The Electrification of Russia, 1880–1926

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In December 1920, electrical engineer and Bolshevik Gleb M. Krzhizhanovskii displayed an illuminated map of a future electrified Russia to convince the 8th Congress of Soviets to approve a plan for state electrification. Moscow’s generating capacity was so low, however, that lighting the bulbs on the map resulted in blacking out parts of the city. Electrification had great political significance for the Communist regime, but dreams outpaced reality.

As well as changing night into day, electrification transformed capital markets, the military, manufacturing, the spatial geography of cities, and many other facets of Russian life. One of the products of the industrial revolution beginning in the last third of the nineteenth century, electrification was a science-based high technology that demanded educated technicians and scientists as well as enormous amounts of capital and industrial capability. In 1920, electrification replaced the railroad as the state technology by which the new government intended to accomplish its political and economic goals and distinguish itself from the old government. How effective was the early Soviet Union in implementing this vision? The answer lies between 1880 and 1926, between the formation of Russia’s first electro-technical society and the initial steps toward Stalin’s superindustrialization.

The approach used in this book is based on a social construction of technology, a powerful analytic tool that deepens our understandings of technologies and the societies in which they are grounded. Technology is viewed not as a given but as part of a “seamless web” with
society. To distinguish among science, technology, economics, and society is to create false dichotomies. Indeed, successful entrepreneurs are coalition builders who can forge alliances between their technologies and important social, economic, and political groups to gain support and resources. And important as individuals and technologies are, their interactions are mediated by organizations, themselves constructs. As Thomas P. Hughes, Michel Callon, and other historians and sociologists of technology have demonstrated, “organizations as well as physical artifacts have to be invented.” Technological controversy, it should be noted, is normal and serves as an arena for competing economic, political, and social interests.

In this history I investigate how political, economic, and social factors shaped the development of electrification in Russia and how electrification affected Russian society. I use Clifford Geertz’s “thick” description and the broad characteristics of the political and economic strands inherent in tsarist and Soviet infrastructures. The viewpoint is that of the engineers and technologists who struggled to form alliances to promote particular visions of electrification. Economic development and political factors structure technological change by guiding institutions and individuals along certain paths and excluding others. As I show, these institutional arrangements did not occur by chance but resulted from political, bureaucratic, and economic struggles among competing groups. These struggles and the concomitant battles for resources and prestige shaped the development of Russian electrification more than did technological momentum.

The historical interest in the rapid economic and industrial development of prerevolutionary Russia during its last decades has concentrated on the technologies of the first industrial revolution: iron and steel, textiles, and railroads. Industrialization meant railroads, not power plants, and tsarist resources (and our historical attention) were

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focused on the iron horse. American research on Russian technology has been devoted to the Soviet era and rarely touches on electrotechnology. The voluminous Soviet literature on electrification concentrates on the post-1920 period, when electrification became a state technology under Lenin’s slogan “Communism is Soviet power plus the electrification of the whole country.”

How should we understand electrification in the nation-state context? Comparing the European and American experiences, Thomas P. Hughes suggests that electrification follows a pattern from invention to development, innovation, transfer, growth, competition, consolidation, and rationalization. Each stage involves different people and institutions. Throughout, the successful entrepreneur adapts the technology to its environment while harnessing outside political and economic forces. Hughes concentrates on Western industrialized states, which are not representative of most of the world. From an industrializing viewpoint, Hughes overemphasizes invention, underemphasizes diffusion, and neglects questions of technology transfer and infrastructure. As post-Meiji Japan has demonstrated, invention is important but not vital for industrialization. Although invention has justly received a great deal of attention from historians, transfer is the key step in economic development. In the case of Russia, problems in transferring electrotechnical technology—institutional, economic, and other—slowed the spread and growth of Russian utilities and, consequently, of modernization.

How did electrification in Russia differ from that in the West? Why did the pace of electrification in Russia proceed so slowly or, an equally appropriate question, how did the West electrify so quickly? Russian electrical engineers did not work in isolation but actively participated in the international electrotechnical community. Commercial development of electricity for light, power, and transportation proceeded more rapidly in the West, however, and Russia never caught up. Major Russian differences included a lower level of urbanization and industrialization, a lack of supportive financial and technical infrastructure, and an overarching state administrative framework.

Electrification was one of four network technologies to transform

6 Vosmoi vserossiiskii sezd sovetov: Stenograficheskii otchet (Moscow: Gosudarstvennoe Izdatelstvo, 1921), 30.
8 The “West” is an ambiguous term, often used as a higher standard of comparison with Russia. Here, it refers to the more technologically advanced countries Germany, Great Britain, France, and the United States.
the urban environment in the late nineteenth century; the others were communications (telephone and telegraph), transportation (trains, trams, buses, and automobiles), and health (water and sewage). In a network technology, individual components—for electricity, generating stations, transmission wires, control and distribution systems—do not work unless the whole system functions. These technologies are usually considered natural monopolies because of the large amounts of capital required and the accompanying centralized control. Instead of resulting from the operation of two parallel systems, competition primarily occurs in the proposal stage when entry costs are low. The large expense of these technologies, their major role in a modern economy, and the political negotiations and alliances necessary to build, expand, and operate their networks means, as Josef W. Konvitz put it, that "the nature and extent of the controls built into systems and imposed upon them from outside mattered as much [as] or more than any purely technical factors."9

The history of electrification can be viewed as one of "bigger and better": more area covered by a single grid; larger power stations to service larger areas; more intensive use of electricity for light, power, and traction; and increased control exercised over the entire system in the name of more rational and efficient operations. Another interpretation is possible, however, one that sees the so-called natural aspect of monopoly determined as much by social and economic factors as by technical considerations. What is natural for a particular technology in a particular country at a particular time depends on the environment. Electrification became a natural activity in Russia in a different way from its development in the West.

Electrification was revolutionary worldwide, but it was also conventional. Electricity does little that cannot be done by other technologies and energy sources. Kerosene and gas provide lighting; wood and coal supply heat; belt drives transmit energy; horses pull trams. In its simplest applications, electricity replaced these sources; in its more advanced and developed forms, conceived within a broader systemic context, electricity could radically transform a workplace, an industry, and even a nation. The economic and social importance of electrification grew as its uses expanded from a novel means of lighting in the 1880s to industrial applications and trams in the 1890s. By World War

I, urban society and heavy industry depended on electric energy. The original electric companies combined the functions of generation, transmission, and distribution in small areas. As utilities grew, they remained in control of all three functions, seeing them as one continuous operation. By World War I, the scale and importance of electric light, power, and traction were such that alternative approaches for utility organization and control increased in number and credibility in Russia, Europe, and North America. After the war, proposals for centralized, large-scale, regional electrification received growing attention as part of a technocratic movement by engineers. Only in Russia, however, did the economic and political upheavals that started in 1914 change the status of electrification as well as the government.

Three themes flow through this book—the omnipresent foreign role in Russian electrification, the political constituency for the electrification process, and the economic, technical, and administrative environment in which it was attempted. Understanding Russian electrification is impossible without including the large foreign influence to which it was subject, influences that ranged from the obvious financial and material transfers to the less overt but very important flows of ideas, legitimization, and people. The lack of a national political constituency resulting from the centralized nature of the state handicapped electrification in tsarist Russia, but similar Soviet centralization benefited the politically connected electrical engineers. In general, the economic, technical, and administrative environment encompasses an invisible supporting infrastructure of activities from capital availability to government regulations to trained personnel. As electrification’s slow prerevolutionary transfer and diffusion illustrate, environment plays a major role in the development of a technology, one noticed more when it hinders than when it helps.

To explore these issues, I divide this book into three chronological parts: 1880–1914, the last years of imperial Russia; 1914–20, the chaotic years of world and civil war; and 1920–26, the period of the New Economic Policy (NEP). In each part I discuss the political and economic environment, the main actors, and the legal and organizational foundations of electrification. I exclude electrical manufacturing and the electrification of industry, which have been explored elsewhere.¹⁰

The focus is on the development of central and regional stations, which provided electricity for residential, commercial, government, and industrial users.

Chapters 2 and 3 on imperial Russia cover the initial decades of electric light, power, and traction as utilities spread from St. Petersburg and Moscow to other cities and towns. Although generation and transmission technologies evolved rapidly, development followed a conservative pattern, as suggested by the predominance of direct over alternating current.

Chapters 4 and 5 on World War I, the 1917 revolutions, and the civil war cover a time of profound change for utilities and electrical engineers. During this period, electrification changed from a local concern to a matter of vital importance and promise to the state. As in the West, World War I served as a catalyst for increased economic centralization and control in Russia, but six years of war and revolution created a political situation in which electrification became the new state technology par excellence. Aided by an increasingly dire economic and revolutionary environment, radical plans for utility development gained support among engineering and political elites. The core of this radical thinking was the regional station, a single powerplant that could serve hundreds of square kilometers.

Chapters 6 and 7 cover the State Commission for the Electrification of Russia (GOELRO) plan for state electrification and its partial implementation during the NEP. The harsh realities of reconstruction and limited resources overwhelmed the optimistic hopes of planners, who had to fend off demands from urban utilities and more radical proposals for rapid rural electrification.

As electric lighting, power, and traction grew in economic importance in Russia, their political importance also increased. Before 1914, electrification received no special treatment from the state; after 1920, it was the state technology, supported by the government and Communist party as a means to achieve their ends. As with so many other aspects of society, the tsarist administration’s “normal” treatment slowed the development and diffusion of new technologies and businesses. In the postrevolutionary period, the prominence given to electrification shows the meshing of agendas of different groups—the leadership of the electrical engineers and the Communist party—produced a mutually beneficial program at the expense of alternatives.

Postrevolutionary planners had three technological choices, each with a different set of political, economic, and social assumptions and priorities. The possible paths were a conservative approach, desired by cities, of supporting their existing utilities; a radical approach of rapid rural electrification supported by political and engineering advocates of social transformation; and a centralized approach of regional stations first for Moscow and Leningrad and later for other industrial centers promoted by engineers, planners, and Communists with a technocratic bent. The Communist party chose the third and technically most demanding approach despite opposition from advocates of radical and rapid decentralized rural electrification and proponents of existing medium-scale urban utilities. Although justified on technocratic criteria of maximizing economic rationalization and industrial development, the decision was inherently political. The importance of electrification ensured that authority over its development rested not in the leadership of the electrical engineering community but in the Communist party. Although electrical engineers occupied important government positions, they discovered that their monopoly on technical expertise did not give them a monopoly on decision making and resource allocation.

This history ends in 1926, when electrification had recovered from the travails of 1914–20 but before it was subordinated to industrialization. The political shift in 1925–26 from support of electrification to support of industrialization, the rapid growth of regional stations after 1927, and the advent of the five-year plans produced a style of electrification quite different from that of the early NEP years. After 1926, we must talk not about electrification in Russia but about Soviet electrification, which has a history sufficiently complex to warrant its own volume.