 215 kVA, 6.3 kV, 50 Hz, diesel engine "Leobensdorfer" with 200 hp and three-phase "ELIN" generator with 155 kVA, 6.3 kV, 50 Hz.²⁵⁰ It was officially put into operation on October 6, 1912.

The frequency has been a complicated issue since the beginning of the application of alternating current. However, around 1900 an attempt was made to equalize the frequency (50 Hz in Europe, 60 Hz in America). "Hungary was the birthplace of the AC system, so it is easy to understand that in electrical plants once built by Ganz & Co., the frequency is 42 Hz."²⁵¹ The Association of German Electrical Engineers (VDE) in Berlin recommended this frequency for all new plants on the eve of the First World War.²⁵²

 ²⁴⁹ Đurđa Sušec (Ed.), Stoljeće električne energije u Požegi 1912-2012. (HEP, 2012): 75-87. See also: Miroslav Badanjak. Energija u Požeštini i obilježavanje 90. Obljetnica HE Kuzmica. (Požega, 2002.)
²⁵⁰ Ibid. 84.

²⁵¹ J. Liska–E. Wilczek, Die Spannungsnormalien des Ungarischen Elektrotechnischen Vereins, *Elektrotechnische Zeitschrift*, 41 (1920), 1052 –1054.

²⁵² Normen für Periodenzahl und Spannungen elektrischer Anlagen (ausgenommen elektrische Bahnanlagen), Elektrotechnik und Maschinenbau, 38 (1920), 477.

Montenegro – Light in the Mountains

At the beginning of the twentieth century, the area of today's Montenegro was politically divided into three parts: the independent state of Montenegro, the coastal part under the rule of Austro-Hungary, and the area of Polimlje and Potar under the rule of the Ottoman Empire. In the economic life of the Principality of Montenegro, at the beginning of the twentieth century, there was some progress, which was not so great that it could significantly reduce the pronounced economic underdevelopment and poverty. From the end of the nineteenth century, there was an inflow of foreign capital in the Montenegrin industry, mostly Italian.²⁵³

At the beginning of the twentieth century, interest for electricity and its application in industry and everyday life did not surpass Montenegro. In a request to the Minister of the Interior from 1906, asking for financial help to go to Budapest for a six-day lecture about gas-fired generators, Cetinje mechanic Petar Drecun assumed that Cetinje and Podgorica would soon be illuminated. However, the Ministry of Interior did not support this request.²⁵⁴

In addition to industrial development, modernization ventures, which not only had economic significance but also symbolized Montenegro's entry into a new era, including the start of operation of the first power plant in Cetinje. Before Cetinje received electric lighting in 1910, kerosene lanterns were used for street lighting and other larger Montenegrin cities.²⁵⁵

²⁵³ Books on the history of Montenegro: Kenneth Morrison. *Montenegro: A Modern History*. (I.B. Tauris, 2009); Elizabeth Roberts. *Realm of the Black Mountain: A History of Montenegro*. (Cornell University Press, 2007); Francis Seymour Stevenson. *A History of Montenegro*. 2002.

²⁵⁴ Inženjerska komora Crne Gore, Strukovna komora Elektro inženjera, Istorijat (Varia).

²⁵⁵ Cetinjski Vijesnik, 15.08.1910.

There are no records in the Archives in Cetinje that would indicate any plans for introducing electric lighting in Montenegro at the end of the nineteenth century. However, Montenegrin officials from the Ministry of the Interior, which was in charge of public affairs, must have known that such novelty was introduced in Belgrade in 1893. In 1909, the newspaper article published that the Montenegrin government plans to introduce electric lighting in Cetinje. The newspaper article states that on the occasion of the prince's jubilee - fifty years of rule²⁵⁶, the construction of new buildings in Cetinje should start immediately, and the town should be introduced with electric lighting.²⁵⁷ After lighting trials with gas lamps, the city administration finally made an official decision for the lighting of Cetinje.

Again, as in the case of Belgrade and Zagreb, Cetinje also had a debate on whether to use gas or electricity. Some experts were not too keen on the choice of gaslighting pushed by the city administration. Two companies responded to the official announcement of the Cetinje town administration - one from Germany and another from the Czech Republic. However, negotiations were not successful. One of the bidders, an entrepreneur from Germany, proposed the introduction of electric lighting in Cetinje. In March 1910, Emanuel Kraus from Trieste made an offer in favor of the introduction of electric lighting. Finally, in May 1910, the municipality of Cetinje signed an agreement with Emanuel Kraus. The news that Cetinje would soon receive electric lighting was published in the newspapers on May 22, 1910.²⁵⁸ Emanuel Kraus procured diesel engines, generators, and other equipment for the power plant. The power plant was equipped with two 60 hp diesel engines and two 55 kW generators purchased in

²⁵⁶ Nikola I Petrović (1841-1921) was the ruler of Montenegro from 1860 to 1918, reigning as a prince from 1860 to 1910 and as the country's first and only king from 1910 to 1918.

 ²⁵⁷ "Električno osvjetljenje na Cetinju". *Cetinjski Vjesnik*, 9.05.1909.
²⁵⁸ Cetinjski Vjesnik, 22.05.1910.

Graz.²⁵⁹ The power plant produced three-phase electricity, and the total length of the high-voltage network was 3,500 meters.²⁶⁰

In September 1913, the city administration of Cetinje formed a committee of local industrials, with an idea to buy the power plant from its foreign owner. As a reason for this, the article states that the government wanted to own a power plant, as it considered that something so important should be "in the hands of Montenegrins".²⁶¹

In Bar's first usage of electric power, the radio-telegraph station on Volujica (Bar) began operating in late July 1904. In his article, Zvezdan Folić states that an unnamed article from 1959 provides the data about the second diesel-powered power plant, which began to operate in 1906.²⁶² However, in the archives of Bar and the fund of the Montenegrin Ministry of Interior, there are no documents to confirm this information. Moreover, news about the commissioning of the new power plant in Bar was not published in the official newspaper "Glas Crnogorca", although that does not mean that it did not start working in that period. This information should be taken cautiously. It is possible that a new power plant existed in 1906 and private ownership, but information that it supplied public lighting is questionable.

What is certain is that in 1911, in Bar, local administration established "Society for the construction of the power plant".²⁶³ Jovan Dade, a landowner from Budapest, also intended to build a power plant in Bar. He addressed the Montenegrin Ministry of the Interior with a request to approve the construction of a steam mill and a power plant. Ministry approved his

²⁵⁹ Državni arhiv Crna Gora [National Archive Montenegro]. CG DA 1 CET. Ministarstvo inostranih djela [Ministry of Foreign Affairs]. 2083 (3).

²⁶⁰ Ibid.

²⁶¹ Cetinjski Vjesnik, 7.09.1913.

²⁶² Zvezdan Folić. "Začeci elektroenergetskog sistema Crne Gore"[Begginings of the electric system in Montenegro]. *Matica Crnogorska* 53 (2011): 363-384.

²⁶³ Državni arhiv Crna Gora [National Archive Montenegro]. CG DA 2 BAR. Kraljevska Oblasna uprava u Baru [Royal district administration Bar], 1576.

request, but the project was never realized, and there is no information about why it never happened.²⁶⁴ Finally, after several unsuccessful attempts to build a public power plant, the first public power plant in Bar was installed and put into operation in 1913.²⁶⁵ The Bar power plant had two diesel engines, with a total power of 66 hp and two three-phase AC generators, with a total power of 60 kW. The generators produced three-phase of 50 hertz and a voltage of no more than 250 volts.²⁶⁶

One of the most significant projects in the field of electrification in the Kingdom of Montenegro was the construction of the first hydroelectric power plant on Morača. The idea for this venture came from engineer Ante Dešković, a citizen of Austro-Hungary, a native of Dalmatia. In 1911²⁶⁷ Dešković addressed the Montenegrin government with a request to grant him a concession for the construction of hydroelectric power plants on the Morača River, submitting a study on the economic importance to the government and justification of such an endeavor. Dešković proposes the construction of a hydroelectric power plant, with a capacity of up to 90,000 hp, and a transmission line from the hydroelectric power plant to Bar. From this main transmission line, connections would be made for all major towns in Montenegro.²⁶⁸ The government gave Desković two concessions for the construction of a hydroelectric power plant near the Morača monastery, and the other for the construction of a hydroelectric power plant near the Morača

²⁶⁴ Državni arhiv Crna Gora [National Archive Montenegro]. CG DA 2 BAR. Kraljevska Oblasna uprava u Baru [Royal district administration Bar]. Collection of Projects, Varia, 1912.

²⁶⁵ Živko M. Andrijašević (Ed.). *100 godina crnogorske Elektroprivrede* [100 years of Electro Industry of Montenegro]. (Nikšić, 2010): 22.

²⁶⁶ Ibid. 23.

²⁶⁷ Drešković already made trips to Montenegro before 1911. During 1902 and 1903, Dešković came to Montenegro with a group of Italian engineers, who studied the conditions for the construction of the railway, as well as for the exploitation of forests and ores.

²⁶⁸ Državni arhiv Crna Gora [National Archive Montenegro]. CG DA Ministarstvo untrašnjih djela [Ministry of Interior], 2046/1 (14.05.1911)
Gorica.²⁶⁹ A few weeks after obtaining the concessions, Dešković undertook the first preparatory actions to build the power plant. However, works on the building of the plant had to be stopped because of the unrest on the border between the Kingdom of Montenegro and the Ottoman Empire, and the beginning of the Balkan War (September 25 / October 8, 1912). Despite the war, Dešković did not give up the construction of hydroelectric power plants on Morača, so in 1912 he submitted a proposal to the Montenegrin government to approve the transfer of the concession to a company that would have its shareholders in France.²⁷⁰ This request has been approved, but the outbreak of the First World War, in which Montenegro joined in August 1914, interrupted this endeavor.

CEU eTD Collection

²⁶⁹ *Glas Crnogorca*, XL, 19 (1911), Zakon o koncesiji Anti Dreškoviću, 25.04.1911.

²⁷⁰ 100 godina crnogorske Elektroprivrede. 29.

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In this short overview, it is clear that electrification processes in Serbia, Croatia, and Montenegro developed on different levels. One thing in common to all regions is the lack of interconnected electrical networks. First power plants remained confined to the local areas, and rarely even supplied neighboring villages. Power plants built for the needs of public lighting initiated interest for the electrification of the households. However, the privilege of having electricity in the private household remained in the hands of the wealthier part of the population.

It is quite clear that electrification took place without a plan. First, power plants were built in industrial areas and exclusively for the needs of production. Stepping towards mixed power plants (power plants used both for the needs of industry and public) happened only in those areas where such a thing was deemed profitable. Also, the cities tried to have power plants in their possession and do not depend on private owners. Examples of the concession agreements gone ill are testimony to municipalities' efforts to have power plants under their jurisdiction. Hydropower plants were built where it proved to be the easiest and most profitable. Notably, Croatia took the lead in building hydroelectric power plants not only for its reach water potential but because of more educated experts (engineers and architects) and access to the substantial capital. In contrast, the enormous potential of the Morača River in Montenegro was not fully used even though the government showed interest in exploiting this source. Inequality in the economic and industrial development of these regions affected the relations that would be established after 1919.

Electrification efforts 1918-1929.

As previously mentioned, the economic structure of Yugoslavia was relatively unbalanced between the two world wars. There is no debate over whether, at the moment of establishment in 1918, Yugoslavia was a country with substantial economic, cultural, and developmental differences. The northern regions benefited from development when they were part of Austro-Hungary. Slovenia, Croatia (Croatia proper, Slavonia, Istria, and Dalmatia) and Vojvodina suddenly became the most developed parts of the country, in contrast to their former status of underdeveloped regions on the outskirts of the Austro-Hungarian Empire. In the Kingdom of Serbs, Croats, and Slovenes and later in Yugoslavia, these territories are the most developed part of the country, especially Slovenia. At the same time, Zagreb will become an industrial and financial center of the Kingdom of Yugoslavia.²⁷¹ The southern regions struggled with underdevelopment in many infrastructural aspects.²⁷²

However, the creation of a single state and significant investments in its economic development did not improve the situation. The differences between the regions were significant at the end of the shared state as well as in its beginning. There are numerous reasons for this situation, but it is possible to pinpoint two main reasons: the centralist organization of the Kingdom and its agrarian character. The complete economic uniformity of the country was also reflected in its political diversity.²⁷³ Thus, the country had six customs zones, five

 ²⁷¹ Mari-Žanin Čalić. Socijalna istorija Srbije 1815–1941, Usporeni napredak u industrijalizaciji [Social History of Serbia. Delayed development of industrialization] (Beograd 2004): 203–207.
²⁷² Ibid. 203–207.

²⁷³ More on the political aspect of the Kingdom of Yugoslavia: John R. Lampe. *Yugoslavia as History: Twice There Was a Country.* (Cambridge University Press, 2000); Stevan K. Pavlowitch. *The Improbable Survivor: Yugoslavia*

currencies, four railway networks, and three types of banking systems. Mutual doubts and mistrust exacerbate the problematic state of the economy and administrative chaos. There was also great dissatisfaction with the uneven tax policy and the granting of state loans. As in all of Central and Eastern Europe, post-war inflation stimulated investment. This was profitable because inflation reduced the costs of debt, taxes, and wages.²⁷⁴

When the internal political problems of the Kingdom of Yugoslavia are set aside, industrialization was one of the most pressing problems. In the first half of the twentieth century, the prevalence of electricity use was mostly a parameter based on which country's economic development was measured.²⁷⁵ Before the First World War, the territory of the Kingdom of Serbs, Croats, and Slovenes was divided into six administrative areas in four states. This determined ways and capacity of development of the electric power grids, as it was already mentioned in the previous chapter. Power plants are rarely built according to a specific plan or with the possibility of connecting via transmission lines. Electric companies were formed in more densely settled areas where it had been shown that there were enough consumers of electricity. In 1918 on the territory of Yugoslavia, 223 general-purpose power plants and 40 municipal power plants were used. However, there was no systematic electrification of the country, and only a small electrified part of the railway served the public.²⁷⁶

and its Problems 1918–1988. (Columbus: Ohio State University Press, 1988); Mira Radojević. "On the problem of democracy and parliamentarianism in Yugoslavia between the two world wars". *Istorijski zapisi* (2012) 85 (3–4): 99–110; Snežana Trifunovska. *Yugoslavia through Documents: From Its Creation to Its Dissolution*. (Martinus Nijhoff Publishers, 1994); Branko Petranović. *Istorija Jugoslavije* 1918-1974. (Beograd: Nolit, 1988.)²⁷⁴ Čalić. *Socijalna istorija Srbije*, 210-211.

²⁷⁵ Electrifying Europe, 61.

²⁷⁶ Maxmilián Čížek. Elektrotechnika v Československu, Jugoslávii a v Rumunsku. In XX. Sjezd ESČ. Congrès électrotechnique. Elektrotechnický svaz československý. Praha, 1938, 38.

The lack of a real branched electrical network conditioned the construction of small and medium power plants, built for local purposes and needs. Industrial companies wanted to own their own power plants and rarely showed any interest in interacting with the government on this subject.²⁷⁷ On the other hand, the electrification of the villages was utterly unprofitable. This is not surprising, keeping in mind that interwar Yugoslavia was predominantly agrarian.²⁷⁸ However, even in wealthy Austria, which lost some of its coal resources for electricity after 1918 and slowly shifted to hydropower, household electricity consumption remained flat during the interwar period.²⁷⁹ Electricity, as the most modern driving force at that time, influenced the development of almost all economic branches. However, in the mid-1930s, those familiar with this topic in Serbia pointed out that the electrification of Yugoslavia was only in its infancy.²⁸⁰

In the very first years, the new government made significant efforts to encourage new investments and to support industrial development. Strivings for unified state regulations did not surpass the electric industry. However, in the first two years, more pressing matters such as the establishment of new borders, the issue of agrarian regulation, currency inequality, the problem of war invalids, and the non-existence of the constitution were pushing the question of the electrification in the second plan. In few sessions of the National Assembly, the question of the need for uniform electrification was raised but with no further involvement of the state officials. The only effort made towards this direction was the Regulation on establishing the *General Directorate of Water Flows* under the *Law on Waters* from 1905 as part of the

²⁷⁷ Mladen Milaković. "Električne centrale u Srbiji 1882–2006"[Electric power plants in Serbia], *Flogiston* 14 (2006): 53.

²⁷⁸ Stevan Kukoleča. *Analiza privrede Jugoslavije pred Drugi svetski rat* [Analysis of Yugoslav industry before World War II], (Beograd 1956): 5.

²⁷⁹ Sandgruber, 45-49.

²⁸⁰ Momčilo Petrović, "Naš program"[Our programe], SEP, *Časopis Saveza električnih preduzeća Kraljevine Jugoslavije*, I, 1 (1936): 1.

Ministry of Agriculture and Water, with departments in the regions. This regulation is brief and more of an administrative nature, where electrification is only mentioned as part of the body's competencies.²⁸¹ However, this regulation brought some alleviation to the former Austro-Hungarian territories where a particular law hampered the process of electrification on waters and autonomous water regimes.²⁸² The exploitation of the river potentials to build power plants was made more accessible. More detailed law on waters and water cooperatives was passed in 1920.²⁸³ This act was not much different from one passed a year before, only more detailed in an administrative sense.

For the needs of the law regulations concerning power plants and utilities newly established Kingdom used the *Standard Act on construction and operation of plants in the Kingdom of Serbia* from 1902 and *Regulations for taking exams for installers of power plants and operators of power plants* from 1911.²⁸⁴

Of course, these legal acts were not nearly enough to accommodate the growing needs of regulation, the electric industry, and further development of the electrical network. Therefore, in 1920 in Belgrade, a select committee established by the Ministry of Transport held a session where the country's electrification was discussed. The result of this meeting was a proposal for the law of electrification on the state level. This plan for electrification anticipated that with the direct cooperation of state capital that would be invested in the

²⁸¹ "Uredba o ustanovljenju i uređenju Direkcije Voda Kraljevstva Srba, Hrvata i Slovenaca" [The Regulation on establishing the General Directorate of Water Flows] *Službene novine Kraljevstva Srba, Hrvata i Slovenaca* [Official Gazette of the Kingdom of Serbs, Croats and Slovenes], (1919), I, 15, 8.03.1919.

²⁸² Simone Gingrich. "Foreign trade and early industrialization in the Habsburg Monarchy and the United Kingdom — Two extremes in comparison." *Ecological Economics* (2011), Volume 70, Issue 7, 1280-1288.

²⁸³ "Regulation on the establishment of Water cooperatives on the territory of the Kingdom of Serbs, Croats, and Slovenes." Službene novine Kraljevine Srba, Hrvata i Slovenaca [Official Gazette of the Kingdom of Serbs, Croats and Slovenes], (1921) III, 53, 9.03.1921.

²⁸⁴ "Regulations for taking exams for installers of power plants and operators of power plants." *Srpske novine. Službeni dnevnik Kraljevine Srbije* [Serbian Gazette. Official Gazette of the Kingdom of Serbia], (1911) LXXVIII, 154, 16.07.1911.

construction of large power plants with declared legal security and exemption from taxes and other easements in which their construction took place, the electrical network could be further developed and integrated. However, this proposition did not pass the National Assembly discussion and remained unrealized.²⁸⁵

In 1920 Council of Ministers of the Engineering Section passed the directive that the field of electric utilities would be regulated according to the German VDE (Verband Deutscher Elektrotechnik) regulations. This directive was part of the *Law on Protection of Industrial Property*, which adopted rules on measures, standards, and materials. This law specified regulations on telegraphy and telephony, conductors, electrical network material, electric lighting, devices for regulating electric currents and generators, and transformers.²⁸⁶ Unfortunately, this law was not enough to support the development of electrification.

In the period from 1924 until 1928 the Ministry of Agriculture and Waters formed a special committee with the task to study the possibilities of the water exploitation of the Iron Gates (Đerdap) on Danube.²⁸⁷ The Head of this committee was engineer Sergije Matić. The question of the Iron Gates was the topic of debate even earlier, during the Paris peace conference when the new state's borders were being established. Serbian politician Nikola Pašić noted that it "…would be beneficial to utilize Danube Iron Gates potential for production of the electrical energy".²⁸⁸ Foreign investors were interested in that particular area, encouraged by

²⁸⁵ Marković. *Korak ispred vremena*. 44.

²⁸⁶ "Law on Protection of Industrial Property." *Službene novine Kraljevine Srba, Hrvata i Slovenaca* [Official Gazette of the Kingdom of Serbs, Croats and Slovenes], (1920) II, 267, 30.11.1920.

²⁸⁷ Nikola Maksimov. Rad na studiji o generalnom uređenju dunavskog sektora zvanog "Đerdap". Plovidba i iskorišćavanje vodene snage. Elektrotehnički izveštaj, Ministarstvo poljoprivrede i voda, Generalna direkcija voda, Đerdapska sekcija, (Beograd, 1928): 33.

²⁸⁸ Bogdan Križman and Bogumil Hrbak. *Zapisnici sa sednica delegacije Kraljevine SHS na Mirovnoj konferenciji u Parizu 1919-1920.* [Proceedings from the sessions of the delegation of the Kingdom of Serbs, Croats and Slovenes at the Peace Conference in Paris 1919-1920], (Beograd: Institut društvenih nauka, 1960): 265.

the success of the Rheine-Maine-Danube Channel. They were considering the possibility of constructing something similar to the Danube section in Yugoslavia. Even though this plan was mainly oriented on the sailing potentiality of Đerdap region, utilization for the electric potential was also considered. Teams of engineers, geologists, and economists created a plan to build two dams with power plants.²⁸⁹ One would be built on Greben and Donji Milanovac and another one on the Sip and Karataš. According to this plan, power plants would significantly accelerate the electrification of the eastern part of the country.²⁹⁰ However, this plan, too, remained only on paper and was cut short by the global economic crisis.

Private individuals mostly built distribution networks in concession. Private initiatives' legal uncertainty was an obstacle to significant investments of private capital in electricity systems for general electrification.²⁹¹ Initially, it was not clear how the state would regulate the relationship between public and private electricity investments. However, the state was not interested in amending the electricity law, which was supposed to provide security to the private sector while overseeing large power plants with a wide range of its surroundings.²⁹² Appropriate tariffs needed to be set in order for electricity to become a regular part of life for the population, industry, agriculture, and the tertiary sector. Proponents of the regulated and planned electrification were domestic businessmen, the professional public, and representatives of foreign capital. They emphasized that Yugoslavia had all the natural conditions and resources necessary for the development of electrification. Appeals were made to the

²⁸⁹ Sergije Maksimov. *Rad na studiji o generalnom uređenju dunavskog sektora zvanog "Đerdap." Plovidba i iskorišćavanje vodene snage. Rezime*. Ministarstvo poljoprivrede i voda, Generalna direkcija voda, Đerdapska sekcija, (Beograd, 1928): 11, 23.

²⁹⁰ Arhiv Jugoslavije [Archives of Yugoslavia], F. 334 Ministry of the Foreign Affairs, 334-654-1928, 2273, 3222; 334-655-1929, 3741, 4766. See also: F. 369 Delegation of the Kingdom of Yugoslavia in the International Danube Commission, 369-26/II, 259/27.

²⁹¹ Hausman. *Global Electrification*, 3-35.

²⁹² Đurović, *Intervencionizam*, 56-57.

competent ministries to pass a law on electrification, which would regulate the matter, provide legal security for foreign investments, and define the state's place in significant future undertakings in the field of electrification.²⁹³

Without a general plan, the electrification process continued in an incoherent way and without any particular agenda in all parts of the country. Electrification was left to private initiative and mostly remained at the level of individual enterprises.²⁹⁴ The increase in demand for electricity after the First World War forced the owners of power plants to expand their facilities, invest in the new machinery, or engage in the construction of new plants. In this period, considerable municipal ownership and initiatives in electrification could be found in countries with limited development like the Kingdom of Serbs, Croats, and Slovenes, but in developed countries such as Germany or Denmark.²⁹⁵ Furthermore, in places where the local authority had a certain degree of independence from the central government, motivation for expanding the electrical network was directed by private business and pressure from the citizens for more competent services.

²⁹³ Ibid.

²⁹⁴ Stevan Popović, "Industrija Beograda"[Industry in Belgrade], *Politika*, 10. 09. 1938, 8.

²⁹⁵ Milward. *Private and Public Enterprise in Europe*. 38-40.

Serbia – Aferwar Years

In Serbia, the expansion of the electrification continued and was organized to some extent. The engineering organizations and business owners pushed interest in the systematic electrification; however, only parts of these initiatives materialized. The presence of foreign capital was noticeable, and "Siemens" enterprises enjoyed a nearly complete monopoly on electric utilities.²⁹⁶

The power plant in Belgrade was significantly damaged during the bombing in the First World War in 1915. After the liberation of Belgrade, the city needed to take over all communal duties and try to sanitize the damages as soon as possible. Thus, the power plant, together with the trams, passed into the Belgrade municipality's hands.²⁹⁷ Although the municipality took over the management of this company in 1919, the owner was still a Belgian joint-stock company.²⁹⁸ During the 1920s, the need for electricity production increased as the city became the capital of an enlarged state. However, the production of electrical energy in the entire country was deficient at that time. In 1925, only 353 million hp were produced, which corresponded to an 80 hp turbine that works 12 hours a day.²⁹⁹ In the period between 1921 and 1926 in Belgrade, there was an increase in consumption due to the increase in population (from over 4 million kWh per year in 1921 to about 15.5 million kWh per year in 1926).

²⁹⁶ Ranka Gašić. "Strani kapital u elektrifikaciji Beograda 1918-1941. Slučaj elektrane Svetlist i snaga". *Tokovi istorije* (2/2014): 11-32.

²⁹⁷ Istorijski arhiv grada Beograda [Historical Archive of Belgrade]. IAB-1-1 Opština grada Beograda [Municipality of Belgrade] Zapisnici odbora opštine beogradske, Knjiga zapisnika odborskih odluka, Zapisnik sednice II, 10.12.1918. See also: *80 godina elektrifikacije Beograda 1893-1973* [80 Years of Electrification of Belgrade], Beograd, 1973, 40.

²⁹⁸ Nikola Vučo. "Beogradska električna centrala 1892-1914", *GGB*, XXIV (1977): 165-180.

²⁹⁹ Smiljana Đurović, *Državna intervencija u industriji Jugoslavije 1918–1941* [State intervention in Yugoslav industry], (Beograd, 1986): 54.

Moreover, the municipality devoted significant efforts to repair and make the power plant operational.³⁰⁰ The old Belgrade power plant was equipped with old machines, had small volume and utilization.³⁰¹

To improve this situation, the municipality was thinking about whether it was better to repair and improve the old power plant or build a new one. The opinion of experts was mainly in favor of repairing and improving the old power plant.³⁰² However, the municipality was also considering concluding a foreign loan and leasing this company. In principle, there were different views on the municipal board and in public, whether the utility companies should be run by the municipality or should be given in concession.³⁰³

In the vicinity of Niš during the interwar period worked three major power stations belonging to "Company for the production of electrical energy Niš" had been built. These are "Crveni Krst" thermoelectric power plant in Niš and two hydroelectric power plants on the river Nišava – "Sićevo" and "Sveta Petka". All three worked on a shared network to provide the local industry and the Niš municipality with the driving force. "Siemens" equipment was prevalent in all stations except in the Crveni Krst plant.³⁰⁴ Thus, hydropower plants "Sveta Petka" and "Sićevo" were equipped with three hydropower turbines bought from the Siemens Company.³⁰⁵ In the case of hydroelectric power plant "Sićevo" firm, "Siemens" was involved

³⁰⁰ Ibid. 55.

³⁰¹ For the production of one kWh in 1926, the Belgrade power plant consumed 20,944 calories. The largest power plant in France had only 5,500 calories, the most modern English 5,000 calories, and only 3,500 calories.

³⁰² Istorijski arhiv grada Beograda [Historical Archive of Belgrade]. IAB-1-1 Opština grada Beograda [Municipality of Belgrade]. "Izveštaj komisije o razlozima u korist obnavljanja stare centrale, umesto izgradnje nove."

³⁰³ Istorijski arhiv grada Beograda [Historical Archive of Belgrade]. IAB-1-1 Opština grada Beograda [Municipality of Belgrade]. Zapisnici odbora opštine beogradske. Knjiga zapisnika opštinskih odluka, Zapisnik XVIII sednice, 19.06.1925.

³⁰⁴ Istorijski arhiv Niš [Historical Archive Niš] F. 15, Uprava Fondova grada Niša i okoline 1901-1925 [Administration of the Head of the Funds of the city Niš and surrounding areas 1901-1925], 257. 91.

³⁰⁵ Arhiv Jugoslavije [Archive of Yugoslavia] F. 65 Ministarstvo trgovine I industije Kraljevine Jugoslavije [Ministry of trade and industry of the Kingdom of Yugoslavia 1918-1941], 65-610-1330.

not only in equipment but also in planning. The "Siemens" company prepared the documentation for this facility based on the data provided to the field engineer Dealer, who came from Vienna.³⁰⁶ It is noted that the Niš municipality asked the company from a branch of "Siemens" in Vienna that they send someone to work on maintaining the city's electrical grid provided by the power plant "Sveta Petka". For this purpose, the Czech engineer Antonija Trojan was sent. He was immediately appointed as manager of network maintenance. However, during this period, there were no electric meters in Niš, so Trojan traveled to Leskovac to find them there. Heads of the "Leskovac electric company" offered him a job, which he accepted.³⁰⁷ Technical novelties were applied even at the local level. Specifically, in the village of Veliko Bonjince in Pirot, a certain Vukašin Lozanić owned in 1934 a power plant equipped with a "Siemens" generator of 95 hp. In Surdulica, brothers Stojiljković, wealthy industrialists, owned the power plant that illuminated this small town.³⁰⁸ Hydropower plant "Gamzigrad" had to be expanded because the needs of the local community increased over time. The existing mechanical equipment, a particular manual control turbine could not meet these needs. Thus, in 1921, a water turbine was purchased from the company "J. M. Voith st. Polten Ganz", while the power generator 160 kVA was purchased from the "Siemens" enterprise.³⁰⁹

The "Vrelo" hydroelectric power plant started operating in 1927. In the report of March 12 of that year, "the signed members of the commission, appointed by the decision of the Ministry of Trade and Industry, for colluding inspection of the hydroelectric power plant in Perućac, met on the spot, performed an inspection (...) and gave an opinion Perućac and the

³⁰⁶ Miloš A. Kremić, "Elektrifikacija Srbije do Drugog svetskog rata" [Electrification of Serbia until the Second World War] R. Ivanković, ed, *Vek elektrike u Srbiji 1893–1993*, Beograd 1993, 49–50.

³⁰⁷ Nebojša Stanković, *Hidroelektrana "Vučje"*[Hydroelectric power plant Vučje], Leskovac 2005, 70.

³⁰⁸ A.K. Spasojević, *Pionirski period elektrifikacije Srbije*, 27.

³⁰⁹ Sanja Roslavcev, *Hidroelektrana "Gamzigrad" kod Zaječara. Svetlo sa Crnog Timoka* [Hydroelectric power plant Gamzigrad near Zaječar. Light from the Crni Timok river], (Beograd 2009): 24.

entire electrical plant in Bajina Bašta - can be allowed to work".³¹⁰ The power plant building was built on the flat part of the bank of Drina. The report of the mentioned commission states that the building is made of solid material, spacious and bright, and has two floors: the first for the turbine and the second for the electrical machinery. The horizontal Francis turbine of 80 hp, was delivered by "Ganz Danubius" from Budapest. Power was transmitted via a belt to the second floor, where a 60 kW three-phase generator was located. A high voltage switchyard was also installed on the first floor, with all the necessary instruments and apparatus needed for "measuring and conducting electricity".³¹¹

The hydroelectric power plant "Jelašnica" is located on the river Jelašnica, whose source branches from the slopes of the mountain Besna kobila. The hydroelectric power plant on Jelašnica was built by the "Joint Stock Electric Company" from Vranje in 1928. Interestingly, a hydroelectric power plant was built on Jelašnica in 1914. According to records, the plant worked only 24 hours – before it was destroyed due to sudden war actions. The power plant was never rebuilt. It was located a kilometer downstream from the site of today's hydroelectric power plant. Turbines and generators were manufactured in 1922 and were obtained as war reparations. At the beginning of the power plant, there were very few consumers. Almost three-fifths of the electricity produced remained unused. Due to that, the electrical installations in the houses of more impoverished citizens were installed free of charge.³¹²

³¹⁰ Bela knjiga Elektroprivrede Srbije. [Documents of Electroindustry Serbia] (JP EPS. Beograd, 2011.)

³¹¹ Aleksandar Tadić. "Stanje uoči II svetskog rata" [Situation before World War II] in *Elektrifikacija Srbije – Od Detinje do Đerdapa* [Electrification of Serbia – From Đetinja to Iron Gates] (Beograd, 1979): 77-81.

³¹² Aleksandar Tadić. "Stanje uoči II svetskog rata" [Situation before World War II] in *Elektrifikacija Srbije – Od Detinje do Derdapa* [Electrification of Serbia – From Detinja to Iron Gates] (Beograd, 1979): 54-81.

After the First World War, the "Užice Weaving Workshop" was always short on electricity, so at the shareholders' assembly in March 1922, it was decided to undertake all repairs at the "Pod gradom" power plant. The following year, 1923, the assembly informed the shareholders that it had obtained plans for a new dam and power plant and sent them to the Ministry of Waters for approval. The power plant's construction would begin immediately after obtaining approval, and the share capital of the Weaving Workshop increased. Permission to build a power plant with two turbines, the main dam and other facilities were obtained from the Grand Prefect of the Užice region in January 1924.³¹³ The bid of engineer Todor Šević from Belgrade was accepted at the auction for the execution of works. Due to adverse weather conditions, and above all, due to the unexplored geological composition of the land at the construction site of the dam, it was necessary to dig three meters deeper than expected. On December 31, 1926, the company requested an extension of the building permit for another two years. The installation of the equipment in the hydroelectric power plant was completed at the end of 1928, and it was noted that the power plant officially started operating on January 1, 1929.314

³¹³ Ibid. 54-81.

³¹⁴ A.K. Spasojević, *Pionirski period elektrifikacije Srbije*, 15-22; Marković. *Korak ispred vremena*. 41-55.

Croatia – In a New State

After the First World War, Croatia was in a better position compared with southern parts of the Kingdom of Yugoslavia, but still underdeveloped. Data on electrification in that period in Croatia are scarce. In an available statistic, we can see that nearly 70% of existing power plants on Croatia's territory were constructed exclusively for the purposes and needs of the industry. Public demand for electric energy was only 21%, and the remaining 9% was directed towards private consumers. The situation was nearly identical to the one in Serbia. Most of the power plants were in the hands of private contractors and associations.³¹⁵

In the province of Dalmatia, the wealthiest region of Croatia in premises of electrification, only public-oriented consumption was connected to the hydroelectric power plant "Jaruga" that supplied Šibenik with electricity.³¹⁶

The fact that the city of Split did not have electric public lighting in 1919 is an excellent example of how public power plants were rare in more developed parts of the country. The electrification of Split began immediately after the end of the war. In 1919, the City Council decided to conclude a joint investment agreement with the "Electric Company Split".³¹⁷ The first director of this company became engineer Jerko Jerić.³¹⁸ The transmission of electricity from the power plant to Majdan was realized by a 10 kV transmission line, 6.5 kilometers

³¹⁵ Vladimir Muljević. "Bilješke o razvoju elektrotehnike u Hrvatskoj"[Notes on electrotechnical development in Croatia]. *Elektrotehnika 24* (1981): 4-15.

³¹⁶ Ibid. 4-15.

³¹⁷ Državni arhiv u Splitu [State Archives Split]. Poduzeće poštanskog, telegrafskog i telefonskog saobraćaja Split. HR-DAST-93-15-63.

³¹⁸ Imenik članova Udruženja inženjera, arhitekta i geodeta u Splitu, *Tehnički list*, Zagreb (1/1919): 4, 51-53.

long.³¹⁹ In 1920, the municipality warned the citizens in the newspaper "Novo doba" that touching electric cables was strictly forbidden. The article states that some citizens dried their clothes on wires.³²⁰ The expansion of the electricity network in Split was continually being worked on. In 1923, the city administration signed a contract with the company "Sufid",³²¹. In 1926 a 50 kV transmission line Dugi Rat – Split was built and in 1927 the existing electrical network of Split was connected to the hydroelectric power plant Kraljevac.³²² The city of Sinj was electrified in 1923, and in 1929 the power plant was additionally equipped with a 120 hp "Langen Wolf" generator.³²³

It has already been mentioned in the previous chapter how complicated the electrification of Dubrovnik was. The situation did not change significantly, even after the war. Reconstruction of the power plant was necessary.³²⁴ To draft the reconstruction plan, the municipal government in Dubrovnik hired an engineer from the Czech company "Kolben",³²⁵. At the beginning of 1927, the reconstruction of the power plant was entrusted to the company "ČKD" from the Czech Republic.³²⁶ The power plant is equipped with a 450 hp "Grazer W. F"

³¹⁹ Jerko Jerić, Die Elektrizitätsversorgung der Stadt Split (Spalato) und ihrer Umgebung, *Elektrotechnik und Maschinenbau* 48 (1930): 478–480.

³²⁰ "Električna rasvjeta u Splitu." *Novo doba*, III, 37, 14.2.1920; "Za električnu rasvjetu"Novo *doba*, III, 55, 6.3.1920.

 ³²¹ Ernest Radetić. "Četrdeset godina elektrifikacije Splita"[Forty years of electrification of Split]. *Energija* (1960):
8-10.

³²² Arhiv HE "Kraljevac"- Varia. See also: Hrvoje Požar and Slavko Butara, Proizvodnost hidroelektrane Kraljevac i njezina uloga u razvoju elektrifikacije Dalmacije, *Energija* 11 (1962): 19–25; Marin Čizmić. "Statistički podaci za HE Kraljevac" [Statistical Data for the HE Kraljevac] *Energija* 11 (1962): 53–54.

³²³ "Elektrifikacija jednog dijela srednjeg Primorja," *Jadranska straža*, 12 (1934), 167.

³²⁴ Državni arhiv u Dubrovniku [State Archives Dubrovnik]. Zbirka plakata [Posters Collection], *Pitanje električne centrale*, 10.02.1921.

³²⁵ Arhiv Jugoslavije [Archives of Yugoslavia]. F. 65 Ministarstvo trgovine i industrije Kraljevine Jugoslavije [Ministry of Commerce and Industry of Kingdom of Yugoslavia], 1288 - 2272. Dopis velikog župana Kneževića 6651/25. Dubrovnik, 27.5.1925; dopis 21317/25, Dubrovnik, 23.12.1925.

³²⁶ Arhiv Jugoslavije [Archives of Yugoslavia]. F. 65 Ministarstvo trgovine i industrije Kraljevine Jugoslavije [Ministry of Commerce and Industry of Kingdom of Yugoslavia], 1288 - 2272. Rješenje ministra trgovine i industrije 4544, Beograd, 4.XI.1927.

diesel generator, with a 380 kVA generator, 6300 V, 50 Hz.³²⁷ The following year, 1928, a 470 hp "Kolben" diesel generator with a 400 kVA, 6300 V, 50 Hz generator was also supplied.³²⁸

For the region of northern Croatia, the leading supplier of electric power was a power plant in Ozalj, and in 1922 Zeleni vir hydropower plant was commissioned for the needs of Gorski Kotar. In the continental part of Croatia, there were only two large capacity power plants: thermal power plant in Zagreb and hydroelectric power plant Ozalj, which supplied Karlovac with electricity.³²⁹ After the war, as the main economic and cultural center of Croatia, Zagreb began to develop and expand rapidly, so it was necessary to increase the installed capacity of the city power plant. The sharp increase in consumption required an increase in the installed power of the source, but it was also necessary to strengthen the distribution network.³³⁰ The original single-phase system could no longer meet the needs of the network, so the transition to a three-phase system (3x220) was proposed. However, this proposal did not meet the needs, so in 1924 a decision was adopted to switch from a single-phase low-voltage network of 110 V to a three-phase network (3 x 380/220 V).³³¹ All these efforts were not enough, and Zagreb was in a constant shortage of electricity. Because of that, city engineers proposed a plan of building a hydropower plant on the Sava near Krško, which would produce

 ³²⁷ Boris Markovčić. *Popis elektrana u Hrvatskoj, Dalmaciji, Bosni I Hercegovini* [List of electric power plants in Croatia, Dalmatia, Bosnia, and Herzegovina] (Ekonomski institut Zagreb, 1945): 56.
³²⁸ Ibid. 56.

³²⁹ Josip Moser, *Pregled razvoja elektroprivredne djelatnosti u Hrvatskoj 1875–2000* [Development of the Croatian electro industry], (Kigen, 2003): 45.

³³⁰ Stoljeće Hrvatske elektroprivrede [Century of Croatian Electro Industry], (HEP: Zagreb, 1995): 28-45.

³³¹ *Razvoj elektrifikacije*, 13-48.

13 200 kW.³³² However, this plan was deemed too ambitious and expensive, so Zagreb was finally connected to the hydropower plant "Fala" in Slovenia.³³³

After the war, in 1925, the "Ozalj" hydroelectric power plant was also equipped with an additional diesel generator "Grazer W. F" of 1000 hp, and a "Siemens" 900 KvA, 5 kV generator, due to problems in the water level of the river Kupa.³³⁴ In the period from 1926 to 1928, reconstruction was undertaken on the "Ozalj" hydroelectric power plant.³³⁵ Despite all the measures taken, during periods of low water levels on the Kupa River, there was a constant shortage of electricity. Because of this, engineers considered the possibilities of building a thermal power plant on lignite deposits in the area of Zorkovac or the construction of another hydroelectric power plant on the Kupa.³³⁶

The power plant in Sisak got additiona equipment in 1921. A "Grazer W. F" 50 hp diesel engine is installed, with a 37 kW, 480 V "Siemens" DC generator.³³⁷ In Glina, the municipal government on their own initiative built a public power plant in 1925, which they financed by selling the nearby forest. The power plant was equipped with an 85 hp diesel engine, with a three-phase "Siemens" 60 kVA, 50 Hz generator. The local network of 4 kilometers was three-phase 380/220 V.³³⁸

³³² Đurđa Sušec (Ed.), Stoljeće svjetla u Zagrebu: 1907 – 2007 [Century of Lighting in Zagreb]. (Zagreb, 2007): 38-40.

 ³³³ J. K, "Hidroelektrična centrala u Fali" [Hydroelectric power plant in Fala] *Tehnički list* 5 (1923): 129–130.
³³⁴ A Century of Hrvatska Elektroprivreda. Zagreb, 1995, 88-96.

³³⁵ Ibid. 88-96.

³³⁶ "HE Ozalj 1 I 2" <u>https://www.hep.hr/proizvodnja/hidroelektrane-1528/pp-he-zapad/he-ozalj-1-i-2/1544</u>, last accessed on May 21, 2020.

 ³³⁷ Vlatko Čakširan. 100 godina Elektre Sisak 1907 – 2007 [100 Years of Electra Sisak]. (Aura: Sisak, 2007): 30-57.
See also: Vlatko Čakširan. Gradska munjara Sisak 1907 – 1947 [City power plant Sisak]. (Gradski muzej Sisak, 2007.)

³³⁸ Razvoj elektrifikacije, 66.

According to the available data, only four places in the territory of Hrvatsko Zagorje have been electrified in this period: Krapina, Lepoglava, Zlatar, and Zelina. After the connection to Varaždin, in addition to the already mentioned, fifteen more power plants were registered in this area, which was used only for personal needs.³³⁹

The electrification of the city of Crikvenica was carried out in 1926. The electrification designer was engineer Kurschner from Zagreb.³⁴⁰ The construction costs were covered by the concessionaire Martin Belen in cooperation with the city municipality. Three diesel generators were installed in the power plant. The overhead electrical network was 16 kilometers long. The high voltage network had a voltage of 3 kV, and the local network 380/220 V.³⁴¹ "Siemens d.o.o" from Zagreb electrified the city of Senj in 1928.³⁴² Two diesel engines, "Grazer W. F" of 35 hp, were installed, with three-phase "Siemens" generators of 30 kVA, voltage 400 V, 50 Hz. The plant was handed over to the city municipality for use, but due to the high price of electricity, only 75 households were connected.³⁴³

The Zeleni vir hydroelectric power plant at the source of the Curak stream was the leading supplier of the entire Gorski Kotar.³⁴⁴ The main initiator of the construction of this power plant was Josip Lončarić, a construction entrepreneur who made significant efforts to bring in well-known experts to determine the technical possibilities as well as the economic

³³⁹ Dragutin Feletar. "Razvoj elektrifikacije severozapadne Hrvatske do Drugoga svjetskog rata" [Development of the electrification of northwestern Croatia until Second World War]. *Ekonomska I Ekohistorija* Vol. 2, 2 (2006): 104-148. See also: Vladimir Huzjan. *Na kraju: o počecima elektrifikacije Grada Varaždina* [In the end: about the beginnings of electrification of the City of Varaždin]. Unpublished article from the Conference: Niskougljični razvoj: paralelni razvoj zelene energije, zapošljavanja i zaštite okoliša, in Varaždin, Croatia, 29.11.2017.

 ³⁴⁰ Ernest Kurschner. "Općeniti pregled prirodnih snaga u Jugoslaviji." *Tehnički list* 6, 22 (1924): 13-25.
³⁴¹ Ibid. 13-25.

³⁴² Đurđa Sušak (Ed.) Četrdeset godina HE Senj [Forty Years of HE Senj]. (Zagreb: HEP, 2006.)

³⁴³ *Razvoj elektrifikacije*, 33-50.

³⁴⁴ Margareta Paver. *50 godina Hidroelektrane "Zeleni Vir"*[50 Years of Hydropower Plant "Zeleni Vir"]. (Elektroprimorje Skrad, 1971): 47-62.

justification for the construction of this power plant.³⁴⁵ The hydroelectric power plant was built according to the project of engineer Valerije Rizner.³⁴⁶ Construction began in the spring of 1920, and the power plant was equipped with a water turbine "Voith- St. Pölten" with a power of 1185 hp and a three-phase "Siemens" 1020 kVA generator, 5500 V, 50 Hz. "Siemens" supplied and installed all electrical appliances, and the power plant was officially put into operation in 1921.³⁴⁷

Croatian islands also got a push forward in expanding the electrification network. The city power plant in Omišalj on the island of Krk was built in 1925. It was equipped with a "Grazer W. F" 36 hp diesel generator and a 27 kVA, 400 V, 50 Hz "ELIN" generator.³⁴⁸ The island of Rab was entirely electrified by the end of 1926. From 1925, the power plant was owned by a certain Franjo Kukilić. The power plant was equipped with a 25 hp diesel generator and a 27 kW "Siemens" DC generator. In 1927, the power plant was equipped with another "Siemens" diesel engine of 100 hp as well as a one-way "Siemens" 65 kW generator.³⁴⁹ The island of Hvar received an electricity network in 1925. The power plant was equipped with a 40 hp "Wolf" diesel engine and a 25 kW DC generator. The power plant was additionally equipped in 1928 with a 15 hp "Deutz" diesel engine and a 10 kW "Sachsenwerk" DC generator.³⁵⁰The island of Korčula was electrified relatively late, only in 1929. At that time, the

³⁴⁵ Razvoj elektrifikacije, 88-101.

³⁴⁶ Ibid, 88-101.

³⁴⁷ *Razvoj elektrifikacije*, 88-101.

³⁴⁸ Ing. El. Franjo Magaš. *Podsjetnik na devedesetu obljetnicu prve elektrifikacije na otoku Krku*. (Krk. 2015): 1-2.

³⁴⁹ *Razvoj elektrifikacije*, 192-195.

³⁵⁰ Ibid. 192-195.

first city three-phase power plant was put into operation.³⁵¹ The power plant had two diesel engines of "ČKD" 50 hp, with two three-phase generators 40 kVA, 400 V, 50 Hz.³⁵²

The electrification of the Lika area, home of the scientist Nikola Tesla, began relatively late. His birthplace, Gospić, got the first power plant in 1925. The power plant was equipped with a 56 hp motor with a "Ganz" 45 kVA three-phase generator, 400 V, 50 Hz. The low-voltage network was three-phase and about 3 kilometers long. In 1929 it was additionally equipped with a "Siemens" 120 kVA generator. In other places such as Perušić and Otočac, there was a small number of privately-owned power plants with relatively small capacity.³⁵³

As already mentioned, the city of Osijek in Slavonia did not have a permanent solution for the electricity supply for a long time. It was not until 1924 that an agreement was reached between the Osijek city administration and the "Charles Mac Daniels" company from Belgrade. The power plant began operating two years later. For that time, the power plant was built according to the most modern solutions and had three identical boilers and two turbogenerators. The switch consisted of two control generators and a switchboard divided into a high-voltage and a low-voltage part. Simultaneously, with the construction of the power plant, a city network was built, divided into a high-voltage part of 3000 V and a low-voltage three-phase voltage of 380/220 V. The high-voltage part of the network was 11.2 kilometers long, and sixteen transformer stations were installed in the city network. At the same time, as the power plant was ceremoniously opened, the first electric tram was launched.³⁵⁴

³⁵¹ Marinko Gjivoje. *Otok Korčula* [The island of Korčula]. (Zagreb 1969): 204-205.

³⁵² *Razvoj elektrifikacije*, 192-195.

³⁵³ Milan Grijak. *Elektrifikacija Like* [Electrification of Lika]. (NOK: Elektrika Gospić, 1962): 11-23; 30.

³⁵⁴ Državni arhiv u Osijeku [State Archive of Osijek]. Collection of the documents from Electro-Slavonia. Varia; Vjekoslav Hengl (1904-1941) HR-DAOS-871, box. 25, 26. See also: *Elektrifikacija grada Osijeka* [Electrification of Osijek City], 1927 (Unknown author); "Električni Božić grada Osijeka" [Electrical Christmas of Osijek]. *Hrvatski list* (1926); *Pravila Jugoslovenskoga deoničarskog društva za plin i munjinu u Osijeku* [Regulations of Yugoslavian

The power plant in Vukovar was in a rather neglected condition in the period after the war, and it also had shortages of coal.³⁵⁵ Because of this, in 1921, engineer Fantoni from Zagreb was invited with the task of inspecting all parts of the power plant and compiling a plan for the necessary reconstruction. After the assessment, it was decided that the reconstruction was necessary, and in 1924 the works were started.³⁵⁶ The works were awarded to Lang Maschinen Fabrik from Budapest. A new water-tube boiler was installed in the power plant, as well as a horizontal steam engine. The total length of the low-voltage network was 23 kilometers, and 17 transformer stations were installed in the city network.³⁵⁷

The city of Vinkovci decided in 1928 on the electrification of the city and surrounding villages. The city sent a request to the company "Jugoslovenski Siemens" from Zagreb to prepare a study for electrification, and the construction of the power plant began in 1929. For unexplained reasons, places near Vinkovci were not connected to the network.³⁵⁸ In 1919, the city municipality of Đakovo decided to electrify the city.³⁵⁹ The works on the construction of the power plant lasted until 1921. However, too many consumers were connected to the network, and the generator was loaded already during the trial operation. The following year, 1922, engineer J. Kovač, a domestic expert in electrical engineering, returned to Đakovo. He compiled a study on the method of reconstruction of the power plant network in Đakovo, it had an 80 hp "Langen Wolf" drive motor, a 60 kVA three-phase "Siemens" generator, 3150 V,

shareholders group for the power plant in Osijek], Osijek, 1926; *Pravila elektrane slobodnog kraljevskog grada Osijeka* [Regulations of the Electric Company of the city Osijek] 1927.

³⁵⁵ Državni arhiv u Vukovaru [State Archives Vukovar]. Gradsko poglavarstvo Vukovar (1881-1946). HR DAVU SCVK 58, 31. (6001-12233)

³⁵⁶ Razvoj elektrifikacije, 104-142.

³⁵⁷ Ibid, 104-142.

 ³⁵⁸ Ante Visković. Verzei der Elektritatswerke fur Allgemeine Stromveesorgung in Jugoslawien, Jug. Siemens, 1931.
³⁵⁹ Joso Lakatoš, Industrija Hrvatske i Slavonije [Industry of Croatia and Slavonia], Naklada "Jugoslavenskog Lloyda," (Zagreb, 1924): 530.

50 Hz.³⁶⁰ In Slavonski Brod, negotiations on electrification of the city lasted from 1923, and the power plant was finally put into operation in 1927.³⁶¹ On the other hand, the power plant that supplied Slavonska Požega was overloaded, so in 1922 it was equipped with an additional unit. In 1929 a 350 hp "Deutz" diesel engine and a 260 kVA "ELIN" generator were also installed in this power plant.³⁶²

³⁶⁰ *Razvoj elektrifikacije*, 104-142.

³⁶¹ Državni arhiv u Slavonskom Brodu [State Archives Slavonski Brod]. Gradsko poglavarstvo Slavonski brod (1918-1945). HR DASB 6-II (c) Gradska Elektrana [Electric Power Plant Slavonski Brod], Zapisnik [Official meeting records] 1927-1932. See also: Ivan Rubić. Slavonski i Bosanski Brod. *Studij o ekonomsko-geografskoj strukturi* grada i okoline. Historijski arhiv Slavonski Brod.

³⁶² Mirjana Šperanda. *100 godina elektrifikacije u Požegi* [100 Years of electrification in Požega]. (Gradski muzej Požega. 2012): 22. See also: Filip Potrebica. *Razvoj elektrifikacije i plinofikacije u Požeškoj kotlini*, 1985.

Montenegro –In the Shadow

Becoming the part of the vast South Slavic state, which was characterized by a high degree of centralization, Montenegro lost the ability to control the main currents of its economic life, as well as to create development plans for any industrial area. In the interwar period, the most substantial part of the population in Montenegro (about 85%) still lived in rural areas, mainly providing for their livelihood from agriculture and livestock. In addition to the two power plants in Cetinje and Bar, with which Montenegro entered a common state, the electrification of other places in Montenegro began in the 1920s. Eleven public power plants operated in the area of today's Montenegro: in Cetinje, Bar, Herceg Novi, Risan, Tivat, Lepetani, Zelenica, Kotor, Podgorica, Nikšić and Kolašin. Apart from Cetinje and Bar, which were installed before 1918, all the others were built in the interwar period.³⁶³

In 1925, the privately-owned power plant in Herceg Novi started producing power. The power plant was powered by diesel engines of 40 kW, while the generator voltage was 110 volts. It produced direct current. After the power plant in Herceg Novi, the public power plant in Kotor started operating in 1926. The power plant had a power of 53 kW and produced three-phase electricity. It had three diesel engines, with a total power of 75 hp and three generators, which provided electricity of 220 volts for lighting and 320 volts for industrial use.³⁶⁴

At the end of 1927, the construction of a power plant in Nikšić was completed, which provided lighting for city streets and a large number of private houses. The power plant was put

³⁶³ 100 godina crnogorske elektroprivrede, 31-33.

³⁶⁴ Jovo Mandić. "Razvoj i elektrifikacija Herceg Novog i okolice"[Development and Electrification of Herceg Novi and surrounding areas]. In: *Boka. Zbornik radova iz nauke, kulture i umjetnosti* 36 (2016), Herceg Novi, 241-259.

into operation on December 11, 1927. It produced three-phase electricity, and its power was 90 kW. The power plant initially had one propulsion machine of 30 hp, which ran on diesel fuel, and in 1930 another diesel engine of 100 hp was connected.³⁶⁵

In the same year, the public power plant started operating in Podgorica.³⁶⁶ The Podgorica power plant was in municipal ownership. The plant was powered by diesel engines, with a power of 208 kW, and produced three-phase electricity. Three years later, the Podgorica power plant increased its production by putting a new diesel generator into operation.³⁶⁷

At the beginning of 1927, the power plant in Kolašin was built. The power plant was put into operation in 1929. The municipality-owned the power plant, and it operated on a locomotive (steam) drive, with a power of 68 kW. The Kolašin power plant produced direct current, and the generators gave a maximum voltage of 44 kV.³⁶⁸

Most likely, in 1928, the power plant in Risan started operating. The power plant produced power of 155 kW, while the generator voltage was 380 kV. The plant produced three-phase electricity.³⁶⁹

In 1929 as the power plant in Zelenica, a power plant was installed in Lepetani, which was owned by the army of the Kingdom of Yugoslavia. The plant operated on diesel engines, with a power of 100 kW, and had generators that produced three-phase electricity, with a

³⁶⁶ Državni arhiv Crne Gore [National Archive Montenegro]. CG DA 2 POD. Zetska banovina (1929-1941). Varia.

³⁶⁵ Državni arhiv Crna Gora [National Archives Montenegro], CG DA 2 NIK. Građevinska komisija Nikšić [Construction Comeettee]. Book 2. See also: "History of Montenegrin Electric Industry" <u>https://www.epcg.com/o-nama/istorija</u>, last accessed on May 17, 2020.

³⁶⁷ Ibid. "Description of the current state of the city power plant 1931."

³⁶⁸ Miodrag Barjaktarović Bago. *Prve hidroelektrane Gornjeg Polimlja* [First hydroelectric power plants of Gornje Polimlje region]. (Bijelo Polje: Pegaz, 2005): 61-79.

³⁶⁹ Živko Andrijašević. *100 godina crnogorske elektroprivrede* [100 Years of Montenegrin Electro Industry]. (Nikšić, 2010): 35-37.

maximum voltage of 380 volts.³⁷⁰ In addition to these power plants, there was a Yugoslav power plant owned by the Yugoslav army in the Bay of Kotor, for which we have no data on the year of establishment. It is known that it worked on diesel engines, 390 kW, with generators with a maximum of 380 volts.³⁷¹

The Tivat power plant produced three-phase electricity. In addition to the construction of new ones, the facilities of public power plants from the period of the Kingdom of Montenegro were modernized, and their power and production increased. In 1929, another diesel fuel engine with a capacity of 90 hp and a three-phase generator with a power of 87 kVA was purchased for the power plant in Bar, which had total power of 147 kVA.³⁷²

The power plant in Cetinje increased its power in 1927, with the purchase of a diesel engine of 150 hp. The power of this engine was greater than the power of the two existing ones (120 hp in total). The purchase of a new "Brown-Boveri" engine was recommended by an expert commission in June 1927, which assessed this engine as the most economical and most suitable for the technical conditions of the Cetinje power plant.³⁷³

Depending on the production proportion of power plants and production costs, the price of 1 kWh of electricity varied from place to place. The cheapest electricity was charged by the power plant in Bar, 5 dinars for one kWh, and the most expensive was electricity from the power plant in Herceg Novi, 15 dinars for one kWh.³⁷⁴

³⁷⁰ 100 godina crnogorske elektroprivrede. 37.

³⁷¹ Ivo Stjepčević. Führer durch Kotor (Cattaro) und die Bocche: [mit 16 Abb., 1 Stadtplan und 1 Karte der Bocche]. (Kotor, 1927): 20-70.

³⁷² 100 godina crnogorske elektroprivrede. 37-38.

³⁷³ Državni arhiv Crne Gore [National Archive Montenegro]. CG DA 1 CET. F. Varia "Statistical data on electric power plants in Cetinje." ³⁷⁴ Ibid. See also: *100 godina crnogorske elektroprivrede*. 41.

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In this short overview, some common traits of the electrification process in the Kingdom of Serbs, Croats, and Slovenes are noticeable. In the first place, uneven coverage of the electric network in different parts of the Kingdom is prominent. Moreover, even in the region, coverage is not proportionate. For example, parts of Dalmatia and Lika did not have any means of electricity production before 1919 and only got some by 1929. Most of the power plants built in this period are owned by private enterprise. In rare cases of public power plants owned by the municipalities, the initiative came from the private entrepreneurs who bid for the concession. With a lack of a plan on the state level, the concession was the only way for most municipalities to build a power plant. These concessions usually meant that concessioners would build a power plant and sell electricity on fixed prices. After a certain period (usually 25 years), power plants would be in the hands of local authorities. However, concession contracts usually ended with amending the rules because, in many cases, prices were too high (especially in the period of approaching economic crisis), or concessioners themselves did not respect terms of the agreement. Secondly, the Kingdom did not lack professional experts; however, their influence in decision-making is almost nonexistent. Engineers made efforts to present plans for broader and unified electrification, but the government always deemed other things to be more critical. In such conditions question of integration of already existing power grids seemed too ambitious.

Finally, the looming question of nation-building reflected in the electrification efforts. In comparison to Serbia and Croatia (but also Slovenia and some parts of Bosnia and Herzegovina), Montenegro lagged far behind in the electrification process. In the political sense, Montenegrins felt neglected, reflecting not only in the administrative, economic, and social aspects. In such conditions straightening the feeling of belonging to the same nation, they have created an impression of an impossible task. The state failed to provide equality in access to public goods, which reflected in the electrification process as much as in any other. In newspaper articles of the time dissatisfaction with the unequal distribution of funds only further undermined existing tensions between national entities.

The Royal Dictatorship of 1929 and the Government of Milan Stojadinović (1935-1939)

On January 6, 1929 (hence the name "January 6 dictatorship"), King Alexander issued a manifesto suspending the Vidovdan Constitution, dissolving the National Assembly, and banning all parties with national, or religious characteristics.³⁷⁵

The indication that King Aleksandar I was already preparing to introduce dictatorship is a specific set of laws coupled with a royal proclamation. The Law on Protection of Public Security forbade all political parties and organizations. Organizations that remained could proclaim only the idea of the Yugoslav nation in their program.³⁷⁶ The Law on Press strictly forbade any newspaper or any other publication that spread ideas against Yugoslav nation or state in general.³⁷⁷ Finally, the most important – the Law on the Name and the Administrative Division of the Kingdom. On January 11, the King passed a law on the name and division of the Kingdom into administrative areas.³⁷⁸ The state was now called the Kingdom of Yugoslavia instead of the Kingdom of Serbs, Croats, and Slovenes. At the same time, the division into the former 33 districts was abolished in the country, and the division into nine "banovina" [plural "banovine"] was introduced. The administrative division into banovine lasted practically until the beginning of the Second World War, except that in 1939 the Banovina of Croatia was founded, which united the Savska and Primorska banovina with minor border changes. The

³⁷⁵ *Službene novine Kraljevine Srba, Hrvata i Slovenaca* [Official Gazette of the Kingdom of Serbs, Croats and Slovenes], XI, 6, 6.01.1929, 1-2.

³⁷⁶ Ibid. "Zakon o zaštiti javne bezbednosti I poretka u državi," 3.

³⁷⁷ Ibid. "Zakon o izmenama i dopunama zakona o štampi," 3.

³⁷⁸ *Službene novine Kraljevine Srba, Hrvata i Slovenaca* [Official Gazette of the Kingdom of Serbs, Croats and Slovenes], XI, 9-IV, 11.01.1929, 53-54.

mentioned nine banovine that were introduced in 1929 were: Dravska (headquarters in Ljubljana), Savska (headquarters in Zagreb), Vrbaska (headquarters in Banja Luka), Primorska (headquarters in Split), Drinska (headquarters in Sarajevo), Zetska (headquarters in Cetinje), Vardarska (headquarters in Skopje), Moravska (headquarters in Niš), and Dunavska (headquarters in Novi Sad).³⁷⁹ The banovine did not have any status of autonomy, nor could they decide on their own entirely independently. Every decision took place with the knowledge and approval of the King, who took all power into his own hands. The idea of forming banovine instead of previous administrative regions had a goal of breaking up national boundaries. Instead, outlines of banovine coincided with economic, natural, and communicative predispositions.³⁸⁰

In previous chapters, there is a broader explanation of Yugoslavism development in this period. It is clear that after 1918 and in the creation of the federal state, the process of national integration did not take a turn as expected in the beginning. The reasons for this failure are already mentioned. Furthermore, in chapters regarding the development of the electrification, this notion is additionally confirmed. According to Wimmer's methodological framework, the Kingdom of Serbs, Croats, and Slovenes failed to present itself as a decisive factor for providing public goods on equal levels. Also noteworthy is that banovine were named after the rivers (except for Primorska, named after the seaside). King Aleksandar I noted that with this move, he intended to "erase visible traces of the past, artificial boundaries of the regions which became something historical only because and during the dreadful division of our tribes".³⁸¹ In

³⁷⁹ Ibid. 53-54.

³⁸⁰ Ljubodrag Dimić, Nikola Žutić and Blagoje Isailović (Eds.) *Zapisnici sa sednica ministarskog saveta Kraljevine Jugoslavije*. (Beograd: Arhiv Jugoslavije, 2002), "Govor Petra Živkovića na XXI sednici saveta ministara 4.07.1930. "

³⁸¹ Arhiv Jugoslavije [Archives of Yugoslavia]. F. 74 Dvor Kraljevine Jugoslavije [Court of the Kingdom of Yugoslavia]. 74-38-56: 71 "Govor kralja Aleksandra novoj skupštini i Senatu 18.01.1932. "

his speech, the King stated that the previous constitution fueled divisions of the past (Yugoslavs being divided into three tribes) and intended to break up this division and completely expunge tribal differences.³⁸² In an interview with a French journalist, King Aleksandar I stated that dictatorship would be only temporary and necessary to save the country from total anarchy.³⁸³ However, dictatorship did result in a sort of unity among the clashing political parties but not in the way King desired – the political parties united in defying dictatorship.³⁸⁴On the contrary, the new administrative partition and, especially, new constitution³⁸⁵, did not alleviate existing divisions; on the contrary, it deepened them even further.

Under the rule of King Aleksandar I, Yugoslavism gained the character of state ideology in a state, and the will of the state ruled it. Therefore, expressions of this new ideology – integral Yugoslavism – mostly found manifestation in the educational system, Youth organizations such as Sokol Movement³⁸⁶, and the military. King Aleksandar I remained deaf to the calls of engineers to be included in the promotion of the new national ideology, mostly because his focus remained on the military and political parties. On the other hand, Czechoslovakia adopted the technocratic approach in an attempt to impulse distinction from Germany and establish "Czech technology and science".³⁸⁷ The Kingdom of Yugoslavia kept close relations with Czechoslovakia in the interwar period, so we can assume that King

³⁸² Ibid.

³⁸³ "Intervju kralja Aleksandra." *Politika*, 17.01.1929.

³⁸⁴ Sabrina P. Ramet. *The Three Yugoslavias: State-Building and Legitimation, 1918-2005*. (Indiana University Press, 2006): 79.

³⁸⁵ Septembarski (Oktroisani) Ustav 1931 – this constitution was proclaimed without consultations or any participation of lower bodies or representatives of the subjects/citizens to whom its provisions should apply.

³⁸⁶ Soko Kraljevine Jugoslavije was an organization whose goal was the physical and moral education of Yugoslav citizens. It was founded in early December 1929.

³⁸⁷ Martin Kohlrausch, Katrin Steffen, Stefan Wiederkehr (Ed.). *Expert Cultures in Central Eastern Europe. The Internationalization of Knowledge and the Transformation of Nation States since World War I* (Einzelveröffentlichungen des DHI Warschau, 23), Osnabrück (fibre Verlag) 2010, 10-15.

Aleksandar I was familiar with this concept of national ideology, but still did not see any practical use of it in its Kingdom. Nonetheless, organizations of engineers and power plant managers tried to influence state politics and include themselves in the processes at hand. Endeavors of these organizations to improve the existing electrical networks and upgrade them into systems were very much present. The importance of even access to a public good such as electricity did not escape the eye of the people involved in electrification networks. In their numerous attempts to seize the government's attention, engineers pointed out that people unable to enjoy the benefits of electricity would not feel like part of the same nation.

The economic crisis in Yugoslavia

The world economic crisis that erupted in 1929 nullified the modest achievements of the 1920s on a global scale. The world economic crisis "roared" through Yugoslavia between 1929 and 1932, reducing the national income of the Kingdom of Yugoslavia as much as 56%.³⁸⁸ However, the most significant impact of the economic crisis in the Kingdom of Yugoslavia was relatively late, only because Yugoslavia did not play a significant part on the world trade scale. Real difficulties for the Kingdom of Yugoslavia were felt after the collapse of the European branch of the Rothschild family in 1931.³⁸⁹ This event toppled the largest private bank in Yugoslavia, the First Croatian Savings Bank, and redirected savings to large state-owned banks in Belgrade. Consequently, it had a political impact on the aggravation of Serbo-Croatian relations.³⁹⁰

There were three primary strategies to get out of the Great Recession. The first was extensive state intervention in the economy, mostly expressed in public works (roads or railways). Countries on the European periphery have supported industries crucial to the military, such as Hungary (Győr Plan) or Germany. This, to some extent, was also the case in Yugoslavia. Another strategy for overcoming the crisis was barter, or clearing trade. The largest partner in that type of trade was Germany. The Germans were ready to help with their own investments in the exploitation of aluminum and the development of power plants. However, Yugoslavia was not the only country to practice barter trade with Germany. In all

³⁸⁸ Mirković, Ekonomska struktura Jugoslavije 1918–1941, 30–33.

³⁸⁹ Ivan T. Berend, *Ekonomska istorija Evrope u XX veku* (Beograd: Arhipelag, 2009): 76–77.

³⁹⁰ Berend, *Ekonomska istorija Evrope u XX veku*: 76–77.

countries of the region, from 1933 to 1939, Germany's share in foreign trade doubled, tripled, and even quadrupled.³⁹¹ The third strategy was to try to help the peasants, who were deeply affected by the economic crisis. The Yugoslav state took over half of the peasants' debts to help them not to face famine.³⁹² The poor and overpopulated village is the main development problem of the Yugoslav state and society in this period. For an example on how overpopulated Yugoslav village was: while 52 people were fed on 100 hectares of arable land in Germany and 84 in France, in Yugoslavia, that number was 114.³⁹³

³⁹¹ Berend, *Ekonomska istorija Evrope u XX veku*, 80,146–14

³⁹² Berend, *Ekonomska istorija Evrope u XX veku*, 82.

³⁹³ Sundhauzen, Istorija Srbije od 19. do 21. veka, 295–296.

Government of Milan Stojadinović

Efforts to expand the electric grid and make it interconnected were further hampered by the assassination of King Aleksandar I in 1934. The political situation changed, and after 1935 an awakened political life rejected the formula of unitarism. The ultimate break up with integral Yugoslavism came with the government led by Milan Stojadinović. As already brought up, Stojadinović propagated so-called "real Yugoslavism," and the state ideology, again, changed. However, Stojadinović made significant efforts to revive the Yugoslavian industry. Stojadinović strengthened his position with economic reforms, new investments, resolving the issue of peasant debts, which forgave or wrote off a part of the debt to the owners of medium-sized properties.³⁹⁴ For a long time during communist Yugoslavia, this policy was perceived as a surrender to foreign capital, because foreigners partially owned certain branches of industry, primarily metallurgy, and the wood industry. However, Stojadinović filled half of the state budget from these and other state-owned companies.³⁹⁵

There is state intervention in the economy, which is carried out and loudly advertised by Stojadinović, with opening large industrial facilities throughout the country and traveling to their grand opening by rail and car, and thus manifesting the power and unity of state and economy, but also general modernization.³⁹⁶ During Stojadinović's government, a significant number of new power plants and transmission lines were built. In this way, electrification finally got some sort of spotlight in the government plans. This would prove too late, as

³⁹⁴ Ljubodrag Dimić, "Serbien und Jugoslawien," *Österreichische Osthefte* 1–4 / 2005 (Sonderband 18: Serbien und Montenegro), 231–264.

³⁹⁵ Čalić, *Socijalna istorija Srbije*, 388–389.

³⁹⁶ Đurović, Državna intervencija u industriji Jugoslavije 1918-1941, 15.

Europe's political situation came to boil in the late 1930s, so did the interests and the focus of the Yugoslav government. Moreover, the Croatian section established its own Banovina Electric Company (BEP).³⁹⁷

³⁹⁷ Razvoj elektrifikacije, 50-53.
Silence before the war

Driven by his temporary successes, Stojadinović did not even notice how much his regime was flustered and how his political influence weakened. In February 1939, after the fall of Stojadinović's government, the way was opened for negotiations between the crown and the Croatian opposition in order to resolve Serbo-Croatian relations.³⁹⁸ The heated debate between new Prime Minister Cvetković and Croatian representative Maček revolved around the question of the Banovina of Croatia because Maček insisted for the Bay of Kotor, Srem, part of Bačka, parts of Bosnia and Herzegovina and Dubrovnik to be part of the expanded banovina. The final agreement on the Banovina of Croatia included the merging of two previous administrative units: the Savska and Primorska banovina, with the districts of Dubrovnik, Šid, Ilok, Brčko (Derventa), Gradačac, Travnik, and Fojnica.³⁹⁹ The jurisdiction of the Banovina of Croatia included agriculture, trade and industry, forests and mines, construction, social policy, public health, physical education, justice, education, and internal administration.⁴⁰⁰ Moreover, this administrative change affected newly established BEP and enhanced electrification efforts on Croatia's territory. In the aspect of the desires for interconnecting the electric grids, this administrative change did not help, or, better said, came too late. If this decentralization happened sooner, chances of advancing existing electrical networks and the possible creation of the interconnected system would be more likely.

³⁹⁸ Dimić, "Serbien und Jugoslawien," 253.

³⁹⁹ Branko Petranović. *Istorija Jugoslavije 1918-1978, Prva knjiga, Kraljevina Jugoslavija 1914-1941*. (Beograd: Nolit, 1981): 310-324.

⁴⁰⁰ Ibid, 317-321.

The Laws on Electrification

The electrification process spatially remained confined to the local level of municipalities. Municipal ownership over power plants that provided electricity for the public purposes had spread. In the mid-nineteenth century, power plants were still mostly in private ownership, bounded to industrial needs. However, in the early twentieth century, this situation rapidly changed. In the Kingdom of Serbs, Croats, and Slovenes, the tendency for electrification efforts to remain in the local domain is mostly caused due to three primary reasons: the agrarian character of the country, lack of clearly defined legislation concerning electrification and centrally organized state. These are not only reasons for failure to develop a more extensive and integrated electrical network. The economic situation and constant political bickering lagged down such a necessary process.

During the 1920s, the Ministry of Public Affairs prepared a systematic plan for electrification with the direct cooperation of state capital, which was invested in the construction of large power plants with declared legal security and exemption from taxes and other easements construction took place. Distribution networks were built mostly by private individuals. Legal uncertainty was an obstacle to large investments of private capital in electricity systems for general electrification. Initially, it was not clear how the state would regulate the relationship between public and private electricity investments. However, the state was interested in amending the electricity law, which was supposed to provide security to the private sector while overseeing large power plants with a wide range of its surroundings. Appropriate electricity tariffs need to be set to become a regular part of the lives of the population, industry, agriculture, and the tertiary sector.

Organizations and associations of engineers constantly reminded the government of necessity to regulate electrification in the legal framework. However, every plan of suggestion never passed further than discussion in the National Assembly. The long attempt to formulate a legal framework for the electrification was the Standard Act for normalization of voltage and frequency of the electric current in the Kingdom of Yugoslavia in 1932.⁴⁰¹ Furthermore, in 1939 an Order for electrical installations regulated what materials could be used for installations.⁴⁰² It is evident when compared to other countries in Europe at the time⁴⁰³, lack of regulatory structure for electrification made things difficult. Without a legal setting, the development of the concrete plan of systematic electrification was nearly impossible. However, engineers and industrialists did not feel discouraged, even though this legal void certainly did not make things easier for them.

⁴⁰¹ *Službene novine Kraljevine Jugoslavije* [Official Gazette of the Kingdom of Yugoslavia]. "Pravilnik za normalizaciju napona i frekvencije električne struje," XIV, 69, 25.03.1932.

⁴⁰² *Službene novine Kraljevine Jugoslavije* [Official Gazzette of the Kingdom of Yugoslavia]. "Naredba za izvođenje električnih instalacija," XXI, 235-C, 12.12.1939.

⁴⁰³ For example, Germany already had a sizeable microregional system in the 1928 – RWE system. *Boll*, Entstehung. 45.

Electrification efforts 1929-1941

In 1925, a section of the Association of Yugoslav Engineers from Zagreb issued a list of power plants stating that there were 270 power plants on the territory of the Kingdom of Yugoslavia. Then, in 1931, the "Yugoslav Siemens" company issued its initial list of public power plants in Yugoslavia.⁴⁰⁴ The most detailed census was issued by the Association of Power Plants of the Savska Banovina. This list included all power plants above 15 kW. In the introduction to the census, it was emphasized that it was compiled with great difficulty because many companies did not want to provide data, so they had to be collected privately.⁴⁰⁵ These statistics is the only source of knowledge about the state of electrification of Yugoslavia before the economic crisis of the 1930s. In statistics, power plants are classified into four groups: hydropower, diesel, gas-fired, and steam-powered or turbine-powered. Each group is further divided into public, mixed, and industrial power plants. All those that serve general electrification are taken as public power plants. In contrast, industrial ones are classified as power plants that serve only for the needs of a factory or a particular facility, e.g., hotel. Mixed power plants are those that, in addition to their own needs, also supply general consumption. The review shows that the average number and power of mixed power plants are relatively large.⁴⁰⁶ Industrial power plants are most numerous.⁴⁰⁷ There are the fewest public power

⁴⁰⁴ "Stanje proizvodnje električne energije u Jugoslaviji u 1935. ", *SEP*, Časopis Saveza električnih preduzeća Kraljevine Jugoslavije, I, 3 (1936): 29.

⁴⁰⁵ Felix Reich (Ed.). *Statistika električnih centrala Kraljevine Jugoslavije: stanje u julu 1932. godine*. (Savez električnih centrala Savske banovine, Zagreb, 1933)

⁴⁰⁶ Ibid. 89-96.

⁴⁰⁷ Ibid. 111.

plants, but their average power is 520 kW, far higher than industrial and mixed ones.⁴⁰⁸ Also, the statistics state the usage of direct current. Power plants that produced direct current are the most numerous, but their power is, on average, 73 kW.⁴⁰⁹ On the other hand, all larger power plants operated on a three-phase system, and the average power they produced was 1150 kW.⁴¹⁰ Analyzing the engagement by individual industries, foreign capital had the most significant positions at the level of the Kingdom of Yugoslavia in the electricity industry. According to available data, foreigners had 1,200,000,000 dinars invested in the electricity industry and controlled 6/10 of the entire electricity production in the country.⁴¹¹

⁴⁰⁸ Ibid. 51; 74; 115. ⁴⁰⁹ Ibid. 61.

⁴¹⁰ Ibid. 65.

⁴¹¹ Ibid. 2-177; See also: Sergije Dimitrijević, *Strani kapital u privredi bivše Jugoslavije*, (Beograd 1958): 35–41.

Serbia – Building of the Integral Network

At the beginning of the 1930s, during the great economic crisis, the two largest power plants in Serbia were built. The first in Vreoci, and the second, "Power and Light" in Belgrade. Despite the crisis, at the Annual Assembly of the Association of Electric Enterprises of the Kingdom of Yugoslavia (SEP), held in 1934 in Zagreb, the first ideas about the need to create a single power system were presented. On the territory of Serbia, the first regional power network formed in the period between 1932 and 1941. Leading suppliers of this regional network were "Vreoci" and "Power and Light" in Belgrade.

In a previous chapter, Belgrade's needs for the new power plant has already been mentioned. In the years after the establishment of a dictatorship, plans for building the new power plant were finally realized. However, the building of the "Power and Light" power plant, was a subject of controversy from the beginning. The municipality of Belgrade announced a tender for a concession for the construction of a power plant in early 1929, despite the opposition of numerous experts, both engineers, and financial analysts. Already carrying several substantial loans from Swiss and American banks, the municipality opted to make one of the terms of the tender that the winning concession would also be obliged to pay the remaining amount of the loan⁴¹² on behalf of the municipality.⁴¹³ Sixteen companies applied for the tender. Among them were the Swiss Railway Bank (Banque Suisse de Chemin de Fer,

⁴¹² In 1927 and 1929 Municipality of Belgrade took out two loans, one with a group of bankers from New York, Chase Security Corporation, and other with the Swiss Banking Association. The sum of 15 million dinars was intended to construct the new power plant, Istorijski arhiv Beograd [Historical Archive Belgrade]. Opština Beograd. Zapisnici odbora opštine beogradske, Knjiga zapisnika odborskih odluka, Zapisnik XV sednice, 4.05.1928.
⁴¹³ Arhiv Jugoslavije [Archives of Yugoslavia]. F. 125 Državna hipotekarna banka, 125-469738, "Pismo Miloša Savičića upravi Državne hipotekarne banke"

Basel) and the Yugoslav Electric AD Brown Boveri, which belonged to the same banking group. However, city administration favored the Swiss Bank and decided to bypass some legal actions to make the Swiss Bank the only bidder.⁴¹⁴ On September 2, 1929, an agreement was concluded between the Association of Swiss Banks in Basel, as a representative of Swiss financial groups, and the Municipality of the City of Belgrade.⁴¹⁵ The Swiss Bank was obliged to build a power plant of 18,999 kW in the city region, on the Sava or the Danube, and submit the project within seven months. Three months after the new plant began operating, the municipality would be obliged to connect its entire electricity network and enable it to accept and distribute a guaranteed 30 million kW. After the expiration of 25 years, all plants, together with the plots, should pass into the possession of the Belgrade municipality.⁴¹⁶ After signing the contract, the Swiss group founded "AD Snaga i svetlost" in Basel in 1930.

Relations between the concessionaire and the municipality of Belgrade were burdened from the beginning, especially after 1932, when the world economic crisis was fully felt. According to the contract, it was determined that 9.12 gold francs for 100 paper dinars should be paid at the exchange rate, which became unfeasible by 1934.⁴¹⁷ It soon became clear that the execution of the contract had become unrealistic, and the Association of Swiss Banks and "AD Snaga i svetlost" considered changing it. The terms of the contract from 1929 were changed in terms of electricity prices, payment modalities, coal procurement, and construction of

 ⁴¹⁴ Petar M. Stojković-Rašković. *Ekonomija beogradske električne centrale "Snaga i svetlost." Jedan prilog proučavanju uloge stranog kapitala u našoj narodnoj privredi*. (Beograd, 1940): 15.
 ⁴¹⁵ Istorijski arhiv Beograd [Historical Archive Belgrade]. Opština Beograd. 6. "Ugovor od 2.09.1929. između

⁴¹³ Istorijski arhiv Beograd [Historical Archive Belgrade]. Opština Beograd. 6. "Ugovor od 2.09.1929. između Društva švajcarskih banaka u Bazelu I Opštine grada Beograda, koje predstavlja predsednik Miloš Savičić."

⁴¹⁶ Istorijski arhiv Beograd [Historical Archive Belgrade]. Opština Beograd. 8. "Ugovor između opštine Beogradske I Švajcarskog udruženja banaka, Bazel."

⁴¹⁷ Istorijski arhiv Beograd [Historical Archive Belgrade]. Opština Beograd. 8. Zapisnik pojedninačnih sednica pododbora Stalnog odbora za Finansijska I pravna pitanja, 6.06.1934.

facilities.⁴¹⁸ Subsequent agreements also amended the contract regarding the obligation of the concessionaire to build a power plant and additional facilities with a total capacity of 30,000 kW in the first 15 years of the concession.⁴¹⁹

The example of this concession also indicates the way of making decisions within the network of business people and politicians connected by financial ties, with far-reaching significance for the city's economy.

The thermal power plant "Power and Light" was put into operation on November 26, 1932, and undoubtedly improved Belgrade's electric grid. For the first time in Belgrade, a low-voltage distribution network for alternating current supply was being used.⁴²⁰ Its capacity was 3x6, 400 kW, and then in 1938, it was expanded by another 12,500 kW. For the needs of electricity transmission and consumer supply, a distribution plant with two 6.6 kV substations was built.

In 1922 sawmill "Makiš" started its business. The electricity produced in sawmill supplied places in the immediate vicinity, at half the current market price. Thanks to this, the plant quickly found customers. In a short time, the production of the electricity supply developed so much that owners founded an independent company. Thus, in 1930, a new company, "Elektro-Makiš," was formed. "Elektro-Makiš" started electrification of the surrounding settlements: Čukarica, Žarkovo, Rakovica, Kneževci, and Železnik, so the Belgrade industrial zone developed there. The company began to develop an electricity network of transmission lines over long distances. According to the data from 1945, on the

⁴¹⁸ Istorijski arhiv Beograd [Historical Archive Belgrade]. Opština Beograd. 8. "Ugovor između opštine Beogradske I Švajcarskog udruženja banaka, Bazel."

⁴¹⁹ Ibid.

⁴²⁰ Neda Knežević, "Revitalizacija termoelektrane 'Snaga i svetlost' u Beogradu," Nasleđe, VIII, Beograd (2007):
212.

entire territory of Serbia, before the war, there were a total of 559 kilometers of transmission lines. Out of that, the area of "Elektro-Makiš" alone accounted for more than 400 kilometers. "Elektro-Makiš" also performed the first laying of river cables in Serbia, in 1929, by laying high-voltage cable lines in the Sava riverbed. After this, 26 settlements in southern Srem were electrified.

Encouraged with previous successes, "Elektro-Makiš" decided in 1936 to build a new power plant in Vreoci. For the purposes of the construction of the thermal power plant, "Elektro-Makiš" bought a mining concession for Baroševac and lignite mine in Junkovac, in the Kolubara basin. The old power plant in Makiš was put in reserve, but a transmission line previously connected it with the power plant in Vreoci. In 1931, a new thermal power plant, "Vreoci," with a capacity of 12 MW, started operating. In 1938, "Vreoci" interconnected with Belgrade, Srem, and Šumadija region. In the same year, the supply of Čačak through the 35 kV transmission line "Kragujevac-Čačak" was realized. Transmission line "Kraljevo-Bresnica" connected Kraljevo and Vrnjačka Banja to the grid in 1939. In 1940 with the construction of the transmission line "Vreoci-Valjevo," the city of Valjevo finally got a steady supply of electricity. In the Morava region, the city of Jagodina connected to the network via transmission line "Vreoci-Kragujevac" in 1940.

The hydro potential in the Sandžak region was not used as it could have been.⁴²¹ Only few plants were built on the Raška and Bistrica rivers. At the end of 1931, electricity was not produced even to a minimal extent for the public needs of Novi Pazar, Sjenica and Tutin.⁴²² Novi Pazar was the only one at that time to have its own power plant with a water turbine of

⁴²¹ Statistički godišnjak 1934-1935, IV (Beograd 1936): 9-11.

⁴²² Branko Tanasijević. Početak i razvoj elektrifikacije na području "Elektrosrbije— Kraljevo" (Kraljevo 1994): 169.

130 hp or 1x105 kW, which produced electricity for only 100 light bulbs.⁴²³ Ranko Ivković, the owner of the "Vrbak Hotel" in Novi Pazar, played the central role in the construction of two power plants in Novi Pazar. He first built a smaller hydroelectric plant for the needs of the hotel. The chief designers of the power plant were Professor Miladin Pećinar and Josif Novaković, a mechanical engineer from Zagreb. The Sandžak hydroelectric power plant was put into operation on November 8, 1931.⁴²⁴ Power plant "Sandžak" was equipped with Francisturbine of 120 kV, and the "Siemens" generator of 105 kV.⁴²⁵

Existing power plants on the territory of Serbia upgraded during this period, especially in the late 1930s. By 1931, 260 settlements were electrified, 100 on the territory of today's Serbia, and the rest in Vojvodina.⁴²⁶ However, many smaller towns and villages still did not have any type of electricity source. Despite the efforts of the engineer organizations, Serbia's electric network remained on the locally confined production levels. Concessions to build power plants often resulted in over-indebtedness and the need for state intervention. The network transmission lines started to develop but remained dispersed. Plans to upgrade "Power and Light" and "Makiš" power plants and make them lead distributors of electricity on Serbia's territory were cut short with the beginning of the Second World War.⁴²⁷

⁴²³ Ibid. 171.

 ⁴²⁴ Istorijski arhiv Ras, Novi Pazar [Historical Archive Ras, Novi Pazar]. Gradsko poglavarstvo 1919-1941, Zapisnici, knjiga 4. See also: L. Lendvaj. *Problemi elektrifikacije – pitanje i stanje elektrifikacije u Jugoslaviji*. Beograd 1930.
 ⁴²⁵ Statistika električnih centrala Kraljevine Jugoslavije. Stanje u julu 1932. godine, (Zagreb 1933): 90-91.
 ⁴²⁶ Ibid. 78.

⁴²⁷ The plan of creating a power plant of such size will be realized only in the 1950s with the construction of thermoelectric power plants Nikola Tesla (TENT).

Croatia – A Different Path

In comparison to Serbia and Montenegro, Croatia already had a more extensive electrical network and even integrated transmission network on its territory. In the period after 1929, electrification continued. In the case of Croatia, the tendency to decentralize itself from the Belgrade can be followed in the organizations in charge of electrification, such as BEP.

On February 6, 1928, the Board of Directors of City Power Plant in Zagreb concluded: "that for exceptional reasons, in order to use the full capacity of the power plant, the administration should be allowed and approved to expand the work of the City Power Plant outside the city of Zagreb." Consequently, on March 12, 1929, based on the agreement between the City Power Plants of Zagreb and the city of Karlovac, the company United Power Plants (UEC) was established in Zagreb. In previous chapters, a dispute between Zagreb and Karlovac about the building of the hydropower plant on Kupa River is explained in more detail. Municipality of Zagreb decided to build a thermoelectric power plant instead of planed hydroelectric and let Karlovac continue with the building of hydropower plant "Ozalj". However, Karlovac had problems with the supply of its consumers during the river Kupa's low water level. Electricity demand was so immense that hydropower plant "Ozalj" and Karlovac's Diesel Power Plant could not meet the needs for electricity.⁴²⁸ First managers of the UEC were engineers Ante Visković and Franjo Čenčić.⁴²⁹ In 1930, the first task of the UEC was to build a

⁴²⁸ Državni arhiv u Zagrebu [State Archive Zagreb] HR-DAZG-258-2-4 Udružene električne centrale u Zagrebu, Zapisnici.

⁴²⁹ Državni arhiv u Zagrebu [State Archive Zagreb] HR-DAZG-10 Gradsko poglavarstvo Zagreb, Obrtna iskaznica Udruženja električnih centrala 1929.

30 kV transmission line "Zagreb – Karlovac" for energy exchange and to supply electricity for electrification of the area on that stretch.

For the Administration of the City Power Plant in Zagreb, the first serious problems began in 1931, because of an outdated plant. For the needs of Zagreb, "Uritad" offered to build a thermal power plant next to the Poljana mine near Konjščina. The "Uritad" managed to obtain a monopoly for the electrification of the entire Savska Banovina, but since it did not fulfill its obligations, the contract was annulled after only five years.⁴³⁰

⁴³⁰ Mira Kolar-Dimitrijević. "Zagrebačka tvornica baterija i džepnih svjetiljaka do 1945. godine". ČSP 20 (1-2) (1988), 73-93.

Banovinsko Električno Poduzeće (BEP)

Professors of the Technical Faculty in Zagreb, Miroslav Plohl⁴³¹ and Juro Horvat⁴³², advocated the idea of founding an organization that would accept general electrification on the entire territory of the Savska Banovina (later the Banovina of Croatia). In 1936, before founding the BEP, Plohl summarized the basic principles of the BEP operation in the article "Problems of Electrification", in the "Hrvatski dnevnik". Plohl was actively involved in efforts to present new laws on electrification, a topic of National Assembly discussion in 1936. However, realizing that this plan would meet the faith of the previous attempts to implement a legal framework in the field of electrification, he turned towards the idea of a separate project such as future BEP. In his article, Plohl wrote:

"The main guidelines for the implementation of electrification, which I presented in the last article, derived from the principle that electricity is a natural force and a necessity of life, which should not be the subject of free trade. Therefore, electrification concessions should not be granted by the state, because the purpose of taking the concession is usually to earn as much as possible, which falls on the consumer... from my previous efforts, it is clear the principle according to which such electrification should be carried out, namely that electricity must be equally low prices for a strong

⁴³¹ Miroslav Plohl (1881-1939), was a Croatian electrical engineer of Slovenian origin. He invented devices for generating a magnetic field of constant direction and periodically variable strength (1911), increasing the load capacity of turbochargers and turbochargers and a two-stage turbocharger (1918-20), generating high-frequency electromagnetic oscillations (1927).

⁴³² Jure Horvat (1882-1954), an electrical engineer. After graduating from the Technical College in Graz in 1904, he worked in factories near Stuttgart, in Geneva, at AEG in Vienna and then as director of the company "Energos" and deputy director of the first Slovenian hydroelectric power plant "Fala" on the Drava. From 1924 he was a lecturer at the Technical Faculty in Ljubljana and from the summer semester ac. yr. 1932/33 at the Technical Faculty in Zagreb, where he founded the Department of High Voltage (today the Department of High Voltage and Energy). He taught the courses Electricity Generation, Electricity Transmission, Electricity Distribution, and Transients in Electrical Devices. He has collaborated in domestic and foreign journals, including the then esteemed journal Electrotechnik und Maschinenbau.

municipality with a large number of consumers and a weak municipality with a small number of consumers. At what price will the municipality sell electricity to its consumers concerning its own electricity supply costs and the public needs of the municipality? This is a question that concerns only the municipality in question, and which depends on the free discretion of the municipality."⁴³³

Banovina Electric Company (BEP) was founded in 1937. At the request of the Sava Banovina, on July 27, 1937, the Ministry of Trade and Industry of the Kingdom of Yugoslavia issued a preliminary permit that such an organization could perform industrial work for the production and sale of electricity and conduct it with power lines.⁴³⁴ Then, by the decision of the Ban of the Savska Banovina of September 11, 1937, the Ordinance on the Banovina Electric Company of the Sava Banovina was issued. The Ministry of the Interior confirmed this decision on October 21, 1937. The Ordinance was published in the "Narodne novine" on October 28, 1937.⁴³⁵ Furthermore, by the Banovina decision of December 15, 1937, three members of the Board of Directors were appointed: Ognjen Aranički, Head of the Ban Administration, and professors Miroslav Plohl and Jure Horvat. The Ordinance on the conduct of the Banovina Electric Company contained only six articles. The most important one is Art. 3:

"For the efforts of electrification, the Banovina Electric Company will build at its own expense all main and distribution power lines with the associated plant, and the municipalities in whose area the electrification will be carried out will raise the low voltage network at their own expense. The maintenance of all networks and facilities falls to the duty of the enterprise. The company's operations will be managed centrally. Municipalities will be approved a percentage of 33% of the total electricity consumption in their area for each kWh. This percentage will be used to cover the

⁴³³ Miroslav Plohl. "Problemi elektrifikacije". *Hrvatski dnevnik*, 27.06.1936, 14.

⁴³⁴ Božo Markovčić. "S BEP-om započinje široka planska elektrifikacija", HEP Vjesnik 143 (2002): 19.

⁴³⁵ *Narodne novine*, 246, 24.10.1937.

costs of building their networks and public works. For these revenues, municipalities will maintain a special account called the Electrification Account³⁴³⁶

On July 20, 1937, Obzor published the following information:

"The Savska Banovina received a concession from the Ministry of Trade and Industry to electrify the entire banovina. Therefore, a new factor has emerged in this area as a stakeholder in electrification. So far, after the collapse of the United Mines and Smelters (URITAD) concession, two factors were decisive for the electrification of our region, the Zagreb power plant and the United Power Plants (UEC)... In any case, the concession granted by the banovina must not serve as a source of income for the banovina, because in that case, it would not mean promoting electrification on some voluntary basis, but preventing further and deliberate electrification of our regions, which would not be an achievement of the main purpose", 437

The most critical and most acute problem was undoubtedly the supply of electricity to Zagreb. BEP continued based on previously performed assessments and immediately after its establishment in 1937 conducted field tests. The BEP management assessed that the idea of building hydroelectric power plants on Gacka is too complicated. Therefore, a new project for the construction of the Vinodol hydroelectric power plant on the Ličanka and Lokvarka rivers was proposed. However, the construction of the Vinodol hydropower plant was accompanied by poor planning. The construction plan foresaw three years until the completion of the works, but in reality, such an endeavor required at least six years. Also, the equipment ordered for equipping the power plant was not in accordance with the construction possibilities.

⁴³⁶ "Statut BEP-a", *Narodne novine*, 246, 27.10.1937.

⁴³⁷ "Koncesija Savske banovine za elektrifikaciju". *Obzor*. 20.07.1937, 4.

The first field works in the broader area of the Sava Banovina began in Moslavina in 1938. Over time, the electrification works of the BEP included the Croatian coast, Međimurje, the area around Karlovac and Osijek, as well as the central Dalmatia. At the beginning of 1939, various newspapers published articles on the electrification of the Savska Banovina. "Jutarnji list" states that on January 15, 1939, the villages of the large municipality of Vojni Križ received an electric light. The article continues that "electricity was turned on" by prof. Plohl and electrification efforts were carried out by BEP in cooperation with "Gospodarska sloga", which organized and carried out works, and that electricity was purchased from the City Power Plant (GEC) from Zagreb.⁴³⁸

In its electrification works, BEP, wherever possible, tied itself to existing electricity sources. In this way, Moslavina and the southwestern part of Hrvatsko Zagorje are connected to the Zagreb Power Plant (GEC) network, Međimurje and other parts of Zagorje to the Fala hydroelectric power plant. Karlovac and Osijek connected to its networks a significant number of nearby towns.⁴³⁹

⁴³⁸ "Elektrifikacija Vojnog Križa provedena je u djelo", *Jutarnji list*, 16.01.1939, 15.

⁴³⁹ Interesting debate on the manner of electrification plans in Croatia and BEP's part in it, between Miroslav Plohl and Ivo Radulović: Zvonko Benčić. "Prof. Miroslav Plohl st.: I najsiromašniji moraju dobiti električnu struju". *Studia lexicographica*, 12 (2018), 23, 127–174.

Montenegro – Missed Opportunities

The growth of electrification in Montenegro continued in the 1930s. In 1931, the municipal administration of Berane decided to announce a tender for the construction of a power plant, the construction of a city network, and the introduction of city lighting. The municipal government considered that the best way to electrify Berane would be to build a hydroelectric power plant on Lim, Ržanička, or Bistrica River. Also, the possibility to build a thermal power plant, since there is a brown coal mine near the city came into consideration. However, the idea of building a hydroelectric power plant or a thermal power plant did not spark interest among the potential investors, so the municipal administration decided to build a diesel-powered power plant. According to the newspaper article, the power plant in Berane started operating on March 27, 1939.⁴⁴⁰ The power plant in Berane had a 33 hp "Lana" engine, a 220/330 volt AC three-phase generator, and supplied about 500 consumers, with 1,500 light bulbs. The length of the power grid was between five and six kilometers.⁴⁴¹ The newspaper article from 1937 states that the first thermal power plant in Montenegro, built in Pljevlja, started operating. The thermal power plant had a power of 70 kW.⁴⁴²

At the beginning of 1939, the electrification of Budva finally came into a more explicit focus of the municipality. Representatives of the joint-stock company "Budva," which owned the hotel "Avala," offered the municipal authorities to electrify the city from the power plant that was built for the needs of their hotel. For public and private lighting, which the hotel

⁴⁴⁰ "Svjetlo u Beranama," Crnogorac, 27.03.1939.

⁴⁴¹ Državni arhiv Crna Gora [National Archive Montenegro]. CG DA 2 BER. 1. Sreski narodni odbor Berane 1945-1958. "Zapisnici Opštinskog odbora Berane iz 1945."

⁴⁴² Crnogorac, 11.05.1937.

headquarters provide to the municipality, the representatives of the joint-stock company "Budva" asked for compensation, exemption from imported municipal taxes for a specified period. The municipal government accepted this offer, so the power plant was built on the land of the "Avala" hotel. It had three diesel engines of the "Škoda" brand, with a total power of about 180 hp, as well as three generators.

In the late 1930s, the first hydroelectric power plant on the territory of Montenegro was finally built. The hydroelectric power plant "Podgor," which was put into operation in March 1941, had a power of 300 kW. Its primary purpose was to produce electricity for the operation of pumps that supplied water to Cetinje. The plant's mechanical section consisted of two "Ganz" turbines, with 250 and 150 hp, as well as two generators. With the intention of supplying electricity from the hydroelectric power plant "Podgor" to Cetinje, by the beginning of the war (1941), only a small part of the high voltage network was completed, from Podgora to the village of Visnica.⁴⁴³

The Banovina government also intended to build a hydroelectric power plant on the Zeta River, so in mid-1938, it announced a tender for the construction of a power plant at the Zeta Slap. Based on the most favorable offer, the job of building the hydroelectric power plant was awarded to engineer Vladimir Suhurenko⁴⁴⁴. The Yugoslav government set aside two million dinars for this venture. In addition to the hydroelectric power plant on Slap, the construction of a hydroelectric power plant on Glava Zeta, near the town of Perućica, was also

⁴⁴³ Državni arhiv Crna Gora [National Archive Montenegro]. CG DA 2 CET. Gradsko poglavarstvo Cetinje 1918-1941. Tehničko odeljenje. 56/41, 1.03.1941. "Izveštaj inženjera Đorđa Spocko o stanju elektrane Podgor."

⁴⁴⁴ Vladimir Suhurenko (Sukurenko) was a Yugoslav architect of Russian origin. He is also famous for the reconstruction of the monastery Ostrog, which was significantly damaged after the fire in 1923.

planned. However, until the beginning of the war (1941), Suhurenko only managed to complete the stone dam on Slap.⁴⁴⁵

The former plans to build hydroelectric power plants on Tara and Morača were renewed along with the construction of new power plants. However, new plans were also made on hydroelectric power plants on Zeta, Perućica, and Lim. In the newspaper, in the middle of 1923, the construction of the hydroelectric power plant on Morača came to focus again. At the end of the 1920s, engineers researched the water power potential of Montenegro to determine the potential for electricity production. The commission that examined the water forces in the area of Montenegro stated that several watercourses have sufficient potential to build a hydroelectric power plant on them. One of such watercourses is the spring Perućica, which consists of waters from the Nikšić field.⁴⁴⁶

The expert commission that studied the water potential for the production of electricity in Montenegro assessed the plan made by Ante Dešković to construct the hydroelectric power plant on Morača as feasible. Drešković's plan was never realized due to the First World War, as mentioned in previous chapters. However, the commission assessed that this endeavor needed to invest nearly 250 million dinars, an enormous amount of money. Due to this, the plan was assessed as impossible. When the engineer Miladin Pećinar made a preliminary design for the construction of the hydroelectric power plant on Morača, which would also use the waters of the river Tara, in 1939, interest for such endeavor sparked again. Pećinar proposes the

⁴⁴⁵ 100 godina crnogorske elektroprivrede. 41-43.

⁴⁴⁶ Ibid. 42-46.

construction of one longer or shorter tunnels, which would transfer the water from Tara to Morača, and thus significantly increase the power of the future hydroelectric power plant.⁴⁴⁷

This idea prompted some investors to reinvestigate the probability of the plan suggested by Drešković in 1918. Banker Nikola Zuber and industrialist Blažo Anđelić requested approval of the Zetska Banovina to build a hydroelectric power plant on Morača, according to the conceptual design made by engineer Dešković. The project envisages the construction of a large dam not far from Kolašin, in order to form a large lake, from which the water would be transferred through a tunnel to the Morača canyon. The project also states that the power of the hydroelectric power plant on Morača would amount to 64,400 hp.⁴⁴⁸

Moreover, a suggestion for the construction of a hydroelectric power plant on the Lim River, near the Berane gorge, was assessed as a much more realistic and economic project. The hydropower plant would produce energy from 2 400 to 10 000 hp and would be used for lighting Berane, Andrijevica, and Budimlje, as well as for industrial plants, construction, and irrigation.⁴⁴⁹

According to the data of the Government Water Directorate, for the rivers flows on the territory of Montenegro, the highest potential for electricity production had Lim (85 000 hp), followed by Piva (34 500 hp) and Morača (22 500 hp).

An interesting plan for the use of the Zeta River for the production of electricity was published in 1938 in the Podgorica newspaper, "Zeta." The author of the article "Exploitation of the Zeta River," Ilija Stojković, a professor of mathematics, suggests that in the upper part of

⁴⁴⁷ Milan Dimkić (Ed.). Akademik Miladin Pećinar: život i delo. (Zlatibor, 2004): 51-78.

⁴⁴⁸ "Nikola Zuber i Branko Anđelković zatražili su odobrenje Zetske banovine za iskorišćavanje vodene snage Tare." Zeta, XII, 11.02.1940.

⁴⁴⁹ 100 godina crnogorske elektroprivrede. 40-41.

the Nikšić field, the springs that make up the Zeta River should be captured. All these springs should be redirected to one concrete canal that would flow along the entire field, to the place of Kunak. At Kunak, the water from the canal would be diverted into a tunnel, about 800-1000 m long, which would be dug up under the Planinica pass, in the direction of Bjelopavlići. Stojković believed that this hydroelectric power plant could be one of the largest in Europe in terms of its strength. The hydroelectric power plant on Morača could provide the necessary electricity for the whole of Yugoslavia.⁴⁵⁰ However, this plan remained only well-wishing. The war interrupted all other economic plans, including the need for new plants to produce electricity.

Just before the beginning of the Second World War, only 28 settlements (2.15%) had some sort of electrical grid in Montenegro. The average annual production of electricity in Montenegro, in the interwar period, was about 1 million kWh. Comparing how low the production of electrical power in Montenegro was compared to the hydroelectric power plant "Fala" on Drava (Slovenia), which produced 170 million kWh in 1930, the number of 1 million is insignificant.

When compared to Serbia or Croatia, Montenegro was left out of state plans many times. The question of the instability of the national momentum of the Montenegrin political elite is better demonstrated in the political bickering of the ruling parties in the Kingdom of Yugoslavia. In the prewar period, the divisions in Montenegrin national thought were insignificant, but during the interwar period, this division became clearer. Boiling dissatisfaction with the Montenegrin political elite became very distinctive, and the traces of the division between "Montenegrin" and "Serb" already took tangible forms. Montenegrins felt

⁴⁵⁰ Ilija Stojković. "Eksploatacija reke Zete," Zeta, IX, 6.11.1938.

neglected by the government in Belgrade. This reflected in the infrastructural policies as well. Even though, as already demonstrated, many engineers and experts presented very feasible projects for the development of electrification, the government showed minimal or no interest at all to invest in them. A glimpse of how this dissatisfaction runs deep can be found in an article from 1942. In this article, a short overview of Montenegro's enormous potential for building hydroelectric power plants is in focus again. The author of the article states, "it is sad that no one wanted to look deeper in this potential in past times".⁴⁵¹ However, this article should be taken with a great deal of skepticism given the fact that Montenegro is under Italian occupation and that this profoundly influences the official narrative of the government.

⁴⁵¹ "Naše električne snage." *Glas Crnogoraca*. I, 32, 14.07.1942, 2.

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The Kingdom of Yugoslavia experienced political turmoil in the period between 1929 and 1941. Moreover, it was affected by the global economic crisis. By introducing a dictatorship, King Aleksandar I tried to preserve the collapsed unity, but the existing conflict was further deepened. The government of Dragiša Cvetković tried to alleviate the rift with Croatia by introducing partial federalism. However, this agreement was seen as a temporary solution because the National Assembly never ratified it. The conflict over the federalist and centralist organization of the state has already done irreparable damage. Attempts to allow some autonomy came late. We can only speculate that electrification efforts would have been more successful if the state's federal system had been approached immediately. Despite all these adversities, the engineers who were the main drivers of electrification managed to realize the plans they had partially. Of course, that was far from what they wanted, but it would be unfair to say that their efforts were insignificant.

Organizations of Engineers and Architects

Engineering using new technologies⁴⁵² connects humanity to the self-view of spatial and temporal distances. It also enables intimacy and connection between people, a topic that has not been broached yet in this thesis. Speaking about technological progress, Slavoj Žižek discusses the role of engineers in the progress of new scientific technologies and discusses transhumanism through the porous and indeterminate boundary between human and inhumane interaction, including machines and other artificial devices.⁴⁵³ Martin Heidegger even went so far as to argue that all ethical and aesthetic failures are grounded in an engineering view of the world. They reduce nature to resources in the dominant "Gestell".⁴⁵⁴

Engineering is the most present activity in the world, which has a direct and vital impact on the quality of life of humanity. It includes imagination and innovation and is a highly creative activity. Engineering decisions and activities have a far-reaching impact on the entire human society. However, despite all this, a paradox is observed: engineers are invisible in society, even though their activities have a significant impact on humanity.⁴⁵⁵

⁴⁵² There are different definitions of technology. Although the issue of technology is not considered here, this study implies the following definition: "Technology is the application of science, which is used to solve problems. In doing so, technology and science are different entities, working 'hand in hand to accomplish certain tasks or solve problems. Technology is also human knowledge that includes tools, materials, and systems." (Mitcham, 1994, 12)

⁴⁵³ Slavoj Žižek. (1998) "Cyberspace, or, How to Traverse the Fantasy in the Age of the Retreat of the Big Other". *Public Culture*, 10.

⁴⁵⁴ Carl Mitcham. "The True Grand Challenge for Engineering: Self-Knowledge." *Issues in Science and Technology*. (2014) XXXI (1), 12.

⁴⁵⁵ Michelfelder, Diane, McCarthy, Natasha, Goldberg, David E. (Ed.). *Philosophy and Engineering: Reflections on Practice, Principles, and Process*. (Springer, Heidelberg, 2013): 91.

In studies connected to the nation-building, the discourse of engineers as nation builders has gained more attention in recent times. Beside obvious implication that engineers are builders in actuality, this notion of them being metaphorical nation-builders can be reduced in three simple tropes. First of all, engineers are connecting people. With the building of railways, electrical grids, telecommunications, safer and shorter roads, engineers are accommodating logistics and infrastructure for faster connections between places. Secondly, engineers can be viewed as suppliers of essential public goods. With their efforts, the population is in the supply of gas, water, and electricity.

Moreover, whenever these supplies are damaged or threatened, engineers are the ones who restore them effectively. Finally, engineers could be perceived as protectors. Engineers guarantee the safety of the infrastructures (building, river dams, and transmission lines) they project.⁴⁵⁶

Yugoslav engineers enthusiastically embraced these roles in the nation-building process, though their ambitions would be frustrated in the unwillingness of the government to facilitate offered ideas and plans.

⁴⁵⁶ Paul T. Durbin (Ed.). *Broad and Narrow Interpretations of Philosophy of Technology*. (Kluwer Academic Publishers, Dordrecht, 1990): 308.

Association of Engineers and Architects of Yugoslavia

Croatia, Serbia, and to some extent, Montenegro had a vibrant history of engineer and architect associations before 1918.⁴⁵⁷ The newly established state had to organize ministries, their work, but also to organize professional associations. Despite the enthusiasm for the newly established state, it took a long time for the politically and professionally coordinated functioning of all sectors and administrations, including the organizations of engineers and architects. As for the Association of Engineers and Architects, the most active in the newly established state were the engineers in Slovenia.

After World War, the initiative for creating an engineer organization in a new state was put in motion from Belgrade's engineer section. Fellow engineers from Ljubljana, Zagreb, and Sarajevo welcomed this initiative. The initial meeting took place in Zagreb in July 1919 when delegates proposed the first Statute and named the new organization The Association of Engineers and Architects of the Kingdom of Serbs, Croats, and Slovenes.⁴⁵⁸ The founders were the Society of Croatian Engineers in Zagreb, the Association of Serbian Engineers and Architects, the Society of Engineers in Ljubljana, the Society of Engineers, Architects and Surveyors in Sarajevo and the Association of Engineers, Architects, and Surveyors in Split.⁴⁵⁹

⁴⁵⁷ Further readings on this subject: Petković, Luka, (Ed). *Razvoj i rad organizacija inženjera i tehničara* [Development and work of organizations of Engineers and Technicians]. (Beograd: Tehnika, Savez inženjera i tehničara Jugoslavije, 1971); Vladimir Šolaja and Adela Magdić. *Putevi srpskog inženjerstva tokom XIX veka* [Paths of Serbian Engineering in the 19th Century]. (Beograd: Srpska akademija nauka i umetnosti. Muzej nauke i tehnike. 1994); Jure Radić (Ed.). *Spomen knjiga stodvadesetpetogodišnjice hrvatskog inženjerskog saveza* [125 of Croatian Engineer Association]. (Zagreb, 2003)

⁴⁵⁸ Slavica Pleše (Ed.). *Pravila društava: 1845. - 1945*. Tematski vodič. (Zagreb: Hrvatski državni arhiv, 2000): 151.

⁴⁵⁹ Luka Petković, (Ed). *Razvoj i rad organizacija inženjera i tehničara* [Development and work of organizations of Engineers and Technicians]. (Beograd: Tehnika, Savez inženjera i tehničara Jugoslavije, 1971): 19.

The first official meeting of newly formed association took place in September 1919 in Belgrade. Professor Milan Andonović⁴⁶⁰, opened this meeting with encouraging words that all engineers and architects should unite in efforts to rebuild the country and start the "new age." Moreover, the meeting participants decided to rename the organization as "The Association of Yugoslav Engineers and Architects" (UJIA).⁴⁶¹ In the official Statute and the records of this meeting, it is never explicitly stated why engineers and architects decided to rename the association from "Serbs, Croats, and Slovenes" into "Yugoslavs." That way, the ideological role of this vital organization gained another, more complex dimension. We can only speculate that members of the association wanted to consciously support the idea of united South Slavs. The new ideological basis positioned the ideology of integral Yugoslavia as an always present cultural pattern. It was based on the need to set this, seemingly independent professional association of engineers and architects, as a kind of model of collective identity, which, in addition to consolidating, meant erasing certain cultural traditions and creating new ones, which would be able to replace the old ones successfully. Since the unresponsiveness of political discourse made it impossible for the new nation-state creation to be called "Yugoslavia" from the beginning, the attribute "Yugoslav" became an effective way to replace existing tribal differences by building national unity in various spheres of social life.⁴⁶²

Moreover, the new name emerged from the acute need for certain regime circles to create an image of the desired national identity. That need was implemented through various aspects of culture, most often outside the political sphere. The engineers and architects were

⁴⁶⁰ Milan Andonović (1849-1926) was a surveyor, civil engineer, and professor at the University of Belgrade. Founder of the Geodetic Institute of Serbia (1888), the Surveying School (1890), and the private Geodetic and Civil Engineering Academy (1907).

⁴⁶¹ "Zapisnik vanredne glavne skupštine UJIA održavane 27. i 28. septembra 1919 u Beogradu". *Tehnički list,* Zagreb, 1/1919, 7, 77-85; "Pravilnik za rad UJIA." *Tehnički list,* Zagreb, 1/1919, 8, 96-100.

⁴⁶² Nacrt za ustav Udruženja inženjera i arhitekata Kraljevstva Srba, Hrvata i Slovenaca. *Tehnički list. Glasilo Udruženja inženjera i arhitekata Kraljevstva Srba, Hrvata i Slovenaca I*, 1, Zagreb 1919, 2.

especially crucial in this sense. As builders, they realized the metaphor of "nation and statebuilding," a phrase that resonated in the political speech of that time. Therefore, it is not unusual for engineers and architects to be among the first to unite under the name "Yugoslavia". It is not difficult to understand that this organization had a notable role for national cohesion in Yugoslav society, both real and metaphorical. The united engineers and architects, building a ruined country, and uniting what had been separated for centuries, set an example to follow.

Furthermore, on the first official meeting governing body of UIJA stated its main goal: "In the big hall of the society "Stanković"... engineers and architects from all parts of Yugoslavia from Triglav to the Vardar meet for the first time, to finally form a group association and enable a joint, a unique, fruitful and successful work of renewal and progress - the tremendous and beautiful homeland of ours, drenched in slave tears and redeemed with heroic blood ".⁴⁶³ A similar intonation regularly followed the meetings of the General Assembly and individual sections of the UJIA, as well as the General Annual Assembly, outlining the ideal of engineers and architects as a kind of builders of the Yugoslav spiritual civilization.⁴⁶⁴ Emphasis on the "people's character" of the UJIA, which, through the speech about Serbs, Croats and Slovenes as one people, reflected the structure of the imagined Yugoslav nation.⁴⁶⁵ This discourse of engineers and architects being perceived as builders of the nation is not uniquely Yugoslav. It resonated in other countries such as Germany, the Soviet Union, or Czechoslovakia. However,

⁴⁶³ Zapisnik vanredne glavne skupštine Udruženja Jugoslavenskih Inžinjera i Arhitekata, održavane 27. i 28. septembra 1919. u Beogradu, *Tehnički list I*, 7, Zagreb 1919, 77.

⁴⁶⁴ UJIA annual assemblies: Belgrade (1919, 1920, 1932, 1933), Zagreb (1927, 1934), Ljubljana (1921, 1928, 1936), Sarajevo (1922, 1929, 1937), and Split (1923, 1930). , 1938), Novi Sad (1924, 1931, 1939) and Skopje (1925).

⁴⁶⁵ "Današnja manifestacija [jeste] manifestacija supremacije duha nad materijom, duševne snage i inteligencije nad materijom. (Gromko odobravanje) ": Stenografski zapisnik IX Redovne Glavne Skupštine "Udruženja Jugoslovenskih Inženjera i Arhitekata" održane od 2. do 4. juna 1928. u Ljubljani, *Tehnički list* X, 15–16, Zagreb 1928, 227.

in reality, the UJIA functioned as a fragmented association. Two financially and politically most relevant sections, in Belgrade and Zagreb, often represented different interests. The political significance and implications were legible not only in the structure but also in all the actions taken by these associations.⁴⁶⁶

The official records state that in the 1919 meeting, Committees for Technical Legislation, Technical Teaching, Issuance of Technical Records, and Technical Terminology were established.⁴⁶⁷ The next meeting was held in Zagreb in May 1920. By that time, the association already had 1200 active members. The main conclusion of the Zagreb meeting was to re-launch the official journal "Tehnički list".⁴⁶⁸ The official gazette of the Association, "Tehnički list", published from 1919 to 1939, not only chronologically framed the virtual borders of Yugoslavia as a whole state, but its pages reflected all the cultural mechanisms that figured within the ideology of conciliatory Yugoslavia. For example, the simultaneous and obligatory alternating use of the Cyrillic and Latin alphabets was supported by the right to publish articles in the Technical Gazette in the official "Serbo-Croatian-Slovenian language".⁴⁶⁹ On the other hand, the regulation that "the first title page should be printed in Cyrillic", as well as constant attempts to centralize the work of this association by emphasizing that the former "Association of Serbian Engineers and Architects" is the pillar of the newly

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⁴⁶⁶ Sekcija Zagreb Udruženja J. I. A. Redovna godišnja skupština, *Tehnički list* III, 6, Zagreb 1921, 72; Sekcija Beograd Udruženja J. I. A. II. Glavni godišnji Skup, *Tehnički list* III, 7, Zagreb 1921, 83.

⁴⁶⁷ Arhiv Jugoslavije [Archives of Yugoslavia]. Transcript of the meeting held in Belgrade provided by archivists in the Archives of Yugoslavia, since the fundus of the Association of the Engineers and Architects of Yugoslavia is not established yet and in the process of archival regulating.

⁴⁶⁸ Established in 1900 as "Srpski tehnički list," published every two-months until 1918. The editor was Milan Andonović.

⁴⁶⁹ "I latinica, i ćirilica moraju se naučiti iz nacionalnih razloga". Iz Glavne Uprave UJIA, *Tehnički list* XI, 10, Zagreb 1929, 157.

formed association, emphasized the same problems that permanently marked the situation in interwar Yugoslavia.470

It published all the decisions and resolutions of the Association's bodies and the expert articles. In addition to this journal, Association also published "Jugoslovenska tehnička terminologija" edited by engineer Živojin Dimitrijević.⁴⁷¹ Electrification of the county is a frequent topic of discussion in the journal and on the association's meetings. In 1934 within the Association, a committee for electrification is established.

Chambers of Engineers were established in the entire territory of the Kingdom of Serbs, Croats, and Slovenes at the end of 1924. Until then, there was only the Chamber of Engineers for Slovenia and Dalmatia, with its headquarters in Ljubljana. Without waiting for new legislation, the engineers in Ljubljana established the Chamber of Engineers in August 1919, according to the principles of the Chamber Act of 1913. This Chamber only moved the seat from Trieste to Ljubljana. Until October 1924, the Ljubljana Chamber operated per the provisions of the Chamber of Engineers Act of 1913.⁴⁷²

The chambers were established based on the Provisional Decree on the Establishment of the Chambers of Engineers of the Kingdom of Serbs, Croats, and Slovenes, prescribed by the Minister of Construction, on October 8, 1924, based on Article 118 of the Financial Law for 1924/1925 year.⁴⁷³ The Chambers of Engineers had a joint General Directorate, based in

⁴⁷⁰ Zapisnik vanredne glavne skupštine Udruženja Jugoslavenskih Inžinjera i Arhitekata, održavane 27. i 28. septembra 1919. u Beogradu, *Tehnički list* I, 7, Zagreb 1919, 77. ⁴⁷¹ "Inženjerima kraljevstva Srba, Hrvata i Slovenaca!". *Tehnički list*, I, 1, 1.

⁴⁷² "Naredba deželne vlade za slovenijo br. 593, naredba celokupne deželne vlade za slovenijo s katero se v zmislu zakona z dne 2. januarja 1913. drž. zak. št. 3 ex 1913, izdajajo določila za ustanovitev inženjerske zbornice v Ljubljani. Kraljevina Srba, Hrvata i Slovenaca." Uradni list deželne vlade za Slovenijo, Vol. I. /1919, br. 132, 476-476. 13.08.1919.

⁴⁷³ Službene novine Kraljevstva Srba, Hrvata i Slovenaca [Official Gazette of the Kingdom of Serbs, Croats, and Slovenes], VI, 231, 9.10.1924.

Belgrade. At the beginning of the Second World War, the Chamber of Engineers worked and developed its activities in cooperation with the Association of Yugoslav Engineers and Architects.

There were five sections of the Association of Yugoslav Engineers and Architects (Serbian, Croatian, and Ljubljana, Dalmatia, and Sarajevo). Every section had its subsections in major cities. It is noticeable that Montenegro had no section of its own. This does not mean that there were no qualified engineers in Montenegro. However, this indicates that the government treated Montenegro as a region that did not need association like that. There are no mentions or indications that the association itself considered a lack of Montenegrin section a problem in the records of the Association of the Engineers and Architects of Yugoslavia. Moreover, this is not only in the case in Montenegro, but a section of engineers in Slovenia also proved not to have enough members, so their section was joined to the Dalmatian section, with headquarters in Split.⁴⁷⁴ Therefore, a reason for the non-existence of the Montenegrin section could be that they simply did not have enough members. All sections of the UJIA association were very active and founded many clubs within their sections. It would take too much space to mention all of them; however, one can be mentioned as an example of a very active and influential section – Dalmatian Section, subsection Split.

Split engineers and architects were very active in UJIA and work on the directory of members of the Association of Engineers, Architects, and Surveyors in Split. Thus, 53 engineers were registered in Split, Trogir, Sinj, and Dugi Rat. At its fourth meeting in August 1919, the Split section of the UJIA discussed the need to organize associations for lower categories of technicians, such as authorized builders, masons, and other construction

⁴⁷⁴ Stanko Piplović. *Izgradnja Splita između svjetskih ratova*. (Split, 2008): 393-394.

craftsmen. They also discussed the establishment of a construction company for the construction of residential buildings and city development.⁴⁷⁵ Engineer Petar Senjanović was very active, both in the Split Section of the UJIA and at the state level. Thus, in his articles, Senjanović points out the necessity of building a Dalmatian railway to Split and building a new port in Split and points out that the construction of such interventions is urgent.⁴⁷⁶

Even though all sections had some sort of magazines or gazettes, the most prominent one certainly was the "Tehnički list" published by Association of Yugoslav Engineers and Architects - Section Zagreb. This journal was a continuation of the previous "Viesti Kluba inžinirah I arhitektah" first issued in 1878.⁴⁷⁷ The owner and publisher of the "Tehnički list" were the Association of Yugoslav Engineers and Architects based in Belgrade. However, due to its long tradition of publishing and rich experience, it was printed in Zagreb.⁴⁷⁸ The "Tehnički list" stopped publishing in 1939 due to the reorganization of the Association of Yugoslav Engineers and Architects. However, the newly established committee of the Association of Engineering Societies of the Kingdom of Yugoslavia launched the journal "Inženjer," whose editor-in-chief was Rikard Podhorsky⁴⁷⁹ and later the editor of the Technical Encyclopedia. The war soon interrupted the publication of this journal.⁴⁸⁰

In order to consolidate architectural and engineering activities, for engineers and architects outside the civil service, the Royal Government in October 1924, at the suggestion of

⁴⁷⁵ "Sekcija Split UJIA Novi Upravni odbor." *Tehnički list*, Zagreb, 2/1920, 5-6, 59.

⁴⁷⁶ Petar Senjanović. "Nove dalmatinske željeznice i splitska luka." *Tehnički list*, Zagreb, 1/1919, 6.

⁴⁷⁷ Alfirević. I, Kalman Ž. and Krajna T. "Povjest, uloga i značaj hrvatskih tehničkih časopisa." *Peti susret Hrvatskog društva za mehaniku* (2013): 2.

⁴⁷⁸ Ibid, 2-3.

 ⁴⁷⁹ Rikard Podhorsky (1902-1994) was a Croatian chemical technology engineer. With his engineering approach, he modernized the teaching of inorganic chemical technology, in which he introduced chemical-technological computing, and in 1947 a completely new subject, "The operations of the chemical industry."
 ⁴⁸⁰ Alfirević. 6.

the Ministry of Construction, passed a Provisional Decree on Certified Engineers and Architects in the Kingdom of Serbs, Croats and Slovenes, which introduced the same conditions, for performing activities and integrating acquired rights from the Austro-Hungarian Monarchy and the Kingdom of Serbia.⁴⁸¹

Towards the end of 1928, an extensive article was published in the daily newspapers by the director of the Zagreb Power Plant, Ante Visković, on the electrification of the western part of Yugoslavia. The mentioned article is interesting because it does not focus on the supply of the city of Zagreb with electricity, but looks at the problem of electrification much more broadly. The author pays homage to the modern concept and proposes the construction of an electric energy system that would be created by connecting larger power plants and consumption centers with high voltage lines. He further warns that cheap electricity is possible only by building economic power plants at coal mines and hydroelectric power plants and connecting them to consumption centers. The author of the article considers the method of electrification that is implemented in the country to be irrational.⁴⁸² He states:

"Every city, every bigger place, in recent times and some more advanced villages, are building large investments that cover loans, their own power plants, without a realistic calculation and without thinking, that the same purpose could be achieved with half the cost when instead of a new power plant, a connection to some neighboring power plant would be requested. On the other hand, the existing power plants are surrounding themselves from everyone..."

Visković pointed out the problem which has dogged electrification efforts since the beginning of electrification in all territories of the Yugoslav lands. However, this is not

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⁴⁸¹ *Službene novine Kraljevstva Srba, Hrvata i Slovenaca* [Official Gazette of the Kingdom of Serbs, Croats, and Slovenes]. "Uredba o ovlašćenim inženjerima i arhitektima u Kraljevini Srba, Hrvata i Slovenaca," VI, 245, 25.10.1924.

⁴⁸² Ante Visković. "Elektrifikacija naše zemlje." Večer, VIII, 289.

⁴⁸³ Ibid. 289.

exclusively a problem that happened in the Kingdom of Yugoslavia, but on a global level as well. Even though the association of engineers pointed out numerous times that the absence of a legal basis for electrification and plans on the state level slows down their efforts, their complaints remained only that. The interesting point is that the plan suggested by Visković would be realized but only after 1945.

After the introduction of dictatorship in 1929, the position of engineers in the Kingdom of Yugoslavia became considerably aggravated. However, engineers did not let this pass easily. In yearly meetings, engineers passed requests demanding that the engineers' independent position be restored, that their material position be improved, and that they enjoy parity with other officials with a university degree.⁴⁸⁴ There was also no progress in the field of legislation. The law only regulated the issue of water law in 1931. However, from discussions at engineering meetings, it is clear that this law was not wholly satisfactory. It was claimed that the profitability of the construction of hydropower plants was not sufficiently taken into account.⁴⁸⁵

When the world economic crisis hit Yugoslavia in the early 1930s, the development of electrification slowed down. Despite the difficulties, the initiatives for the development of the electric economy have not been suppressed. Many business people expected that after the economic situation improved, economic activity would be directed towards planned electrification. An example is the Čačak electric company "Jelica A.D," from which foreign

⁴⁸⁴ Petković. *Razvoj i rad organizacija inženjera i tehničara*. 25.

⁴⁸⁵ "Zakon o vodnim zadrugama I tokovima." *Tehnički list*, Zagreb, 1931, 5.

capital was withdrawn in 1936 due to the absence of the expected extensive works on the electrification of Šumadija.⁴⁸⁶

Modern regulatory solutions covered by the Law on Certified Engineers from 1937, as well as a set of bylaws adopted on its basis (rulebook on the operation of disciplinary courts of chambers of engineering, the rulebook on passing the professional exam for architects and engineers, the rulebook on competitions), gave an adequate legislative framework for the protection of the engineering and architectural profession.⁴⁸⁷ However, due to the Second World War, the application of these regulations did not give the expected results, so that the process of professionalization in the Kingdom of Yugoslavia remains unfinished.

At the assembly of the Association held in 1939 in Novi Sad, eight resolutions on the problematic position of most engineers and architects were adopted. The resolutions called for an increase in the number of engineers and public servants, as well as for public competitions to be announced in cooperation with the Association. One of the resolutions also talks about women engineers, against the decree that women engineers are not accepted into the civil service.

 ⁴⁸⁶ Arhiv Jugoslavije [Archives of Yugoslavia]. F. Ministarstvo trgovine i industrije Kraljevine Jugoslavije 1918-1941. 65–603–1323. "Jelica, a. d. Čačak. Izveštaj Upravnog i Nadzornog odbora sa bilansom za 1937. godinu"
 ⁴⁸⁷ Službene novine Kraljevine Jugoslavije [Official Gazzette of the Kingdom of Yugoslavia]. "Zakon o ovlašćenim inženjerima," XIX, 232, 13.10.1937.

First Electrotechnical Congress and Exhibition in the Kingdom of Yugoslavia

At the beginning of 1930, the Association of Power Plants of the Savska Banovina was founded to unite the power plants into one body to jointly promote the electricity industry and spread the professional and economic interests of their members.⁴⁸⁸ In 1934, on the occasion of the main annual assembly of the Association of Electric Companies of the Kingdom of Yugoslavia, the Association organized the First Electrotechnical Congress in Zagreb with the first specialized electrotechnical exhibition.⁴⁸⁹

The purpose of this congress "is for the gathered representatives of the power plants of our country, taking into account the economic, financial, and political opportunities, to find the best and fastest way to implement the planned electrification of the country".⁴⁹⁰ In the papers at the congress, a lot of interesting data on the state of the electric economy in Yugoslavia were presented. An example paper states that in 1931 in Yugoslavia, the specific production per capita was 56 kWh. It was stated that from the founding of the state until 1931, the installed power increased three times, but the planned electrification progressed slower. The biggest problem in every paper is the development of the electric power industry, which has been declining since the beginning of the 1930s.

In addition to the difficulties caused by the world economic crisis that affected Yugoslavia, which certainly slowed down development, in 1932 the state prescribed an excise

⁴⁸⁸ Arhiv Jugoslavije [Archives of Yugoslavia] F. 76 Centrala industrijskih korporacija Kraljevine Jugoslavije 1923-1941. "Osnivačka rezolucija"76-6-14.

⁴⁸⁹ I. Elektrotehnički Kongres I V. Glavna Skupština Saveza Električnih Preduzeća Kraljevine Jugoslavije 7.-9.septembra 1934. (Zagreb: Jugoslov. Štampa D. D. 1934.)

⁴⁹⁰ Ibid. "Spomenica," 1-5.
tax of 70 para⁴⁹¹ per kWh. This averaged 10% to 20% of the then price of electricity for households, and up to 50% and more for large consumers.⁴⁹² In addition to these excise duties, each banovina and municipality had its own levies on electricity.⁴⁹³ Besides, a significant state tax has been set for the calibration of electric meters. Moreover, serious difficulty emerged in the supply of electrical materials from abroad because customs privileges had been abolished.⁴⁹⁴ Light bulbs were burdened with particularly high excise duties.⁴⁹⁵ The state excise duty on light bulbs that are regularly sent for testing was charged according to the intensity. Excise duty also made it challenging to introduce modern tariff systems that would stimulate consumption. Because of this, the industry began to switch from electric to mechanical propulsion, which was not burdened by these costs. One good side of such state action was establishing the official records of electricity consumption in Yugoslavia.

Furthermore, a major obstacle to intensive electrification was the lack of strong enough capital in the country. If it even existed, financiers were reluctant to invest in electrification. Low electricity consumption due to an underdeveloped industry and an extensive and sparse consumer area did not give far-reaching capital enough prospects for business profitability. The electrification of the villages seemed particularly unsuitable, so its profitability and expediency were a constant topic of discussion until 1941. The prevailing opinion among experts was that, in such cases, the electrification of the railway could be a suitable base for the country's

⁴⁹¹ The dinar (динар) was the currency of the Kingdom of Yugoslavia. The dinar was subdivided into 100 para (пара).

⁴⁹² Službene novine Kraljevine Jugoslavije [Official Gazzette of the Kingdom of Yugoslavia]. "Obznana Zakona o državnoj trošarini za potrošnju električne struje". XIV, 289, 12.12.1932.

⁴⁹³ *Službene novine Kraljevine Jugoslavije* [Official Gazzette of the Kingdom of Yugoslavia]. "Pravilnik za obračun naplate državne trošarine na električnu struju u državnim, banovinskim i opštinskim električnim centralama", XV, 85, 15.04.1933.

⁴⁹⁴ *Službene novine Kraljevine Jugoslavije* [Official Gazzette of the Kingdom of Yugoslavia]. "Zakon o carinskim povlasticama," XV, 66, 23.03.1933.

⁴⁹⁵ Službene novine Kraljevine Jugoslavije [Official Gazzette of the Kingdom of Yugoslavia]. "Raspis u vezi s postupkom pri uvozu električnih sijalica."

electrification.⁴⁹⁶ However, this initiative was not even considered. The state did not give any help, but, on the contrary, aggravated the situation at the beginning of 1934 by imposing a new tax on new constructions in the electric power industry.⁴⁹⁷

At the end of the First Electrotechnical Congress, a resolution was passed in which the royal government was warned of the stated difficulties and which asked for its help. During the mentioned congress, the first electrotechnical exhibition was organized. The initiative originated from the Zagreb Power Plant, and its purpose was to popularize electrification and electricity consumption as much as possible.⁴⁹⁸ All exhibition pavilions have been renovated for this exhibition. The exhibition was divided into five groups: electrical exhibition, Yugoslav ores, and minerals, textile industry, household, groceries, collective exhibition of the Kingdom of Italy organized by the export company from Rome.⁴⁹⁹

The carriers of electrification, that is, the management of public power plants, in turn, sought to develop consumption in order to increase the profitability of power plants whose use was deficient. For this purpose, it was decided that propaganda offices should be established.

⁴⁹⁶ Petar Senjanović. "Željeznička konferencija u Beogradu." *Tehnički list*, Zagreb, 2/1920, 11-12, 107-110.

⁴⁹⁷ "Razne vesti," SEP, Časopis Saveza električnih preduzeća Kraljevine Jugoslavije, II, 4, 1937, 38–39

⁴⁹⁸ Kruno Sabolić (Ed.). *Od Zbora do Velesajma: 1909. - 1999. : 90 godina Zagrebačkog velesajma*. (Zagreb: Ars media, 1999): 5-21.

⁴⁹⁹ Državni arhiv u Zagrebu [State Archive Zagreb]. Zagrebački zbor 1909-1945. HR-DAZG-251-4-28. "Izvješća o izložbama"; 30 "Popis izlagača na izložbama."

SEP - Association of Electric Enterprises of the Kingdom of Yugoslavia

In 1936, the magazine SEP, the newspaper of the Association of Electric Enterprises of the Kingdom of Yugoslavia, and the professional section of electric power plants of the Association of Industrialists for the Savska Banovina began to be published in Belgrade. The first president of the Association was engineer Ilija Jojkić, and as Secretary Milisav Marković, both from Belgrade. The first issue of the magazine states that it was launched in order to solve the issues of electrification development more efficiently. The editorial office further states that special attention will be paid to the choice between different energy sources, reduction of operating costs, and processing of tariffs that would best suit the local circumstances of the Kingdom of Yugoslavia. In short articles, all the troubles that accompanied the development of electrification, which were already highlighted at the Electrotechnical Congress in Zagreb in 1934, are mentioned again.⁵⁰⁰

At the annual assembly of SEP in 1936, the center of discussion remained around the increase of consumption and the application of suitable tariffs. The representative of the Zagreb Power Plant advocated the introduction of a block tariff⁵⁰¹ because the consumption of electricity is deficient. At the annual assembly in 1937, all the problems of electrification were

⁵⁰⁰ Momčilo Petrović, "Naš program," *SEP*, Časopis Saveza električnih preduzeća Kraljevine Jugoslavije, I, 1, 1936, 1.

⁵⁰¹ Block tariff is a schedule of prices for electricity wherein the price per kilowatt-hour (kWh) changes at different levels of consumption. Customers on this tariff are charged for electricity in tariff blocks (i.e., a quantity of energy usage). Richard Cuthbert and Kiley Faherty. *Use of Block Rate Structures in Electric Utility Ratemaking: Options for City Light to Consider in Modifying Residential Rate Blocks*. Seattle City Light City Light Review Panel Meeting, 2012.

presented again, with the general conclusion that the state was not doing anything. Participants summarized:

"Construction of electrification began immediately after the 1919 war. The progress of work in this field can be seen in the import of electrical material from year to year, whose import grew and reached its maximum of about 200 million dinars in 1930. Since then, imports of electrical material began to decline and amounted to about 100 million dinars. This decline was due to the crisis and also because certain electrical materials began to be produced in the country."⁵⁰²

Furthermore, engineer Momčilo Perović noted:

"Pioneering works on the electrification of our country have not been completed yet. So far, mostly only towns and cities in most of our Kingdom are supplied with electricity. However, several villages near larger towns have been electrified, while most villages still do not have the opportunity to enjoy the benefits of electricity."⁵⁰³

The only thing that has been done to improve the development of electrification is that the Ministry of Construction has regulated the issue of approval and expropriation during the construction of power lines.⁵⁰⁴ On that occasion, engineer Žarko Pecić from Belgrade presented his proposal for planned electrification of the Kingdom of Yugoslavia. He advocated that such a state plan cover only the regional and state network. It was to rely on hydropower and thermal power plants to operate on weaker types of coal. Voltages of 6.15 and 30 kV are proposed for

⁵⁰² "Izveštaj o VII Glavnoj skupštni Saveza električnih preduzeća," *SEP*, Časopis Saveza električnih preduzeća Kraljevine Jugoslavije, I, 3, 1937, 38.

⁵⁰³ Momčilo Petrović, "Pri Udruženju Jugoslovenskih industrijalaca i arhitekata – Sekcija Beograd," *SEP*, Časopis Saveza električnih preduzeća Kraljevine Jugoslavije, II, 4, 1937, 40

⁵⁰⁴ *Službene novine Kraljevine Jugoslavije* [Official Gazzette of the Kingdom of Yugoslavia], "Rešenje o produženju roka isključive upotrebe električnih vodova," XIX, 188, 20.08.1937.

the local network, 60 and 100 kV for the regional network, and 100 and 200 kV for the state network.⁵⁰⁵ However, this plan, like many others, remained only a wish.

* * * *

Engineers and architects of the Kingdom of Yugoslavia had put significant efforts to electrify the country as much as possible. Regardless of their primary goals, the electrification legislation and building of an efficient and interconnected power system have not been realized, engineers and architects still managed to achieve a great deal in the field of electrification. This study is concentrated on the expansion of the electrical network in the public frame. However, it should be mentioned that a great deal of electrification had been done in the railroads, telecommunications, and electrical household appliances. In conditions where they were marginalized continuously, the engineers did a lot. They seldom had access to the corridors of power, just as their advice was often ignored for the sake of more comfortable political opportunities. However, organizations of the engineers' organizations did not fail in the exchange of ideas and experiences. During the interwar period, engineers actively engaged in vivid debates, often traveled to the different parts of the country, organized numerous seminars and workshops, bettered university syllabuses, and, overall, became better connected.

⁵⁰⁵ SEP, Časopis Saveza električnih preduzeća Kraljevine Jugoslavije, II, 4, 1937, 38–39.

Conclusion

In the recent historiographies studying the period of first Yugoslavia, not many focused on the questions of infrastructure. Even today, most of the studies remain strictly focused on the turmoil of Yugoslav politics. Some historians ventured to study the social and economic aspects of the mentioned period, but those examples are rare. Moreover, the notion that electrification took hold only after 1945, during Communist Yugoslavia remains even in the academic circles. This study is a humble effort to debunk that notion. The Kingdom of Yugoslavia did have a somewhat developed electrical network, and more importantly, enthusiastic and excellent engineers and architects. Unfortunately, the potential of expertise and ingenuity that the Kingdom of Yugoslavia possessed never reached full capacity.

According to Wimmer's methodology of providing public goods, the Kingdom of Yugoslavia is an example of the country that failed to provide citizens with equal access to public goods. An analysis provided by Wimmer, an example of the French Third Republic, is a good model of a country that succeeded in the provision of public goods. Moreover, the Third Republic in France is a showpiece of how the country with the central government managed to assimilate various groups in France who spoke different dialects (Aquitaine or Basque) into the French nation, all thanks to equal distribution of public goods. Eugene Weber described this process in great detail in his *Peasants into Frenchman*. The Kingdom of Yugoslavia was unsuccessful in supporting the existing networks of the regions that came to be a part of it. Moreover, the Kingdom of Yugoslavia did not have a capable and efficient bureaucracy at the government level.

In this short overview of the creation and development of the electrical network of the Kingdom of Yugoslavia, few things are clear. It is apparent that electrification processes in Serbia, Croatia, and Montenegro developed on different levels. In the framework of Wimmer's methodology, the Kingdom of Yugoslavia did not incorporate the political capacities of the regions which were part of it. On the contrary, the Kingdom of Yugoslavia did everything to destroy them. The reason behind these efforts was the need for the Serbian part of the state to concentrate as much power as possible in its hands. The conflict between the Croatian and Slovene representatives, on one side, and Serbia, on the other side, in the question of the organization of the state with the federal or central government, resulted in overpowering of the Serbian side. This reflected in the provision of public goods in the shared state. Montenegrins felt neglected from the beginning. The centrally organized government is not necessarily a wrong solution as it can be seen in the case of the French Third Republic, however, in the case of the Kingdom of Yugoslavia, this solution proved to be one of the main reasons of its downfall.

Before 1919, one thing in common to all regions is the lack of interconnected electrical networks. Early power plants remained confined to the local areas, and rarely even supplied neighboring villages. Power plants built for the needs of public lighting initiated interest for the electrification of the households. The privilege of having electricity in the private household remained in the hands of the wealthier part of the population. However, locally confined electric systems are not unique for the regions that would be part of the Kingdom of Yugoslavia. Local supply systems were spread in most European countries and the rest of the world. The electrification of the households and appearance of the organizations with electrification planning was in its infancy on the global level. In the territory of the Austro-

Hungarian Empire, electrification was sporadic and without a unified plan. The same could be said for the Kingdom of Serbia and the Kingdom of Montenegro. In all cases, the use of different frequencies and voltage values reflected the lack of a central plan.

It is quite clear that electrification took place without a plan in Croatia, Serbia, and Montenegro. First, power plants were built in industrial areas and exclusively for the needs of production. Stepping towards mixed power plants (power plants used both for the needs of industry and public) happened only in those areas where such a thing was deemed profitable. The growing industry dictated how electrification would take place. Also, the cities tried to have power plants in their possession and do not depend on private owners. However, the building of power plants was an expensive venture, and most municipalities did not have economic means to build power plants from their budgets. For that reason, municipalities resorted to the concession arrangements. Examples of the concession agreements gone ill are testimony to municipalities' efforts to have power plants under their jurisdiction. First, power plants were mostly thermal or diesel-powered. The construction of hydroelectric power plants required significant investments and experienced experts such as geologists, engineers, and architects. Some of the hydropower plants built in this period are architectural gems protected by UNESCO, such as the power plant Ozalj in Croatia. Because of this, hydropower plants were built where it proved to be the easiest and most profitable. Notably, Croatia took the lead in building hydroelectric power plants not only for its reach water potential but because of more educated experts (engineers and architects) and access to the substantial capital.

In contrast, the enormous potential of the Morača River in Montenegro was not fully used even though the government showed interest in exploiting this source. Inequality in the economic and industrial development of these regions affected the relations that would be established after 1919. Montenegro always stayed in the shadows of Croatia and Serbia, and even though a certain number of engineers pointed out that the building of the hydropower plant on the Morača River could solve problems of providing southern parts of the country with a stable electric network, political tensions always stood in the way.

Even though in 1919, many factors remained unsolved and grip of the central government in Belgrade tried to overlook these problems, there was a chance to amend some fractures. However, the central government always found some other issue to focus on, and the efforts of those involved in the development of the reliable electric infrastructure remained neglected.

The Kingdom of Yugoslavia experienced political turmoil in the period between 1929 and 1941. Moreover, it was affected by the global economic crisis. By introducing a dictatorship, King Aleksandar I tried to preserve the collapsed unity, but the existing conflict was further deepened. The government of Dragiša Cvetković tried to alleviate the rift with Croatia by introducing partial federalism. However, this agreement was seen as a temporary solution because the National Assembly never ratified it. The conflict over the federalist and centralist organization of the state has already done irreparable damage. Attempts to allow some autonomy came late. We can only speculate that electrification efforts would have been more successful if the state's federal system had been approached immediately.

Despite all these adversities, the engineers who were the main drivers of electrification managed to realize the plans they had partially. Engineers and architects of the Kingdom of Yugoslavia had put significant efforts to electrify the country as much as possible. Regardless of their primary goals, the electrification legislation and building of an efficient and interconnected power system have not been realized. Engineers and architects still managed to achieve a great deal in the field of electrification. Atlhough this study is concentrated on the expansion of the electrical network in the public frame, it should be mentioned that a great deal of electrification had been done in the railroads, telecommunications, and electrical household appliances. In conditions where they were marginalized continuously, the engineers did a lot. They seldom had access to the corridors of power, just as their advice was often ignored for more comfortable political opportunities. However, organizations of the engineers' organizations did not fail in the exchange of ideas and experiences. During the interwar period, engineers actively engaged in vivid debates, often traveled to the different parts of the country, organized numerous seminars and workshops, bettered university syllabuses, and, overall, became better connected.

In the first place, uneven coverage of the electric network in different parts of the Kingdom in the first decade of its existence is prominent. Moreover, even in the region, coverage is not proportionate. For example, parts of Dalmatia and Lika did not have any means of electricity production before 1919 and only got some by 1929. Most of the power plants built in this period are owned by private enterprise. In rare cases of public power plants owned by the municipalities, the initiative came from the private entrepreneurs who bid for the concession. Again, Montenegro is heavily neglected. However, this is the case with Macedonia and some parts of Bosnia and Herzegovina.

With a lack of a plan on the state level, the concession was the only way for most municipalities to build a power plant. These concessions usually meant that concessioners would build a power plant and sell electricity on fixed prices. After a certain period, power plants would be in the hands of local authorities. However, concession contracts usually ended with amending the rules because, in many cases, prices were too high (especially in the period of approaching economic crisis), or concessioners themselves did not respect terms of the agreement.

Furthermore, the Kingdom did not lack professional experts; however, their influence in decision-making is almost nonexistent. Engineers made efforts to present plans for broader and unified electrification, but the government always deemed other things to be more critical. In such conditions question of integration of already existing power grids seemed too ambitious. Lack of legal foundation slowed down the process of electrification in a great deal. There were three attempts to pass a law on electrification that would apply to the entire territory of the Kingdom of Yugoslavia. All three never reached further than the discussion at the National Assembly. The first attempt never even reached the National Assembly and remained only as of the proposal of the special committee.

Finally, the looming question of nation-building reflected in the electrification efforts. In comparison to Serbia and Croatia (but also Slovenia and some parts of Bosnia and Herzegovina), Montenegro lagged far behind in the electrification process. The conflict between the Croatian and Serbian political elites is the most visible part of the history of first Yugoslavia. The reasons behind this conflict are studied in many aspects of modern historiography. However, only a small portion of those studies dedicated some parts to the aspects of the provision of public goods being affected by this conflict. In the political sense, Montenegrins felt neglected, reflecting not only in the administrative, economic, and social aspects. In such conditions straightening the feeling of belonging to the same nation, they have created an impression of an impossible task. The state failed to provide equality in access to public goods, which reflected in the electrification process as much as in any other. In newspaper articles of the time dissatisfaction with the unequal distribution of funds only further undermined existing tensions between national entities.

In the end, the political situation dictated the development of any infrastructural investments, including electrification. By transferring or withholding funds, various state structures were able to expand, slow down, or completely stop some efforts in electrifying the country. In the technical sense, the distribution of the electric energy among the individual producers is easy if there is political uniformity to support the building of interconnected transmissions. However, this is usually not the case, not only in the Kingdom of Yugoslavia but worldwide. The indifference of the central government towards the Association of the Yugoslav Engineers and Architects, as the central platform for the country's electrification, proved to be of the reasons for failure to build an integrated electrical system. In the case of Czechoslovakia, Czechoslovak Electrical Engineering Union had the full support of the government and was one of the leading platforms in developing the interconnected electric system. The electrification efforts of the Kingdom of Yugoslavia remained humble due to the lack of legislation that should have been conducted in the very beginning; neglected engineering experts; uneven distribution of the funds and overall unwillingness of the state to embark on large infrastructure projects.

To conclude, after the First World War, European countries alleviated efforts in the electrification. At the beginning of the twentieth century, the first transnational systems in Europe took first visible shapes (Switzerland – Italy grid). With the construction of large hydroelectric power plants, the possibilities of high voltage transmissions opened new prospects for interconnecting the regional electric networks. The Kingdom of Yugoslavia did not discard the idea of the development of the electrical network. However, it did not provide

sufficient support to both the power industry and engineering organizations and unions. When compared to the electrification processes happening in interwar Europe, the case of Yugoslavia seems dormant. The government's focus was always somewhere else, and, even though efforts of the "system-builders" were never interrupted or discouraged, they were not supported or encouraged. The Kingdom of Yugoslavia did not provide efficient facilities to produce enough electricity to be even considered for sale to other countries. In the aspect of Hughes's economic mix, the Kingdom of Yugoslavia partially succeeded. Even though the number of hydroelectric power plans was far from satisfactory, the engineers of Yugoslavia always tended to combine various energy sources to provide electricity. Wherever hydro or mineral potential was sufficient to support the power plant, the government provided some support to build the facilities.

To say that insufficient provision of the public good such as electricity is the reason for the failure of nation-building in the Kingdom of Yugoslavia is tendentious. For such a complex problem, many aspects should be considered. Even though political factors always determine how everything else develops, in the aspects of nation-building besides political factors, social, economic, and infrastructural aspects should be studied as well. In this sense, this study could offer a fresh approach to this prevalent subject and provide some answers to why the nationbuilding project of Yugoslavs ultimately failed.

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