The Electrification of Russia, 1880–1926
Coopersmith, Jonathan

Published by Cornell University Press


For additional information about this book
https://muse.jhu.edu/book/46089
Although militarily successful, war communism failed to transform Russia into a socialist society. By 1921, the worsening political and economic situation demanded another approach. The Leningrad strikes, Kronstadt sailors’ rebellion, and Tambov peasant uprising challenged the legitimacy of a government claiming to represent workers, soldiers, and peasants. The economic situation looked bleak: a devastated transportation network, empty factories, rampant inflation, recalcitrant peasants, famine and accompanying epidemics, high unemployment, little trade with the West, and distinctly nonrevolutionary, if not hostile, international relations. In a reversal of war communism, the government’s NEP attempted to create an alliance (smychka) between peasants and workers to restore the agricultural economy and lead the peasants to socialism. The new policy legalized small-scale capitalism and decentralized many industries while retaining state control over heavy industry and foreign trade. State action and market forces coexisted uneasily in a reviving mixed economy.

The shift of resources to more consumer- and peasant-oriented industries, reacquaintance with market forces, and severe financial constraints drastically changed the economic and political environment for electrification. A sharp political struggle over the future of electri-

---


Electricity generation recovered faster than the rest of the economy, but the government’s focus on regional stations impaired the recovery and expansion of utilities in the second and third tiers. The initial optimism for rural electrification weakened with a tide of problems encountered in transferring high technology into a low-technology environment. Some electrifiers refocused on regional stations; others
realized that, as with any technology, social and organizational changes had to accompany the successful diffusion of electric light and power into rural regions.

The actor network that created the GOELRO plan lost some of its effectiveness as promotions increased the responsibilities of its leaders, while Lenin’s death and instability of the Glavelektro chair reduced its power. The first half-decade of the NEP demonstrated the state’s political reinforcement of one line of technological development, regional stations, at a time when conventional economics and urban governments urged a redeployment of resources elsewhere. Ironically, Glavelektro beat off these challenges but lost its priority to the demand of the state and party for accelerated industrialization.

Organization of State Electrification Agencies

The pull of central political support and the push of increasing demand shaped the bureaucratic evolution of electrification. The early 1920s saw the growth and maturation of new organizations and responsibilities at the national, regional, and local levels. Although electrifiers did not amass great administrative strength, electrification nonetheless became solidly embedded in the Soviet state apparatus. Most important were the failure to create a people’s commissariat of energy, the growing power of central planning and control, the rise of central financial organs, and the creation of local companies.

In 1920, the state organizational structure remained fairly simple. The VSNKh housed the KGS and ETO/Glavelektro. The KGS’s Elektrostroi handled construction and, through the TsES, technical advice. GOELRO assumed that it would represent electrification in a future state planning commission and that the ETO and Elektrostroi would implement the plan. GOELRO justified its continued existence on the grounds that the task of electrification remained unfinished. Prewar utilities would need replacement and the smaller stations should be integrated into a national grid. Electrification still required much planning, and GOELRO intended to do it.

GOELRO’s assumptions proved unrealistic. By 1924, a series of battles over the course of electrification had produced a more complex organizational matrix that diffused responsibility and increased duplication, the worst of both worlds. The 1921–22 battle over the future of

---

The ETO demonstrated the subordination of electrification to more powerful state interests. On 21 December 1921, the VSNKh ordered the newly formed Glavelektro, the ETO successor, to submit organizational proposals to fulfill the GOELRO plan. Four months later, Glavelektro submitted three options: a commissariat of energy, a commissariat of electrotechnology, and a continuation of Glavelektro. The major differences were the degrees and centralization of authority, vertical integration, and independence from the VSNKh.

Glavelektro favored a commissariat of energy to control the entire energy cycle from coal mine to consumption, unifying Glavelektro, Elektro stroi, and the Main Fuel Administration into a center above the VSNKh and answerable only to the powerful SNK. Controlling all energy would provide "the state exceptional advantages for administering all the economy," since the government could "prevent all those activities that can lead to violations of the general state economic plan." This proposal implied economic management by control of energy and a return to a command economy. More important, the proposed commissariat would create a new political center for industrialization and threaten the authority of the VSNKh, the Commissariat of Transportation, and other state organs. Such ambitious schemes proved politically impossible in 1922. The rejection of a commissariat of energy or milder commissariat of electrotechnology in favor of the existing Glavelektro indicated the limits of the political power of the electrical engineers and the strength of the established state structure.

Officially the VSNKh Main Electrotechnical Administration, Glavelektro handled the electrotechnical industry, electricity supply, and, with the transfer of the TsES from Elektro stroi, grand advice. Glavelektro directly controlled the three largest centers of electrical consumption, Moscow, Petrograd, and Baku. Although it eventually lost direct control over smaller stations, it maintained its influence by establishing standards for equipment, tariffs, and operations, and, most important, by coordinating utility financing with Gosplan and Elektrobank.

Five men headed ETO/Glavelektro from 1920–26: Gleb M. Krzhizhanovskii, Valerian V. Kuibyshev, Abram Z. Goltsman, Leon Trotsky, and Isaak E. Korostashevskii. Of the five, only Krzhizhanovskii...
skii was a prominent electrical engineer. Kuibyshev and Trotsky were professional party members who served only short stints and whose interests lay with the party. Korostashevskii served as Glavelektro vice-chairman before and after his period as director. Goltsman was a Bolshevik worker with a polytechnic education who served on the central committee of the metallurgy union. Irrespective of the individuals, five heads in six years provided neither firm leadership, continuity, nor skill in bureaucratic politics. The political appointees did not stay long enough to influence the VSNKh, and the electrical engineers played a subordinate role to their political superiors.

Possibly the most unexpected director was Trotsky, appointed in May 1925 following his January dismissal as commissar of war. Together with his appointment to head the concessions commission and the VSNKh science-technology section, this selection marked a major stage in his gradual political defeat by Stalin. Although placing him under Felix Dzerzhinskii, VSNKh chairman and founder of the Cheka, the Soviet secret police, these appointments allowed Trotsky to pursue his interests in industrial planning, including scientific management. At the June 1925 opening of the Moscow Thermo-Technical Institute named for the heat committee’s Kirsh and Ginevetskii, Trotsky called for “Ramzinists” to explore and promote rationalized fuel use and industrial organization because “scientific technology is one of our most important weapons of our state self-assertion in the world struggle.” This connection with Trotsky may have contributed to Ramzin’s involuntary participation in the 1930 Industrial party trial. In 1925, Trotsky adopted a comparative approach in industrial planning by organizing a body of U. S. experts, augmented by a similar body of Germans, to guard the Dniepr hydrostation planning from defective estimates and to attract foreign involvement.


Prior to 1925, Trotsky had viewed regional electrification as a long-term goal with colossal significance for integrating the peasants into a single economic plan. His interest predated the GOELRO plan, but, except for his support of Shatunovskii’s 1921 unrealistic hydroelectric proposal for Petrograd, Trotsky did not favor an aggressive approach to electrification. Although important, electrification was a ten-year plan, and other industries—particularly transportation—demanded more immediate priority.\(^{15}\)

Trotsky claimed that he worked energetically at Glavelektro, but his political baggage disrupted his new duties: “Every practical step that I took gave rise to a complicated intrigue behind the scenes.” Equally important, “it became practically impossible for the institutions under my direction to obtain the necessary wherewithal. People working there began to fear for their futures, or at least for their careers.”\(^{16}\) According to Valentinov-Volsky, a high-level VSNKh official, Trotsky lost the great initial interest of the VSNKh staff by his lack of patience, attention to too many issues, and leisurely work habits.\(^{17}\) Instead of vigorous leadership, Glavelektro suffered the double handicap of an unmotivated director in political disgrace. In January 1926, Trotsky asked to be relieved of his VSNKh assignments. His vice-chairman, Korostashevskii, replaced him.\(^{18}\)

Electrification was affected not only by changes in Glavelektro chairmen but from an expansion of bureaucracy. Elektrostroi remained the state construction organ under the KGS, now renamed the Main Administration for State Construction. At the state level, the NKVD Main Administration for Cities (GUKKh, Glavnoe Upravlenie Kommunalnykh Khoziaistv) represented urban interests. Like the tsarist MVD, the GUKKh’s planning commission reviewed city projects and worked with Gosplan.\(^{19}\)

Above Glavelektro and the GUKKh stood Gosplan. Instead of becoming part of Gosplan, established in February 1921 to develop a unified plan for the entire economy, GOELRO dissolved into the new


\(^{16}\) Trotsky, My Life, 520.


\(^{18}\) “Prikaz 312,” Sbornik postanovlenii i prikazov po promyshlennosti, 1926, no. 8: 60.

\(^{19}\) “Kronika Tsenta,” Kommunalnoe delo, 1922, no. 2: 44–45; 1924, no. 5: 32–33; “Na mestakh,” Kommunalnoe delo, 1924, no. 1: 73.
organization. Gosplan relied heavily on GOELRO members, including Krzhizhanovskii, its first president; Osadchii, a vice-president; Aleksandr A. Gorev, a presidium member; and at least eleven other people. Within Gosplan, the section on energy handled electrification. The GOELRO veterans had greater authority and power than before, but their responsibilities and priorities changed also. The initial political emphasis on the short term and responsibilities far beyond electrification meant that implementation of the GOELRO plan would not receive top priority despite the high posts of its founders. The electrifiers became captives of their positions.

The greatest growth occurred in planning organs as each agency established its own cadre of planners to work with Gosplan. Both Glavelektro and the TsES established planning sections in 1921–22. At the urging of the Gosplan section on energy, the VSNKh created in July 1922 a planning commission for electrification, Elektroplan, which united the planning activities of Glavelektro, Elektrostroi, and the TsES; in early 1923, the activities of the GUKKh were added, belatedly reflecting the transfer of local utilities from Glavelektro to the GUKKh. The TsES abolished its planning section in mid-1924 on grounds that its representatives in Elektroplan rendered the section redundant, but it then created a new section for regional stations.

With four central planning organs and a state-approved plan, electrification suffered not from a deficit of thought but a lack of meaningful action. These sections repeatedly sent plans and proposals back and forth, seeking unanimous approval and diverting disputed issues elsewhere. Elektroplan was the most active organ, followed by the Gosplan section on energy. These planning bodies did not contribute to the realization of electrification, only to its bureaucratization, yet another legacy of the tsarist government.

A major focus of early planning consisted of devising operating and

20 V. G. Smoliakov, Voprosy gosudarstvennogo stroitelstva v resheniakh IX-oego Vserossiiskogo seza sovetov (Moscow: Izdatelstvo Moskovskogo universiteta, 1962), 38–44.
21 Including Ivan G. Aleksandrov, Kogan, Krug, and Shulgin; Trudy GOELRO, 259–74.
22 “Iz zhizni,” Elektrichessto, 1922, no. 2: 54–55. An early task was sending local governments copies of the GOELRO plan.
24 E. g., the siting of the Shatura substation; “Khronika,” Elektrichessto, 1924, no. 5: 289.
construction plans for Petrograd and Moscow on one-year and five-year bases; these constantly underestimated demand and overestimated supply.\textsuperscript{25} Elektroplan and Gosplan actually exerted decisive influence in settling the constant arguments within the Moscow and Petrograd utilities over the appropriate mix of stations for generation.\textsuperscript{26} The planners responded as well as initiated, using their commanding central position to coordinate separate activities.\textsuperscript{27} One benefit of the emphasis on planning was the creation of far more comprehensive statistics. As lines of authority firmed and the outlook for regional stations improved, the central planning organs devoted more resources to areas outside the first tier.

In contrast with the growth of the state electrification bureaucracy, the VI Section and the military did not regain their prerevolutionary roles. Although the VI Section of the Russian Technical Society, shorn of its “Imperial” designation, and the Moscow Society of Electro-technicians resumed activities in 1921–22, the professional electrical engineering associations never regained their prerevolutionary prominence or wartime initiative.\textsuperscript{28} Instead, the TsES and planning organs now advised and guided cities, while society members proposed ideas within rather than to the government. In achieving state-sponsored electrification, the VI Section lost its independence. Before 1917, it was a junior partner and occasional adversary of the government; now it functioned increasingly as a branch of the government.

During World War I, the military again played an important role because of its industrial needs and authority to allocate resources. It could protect skilled workers from mobilization, obtain priority in materials and transport for factory orders, and transfer surplus military equipment to generate electricity elsewhere. This equipment proved marginally important during the civil war, but as better equipment replaced the old equipment the military retreated from an active role in electrification.

The first electrotechnical journals published since 1918 appeared in 1922, a sign of economic recovery. Voprosy elektrifikatsii (Questions of


\textsuperscript{27} E. g., the Urals planning organ combined proposed stations for a coal mine and a factory into one larger station at the coal mine; “Kommunalnye predpriiaitiia,” Kommunalnoe delo, 1925, no. 8: 59–60.

\textsuperscript{28} “Iz zhizni,” Elektrichesvo, 1922, no. 1: 52; 1923, no. 3: 165.
Electrification) appeared only once before replaced by Elektrichestvo, now the organ of Glavelektro as well as the electrical engineering community. As before, the journal served as a major conduit for information from the West and the government. Significantly, coverage of urban electrification shifted to Kommunalnoe delo (Communal Affairs), the NKVD journal for municipal governments. Another new journal, Elektrifikatsiia, provided information for rural electrification.

The state agencies promoting electrification under the NEP were not what Krzhizhanovskii and other electrifiers desired. Instead of commanding positions, they were subordinated to other state authorities; instead of clear-cut lines of authority, bureaucratic confusion resulted. Confusion grew not just from administrative flux but from very real uncertainty among government officials as well as engineers about what to do and how. Nonetheless, within the realm of electrification Glavelektro successfully forged an alliance with Gosplan and Elektrobank to defeat alternative programs. Against the interests of other parts of the state, particularly heavy industry, and the Communist party, Glavelektro fared less well in the larger debates about economic development.

The Implementation of the GOELRO Plan

The implementation of the GOELRO plan differed greatly from its creation. Instead of generating a well-funded, well-organized, and centralized program to build regional stations, the drive to electrify split into competing directions, which vied for resources. The NEP shift of the political and economic environment toward decentralization and short-term, profitable operations was the major causative factor. Inadequate funding chronically hindered electrification, especially in the slow economic recovery of 1921–22.

Faced with continuing “bureaucratic irresponsibility and muddles” and shortages of equipment, materials, and food, the government in June 1921 stopped construction on all regional stations except for projects promising short-term results, like the temporary 5-MW Shatura station. Other projects, including railroad electrification, experienced similar delays. These cutbacks grew from an overextension of

resources caused by the simultaneous construction of too many stations. Since total investment did not increase sufficiently, funding was greatly inadequate to complete all the stations. Limited resources were spread too thin, the result of bad planning. At a time when reconstruction demanded optimal use of financial, material, and human resources, this waste delayed recovery. Partially constructed stations contributed nothing to economic growth; indeed, they postponed growth by absorbing resources better used elsewhere.

As obstacles mounted, expectations fell. In February 1922, a pessimistic Krzhizhanovskii forecast that the construction of the twenty-seven regional stations would demand ten to twenty years, a potential doubling of the original goal. In May, a major article claimed ongoing construction on thirteen of the twenty-seven stations. Half a year later, only ten stations were so described, work on two had stopped, and two other stations remained in the planning stage. According to V. V. Kuibyshev, Krzhizhanovskii’s successor at Glavelektro, large-scale construction presented a “not especially delightful picture.”

Divided authority, poor organization, and local-center conflicts hindered the allocation of inadequate resources. In 1921, Elektrostroi controlled construction of regional stations with the significant exception of stations already started. The VSNKh presidium directly controlled Volkhov construction, and Glavelektro managed Shatura construction. Not until 1924 did Glavelektro receive responsibility for construction of all regional stations, excluding the Volkhov.

One problem generic to the construction of regional stations and other large-scale projects was the poor living conditions. Overcrowding, illnesses, and infestations of cockroaches and bedbugs so bad that “night without light is unsafe from them” were not unusual. The terribly inadequate living conditions at Kizel, documented by an inspection team sent from the Commissariat of Labor in 1922 because of a typhus epidemic, hurt the health of the labor force. As the large-

---

32 “Ekonomicheskii otdeI,” Pravda, 31 January 1922, 4; Obzor sostoiania rabot po krupnomu elektrostroitelstvu na 10go oktiabria 1925 g. (Moscow: Glavelektro, 1926), 18.
33 E. g., Kashira and Volkhov; “Vnimaniu Glavelektro,” Pravda, 19 July 1924, 5.
scale projects of the Stalin era and the tsarist trans-Siberian railroad demonstrated, poor living and working conditions were the rule, although conditions in the tsarist era were better.\textsuperscript{35} One contributing factor was the siting of regional stations in undeveloped areas, which necessitated first the establishment of construction industries, including sawmills and brickworks, to build the town needed to construct the plant.\textsuperscript{36}

The Ural Kizel plant exemplified the problems of translating GOELRO's vision into reality. The Kizel project suffered from a scan-


\textsuperscript{36} For Shatura, see Allan Monkhouse, \textit{Moscow, 1911–1933} (London: Victor Gollancz, 1933), 117.
dal of equipment shipped in 1919 from the Oranienbaum electric station but still absent from Kizel in 1921. More mundane but no less serious were the death of the chief engineer, desperate living conditions, an epidemic, inadequate work clothing, poor communications, too few horses, and lack of assistance from Elektrostroi. The Kizel station’s continued difficulties threatened the area’s mining industry. In a now-familiar tale, shortages of money in 1922–23 also delayed construction. The station finally opened with 6 MW (15 percent of its planned capacity) in spring 1924, powered by the two 3-MW generators from Oranienbaum.

The overall situation improved in 1923 as a growing economy, the end of the famine, increased state funding, and greater access to materials, equipment, and fuel eased many shortages. Repairs and reconstruction of existing stations resulted in greater availability of equipment, and three years of experience had produced a more mature and seasoned set of administrators. Nonetheless, projects moved slowly toward completion, with initial capacity significantly below planned capacity (see Table 7.1).

The value of regional stations began to improve drastically in 1926, when three regional stations—Volkhov, Nizhegorod, and Shterov—and the main Shatura station began operations, consummating the work of several years. The 164 MW of new construction, although only a tenth of the capacity planned by GOELRO, nonetheless equaled the prewar capacity of all second- and third-tier stations. Of the seven regional stations generating electricity in December 1926, one (Red October) had prewar origins and served Leningrad like the just opened Volkhov, and two (Kashira and Shatura) served the capital, leaving only the Kizel, which was more an industrial station than a regional station, Shterov, and Nizhegorod stations providing power outside the Moscow-Leningrad industrial nexus. Those three stations did not generate even 5 percent of the electricity of first-tier and regional stations in 1926–27.

Compared with the goals and promises of GOELRO, rhetoric outpaced results. GOELRO’s minimum plan produced incremental, not


Table 7.1. Capacity of regional stations, 1924–26

<table>
<thead>
<tr>
<th>Station</th>
<th>GOELRO</th>
<th>1924</th>
<th>1925</th>
<th>1926</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>planned (MW)</td>
<td>actual (MW)</td>
<td>actual (MW)</td>
<td>actual (MW)</td>
</tr>
<tr>
<td>Kashira</td>
<td>60</td>
<td>8</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Shatura</td>
<td>40</td>
<td>5</td>
<td>5</td>
<td>32</td>
</tr>
<tr>
<td>Volkhov</td>
<td>54</td>
<td>—</td>
<td>—</td>
<td>54*</td>
</tr>
<tr>
<td>Red Octoberb</td>
<td>60</td>
<td>6</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Kizelc</td>
<td>40</td>
<td>—</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Nizhegorodd</td>
<td>40</td>
<td>—</td>
<td>—</td>
<td>20</td>
</tr>
<tr>
<td>Shterov</td>
<td>60</td>
<td>—</td>
<td>—</td>
<td>20</td>
</tr>
<tr>
<td>total*</td>
<td>314 (68)</td>
<td>19 (100)</td>
<td>33 (82)</td>
<td>164 (72)</td>
</tr>
</tbody>
</table>


a Volkhov did not open until December 1926.
b Formerly Utkina Zavod.
c Renamed Gubakha.
d Renamed Balakhnin.
e Percentage of Moscow and Leningrad plants to all stations in parentheses.

revolutionary, improvements. Engineers measured their progress by electrifying a large factory in Nizhni-Novgorod, extending transmission lines to towns near the Kashira station, and understanding mining needs to design the Kizel station better. In an inexpensive approach to spreading electric light and power, low-voltage transmission lines electrified areas outside seventy-seven factories. The economy’s recovery on traditional lines, however, derailed efforts to create new industrial regions. In the Northern Region, predicted demand rose faster than predicted supply, whereas Siberia grew too slowly to justify a regional station.

Regional stations remained the government’s priority. State funding skewed heavily toward them—of the 258 million rubles directly invested in utilities from 1920 to 1926, 229 million (89 percent) went to regional stations and only 29 million to urban and rural stations. Of the 229 million rubles, the capital-intensive Volkhov project consumed 93 million (41 percent), though its 54 MW provided only one-

third of the 164 MW installed in 1926. The "white coal" revolution cost 2.5 times more per megawatt than other fuels (1.7 to 0.7 million rubles/MW).

In 1926, Krzhizhanovskii called the delay in hydrostation construction electrification's major problem. The record was poor: the Volkhov station finally opened in late 1926, eight years after the ETO started construction, three years after the original 1923 goal, and two years from GOELRO's 1924–25 goal. The Volkhov was a symbol of the electrified future as much as Leningrad's main power source. Nonetheless, July 1925 found construction finished only in the rough. Swiss engineers began installing the turbines only in August 1925. Workers completed the transmission line to Leningrad in November 1926 and the hydrostation officially opened on 19 December 1926.

The only other hydrostation under construction was the 11 million ruble Zemo-Avchalsk in Georgia, which grew from local initiative with some state financial assistance. Planning of the 13-MW station started in June 1922, construction commenced in early 1923, and operations began in June 1927, two years later than scheduled. Costs had also significantly exceeded the original estimates. Mikhail D. Kamenskii, secretary for the short-lived Union of Electrotechnicians and ETO vice-chairman, had warned in 1920 that, based on Western experience, the construction of a hydrostation demanded six to ten years and cost three to five times more than thermal stations.

---


49 M. D. Kamenskii, "Svirskaiia i Volkhovskaiia gidro-elektricheskie stantsii i realnye vozmozhnosti obespecheniia petrogradskogo raiona na blizhaishchee vremia," TsGANKh f. 5208, op. 1, ed. kh. 69, 95.
Lenin and electrification. Volkhovstroi produces power! Communism is Soviet power plus electrification. Courtesy of the Hoover Institution.
fortunately for the Soviet economy, his prediction proved more accurate than GOELRO’s.

The heavy investment in the Volkhov raises the question of whether the capital-short country should have focused its resources elsewhere. Alternatives for Leningrad were, however, few. In 1920, Kamenskii had proposed expanding existing thermal stations and using British coal for most efficient operations. But returning to pre-war dependence on British coal was politically impossible domestically, so the easiest technological choice was eliminated. Shipping southern oil and coal would strain the transportation system and contradict the concept of regional autarky. Local low-quality peat did supply Petrograd, but never at the levels necessary. Furthermore, the cult of “white coal” was deeply entrenched in the mythos of electrification. Against the vision of massive dams feeding the country’s vibrant industries tomorrow, what were high capital costs and shortages today?

The answer also depended on who was paying. Gosplan’s Gorev decried the opposition to the long-term investment necessary to create a centralized energy supply. But industries could not afford to wait for the future. Delays of regional stations forced electricity-dependent industries to upgrade and expand their own stations. Delays and inadequate capacity in the “long-constructed and long-awaited” Kizel station forced the city and the Karabash copper factory to add 2.5 MW to their stations. These expansions, often done at the last minute, were costly and resulted in equipment purchases that soon became surplus. They also inspired the desire to minimize future dependence on outside electricity.

Promises of regional stations remained mostly that during the early NEP years. The major exception was Moscow; Leningrad proved only a partial exception. In a continuation of prerevolutionary activity, the first half-decade of the GOELRO plan had increased the electricity supply for the first tier, not for the country as a whole.

The First Tier

GOELRO’s first years were, to a great extent, the history of the electric networks of Petrograd/Leningrad and Moscow, which pro-

---

50 Ibid., 95.
duced nearly half the country’s utility-generated power and consumed the majority of resources and investment. The government’s concentration of resources on the first tier enabled these utilities to recover and expand more rapidly than those of other cities. Moscow and Baku surpassed their 1916 highs in 1922–23, four years before Leningrad, because their utilities directed investment into traditional technologies and locally fueled regional stations (see Graph 7.1).\(^{53}\) Moscow continued to expand rapidly with new regional stations while Baku, which did not add any new stations, grew more modestly. Leningrad suffered longer because the bulk of its investment went into the Volkhov hydrostation and because the Soviet government chose not to resume imports of British coal.

The unheralded success of postrevolutionary electrification was Baku, which generated more electricity than Leningrad until 1927. Baku’s two central stations had suffered catastrophically from worn-out equipment, the lack of replacement equipment, shortages of trained personnel, and overloading.\(^{54}\) Aided by new insulators and other imported equipment, the two-station network reached prewar levels in 1919, in sharp contrast to Moscow and Petrograd, and rapidly expanded in the mid-1920s. Under the rubric of rationalization, the Azerbaidzhian oil trust, Azneft, increased the share of electric motors in oil fields from 54 percent in 1920 to 83 percent in 1926.\(^{55}\) This major accomplishment of the Soviet government received little attention, in large part because regional stations were not involved.

Nowhere was the gap between the promise and the reality of GOE LRO greater than in Petrograd. Its utilities suffered more than Moscow’s because of the variability of the low-quality fuel burned and shortages of spare parts and equipment: in 1922, only half of Petrotok’s installed capacity functioned. The 1st State Electric Station (formerly the 1886 Company station) had only 22 MW of working turbines, compared with a theoretical 45 MW, and seven of the nine working turbines needed blade changes. Similar problems afflicted


Graph 7.1. First-tier electricity generation, 1913–27


boilers and auxiliary equipment. Major repairs and new boilers for the former 1886 Company station in 1924–25 restored its capacity to prewar levels, but inadequate boiler capacity constrained output through the 1920s. The incompatibility of voltage and frequency of the four utilities hindered citywide operations until the completion of the 1915 unification plan, originally scheduled for 1917–19, in 1925.

Organizationally, the ETO operated the 1st Station and the city’s


57 In October 1927, only 96 MW of boiler capacity functioned compared with 129 MW of available turbine capacity; Elektrotok, Statisticheskie spravochnik ‘Elektrotoka’ 1913–1928 (Leningrad: Elektrotok, 1929), 10–11.

Section for Communal Economy operated the other three utilities until 3 December 1920, when the ETO took command of the 93 MW of all four stations and established the Unified State Electric Stations—despite opposition from local government. The new state section formally became Petrotok under Glavelektro in March 1922, and Petrotok became Elektrotok when Petrograd became Leningrad in 1924.59

Geography may not be destiny, but access to fuel shapes future options. Leningrad’s prewar fuel, Cardiff coal, was politically undesirable, and the poor railroad system aggravated the city’s distance from southern oil and coal. Hydropower depended on the completion of the Volkhov station. Thus the fuel situation remained “fully undetermined and disordered” through the mid-1920s.60 Wood generated two-thirds of the electricity during the darkest days of 1920 and remained a major Petrograd fuel through 1924, when it was quickly eclipsed by the return of Donets coal, as Graph 7.2 illustrates.61 Once accessible, southern oil and coal supplied three-quarters of Leningrad’s fuel. The growing role of peat came from the expansion of the Red October regional station.

Supplies of domestically produced materials and equipment remained precarious. In March 1920, the Red October (formerly Utkina Zavod) project, halted during the war, received only fractions of materials, ranging from no iron to 69 percent of wood. Similar shortages hindered the construction of the Volkhov and connecting substations.62 These problems limited the Red October station initially to 4 MW in 1923, down from the original 30 MW and revised 10-MW forecasts. The peat-fired station gradually increased capacity to 10 MW in 1925 and 20 MW in 1926, although unpublicized defects kept it from operating fully until late 1927.63 Equipment shortages also frustrated plans


61 Elektrotok, Statisticheskii spravochnik, 32, 48–49.


to harness surplus factory capacity. Of three factories, only Obukhov, operating on the same frequency and phase as the 1886 Company station, produced electricity for Petrotok in 1921. The lack of transformers and cables delayed the conversion of Putilov until 1923 and ended any chance to use Metall. On the demand side, higher tariffs and the installation of 40,000 electric meters reduced the lighting load to prerevolutionary levels by 1924.

Finances continually troubled Petrotok. Before the reestablishment of tariffs, free electricity and the kustar heaters for lightbulb sockets resulted in high consumption despite the lack of commercial and industrial use and street lighting. As part of the NEP's focus on economic feasibility, Petrotok had to pay for fuel after May 1922, placing the utility in a desperate financial situation. Delayed payment from some users and nonpayment by others, including the state govern-

Graph 7.2. Leningrad fuel use, 1920–27


65 Kotomin, “Deiatelnost,” 328. This increased Leningrad’s electric meters by one-half.
ment, exacerbated the utility’s problem. One response was to inte­
grate vertically by taking control of its peat supply from its govern­
ment suppliers, decreasing Elektrotok’s cost by a third and increasing
availability. 67

By mid-decade, the question of future fuels remained open, but the
debate had shifted from availability to the economics of investment.
Major industrial customers did not rebuild their stations, economi­
cally more advantageous than paying Elektrotok tariffs, only because
they lacked the funding and state planning organs pressured them to
wait for the Volkhost hydrostation. 68

Delays in completing the Volkhost station, problems with the Red
October, and NEP-boosted industrial demand caused serious short­
ages in 1925–26. Elektrotok prohibited new hookups, and some facto­
ries reopened their own stations in response to cutbacks. 69 Until the
Volkhost station opened, Leningrad endured the worst electric supply
situation of the first-tier cities, a victim of its prerevolutionary inability
to act on hydropower. Although the Volkhost’s 54 MW nearly in­
creased Leningrad’s capacity by half, rising industrial demand en­
sured that the fuels of the future would burn as well as bubble.

Despite the near collapse of the city’s power supply in 1920–21,
Moscow recovered quicker than Leningrad. The MOGES consisted on
1 January 1922 of eight stations with 108 MW of installed capacity, 81
MW of which were 50-cycle 3-phase AC, the industrial standard, and
23 MW of which were 25-cycle 3-phase AC from the tram station. 70
The 1st Moscow State Electric Station supplied half the capacity, and
Elektroperedachad and the tram station provided another 40 percent.
Three small stations near Elektroperedacha—Pavlov, Glukhov, and
Orekhov—supplied the other 10 percent via the peat-fired station.

Recovery occurred on three fronts: organization, fuels, and equip­
ment. When the NEP “delivered [Moscow utilities] from the excessive
guardianship of numerous agencies which mixed in its life” and sta-

67 “Elektrotekhnicheskaia promyshlennost,” Ekonomicheskaia zhizn, 11 May 1922; Ko­
tomin, “Deiatelnost,” 331.
68 E. g., 1 kWh cost the Red Vyboretz (former Rozenkrantz) factory 7.3 kopecks
versus the 9.0 charged by Elektrotok; see A. Gorev, “Planovaia elektrifikatsiia,” Pravda,
4 January 1925, 1; see also A. A. Gorev, “Elektrifikatsiia SSSR,” Planovoe khoziaistvo,
1925, no. 2: 171, 173.
69 Elektrotok, Statisticheskii spravochnik, 11; A. A. Kotomin and M. D. Kamenetskii,
“Obzor deiatelnosti Leningradskogo obedineniia gosudarstvennykh elektricheskikh
stantsii ‘Elektrotok’ za period 1917–1927 gg.,” in Izvestiia Elektrotoka, Elektrichestvo,
1928, nos. 1–2: 4.
70 V. I. Ivanovskii, “Elektrosnabzhenie Moskvy i blizaishie perspektivy v etoi ob­
tion operations concentrated in the MOGES, reconstruction began in earnest. The arrival of spare parts in 1922 greatly improved output, although working turbine capacity still exceeded boiler capacity by 20 MW (20 percent) in 1923. The revival of oil and peat supplies essentially eliminated wood consumption by 1922, two years before Leningrad. Using specific fuel consumption as an indicator, the MOGES reached its nadir in 1919–20 and regained prewar levels of efficiency in 1924–25 with the completion of capital repairs. Industrial consumption reached its prewar share of two-thirds of output in 1925–26.

Consumption expanded rapidly at an “American tempo” due to the NEP-prompted industrial recovery, forcing an expansion of capacity at the 1st Moscow and Elektroperedacha stations. The MOGES matched 1916 levels in 1922–23. Three years later, its output of 498 MkWh doubled the 1916 level and represented 45 percent of first-tier and 35 percent of all utility output. Most of the increase came from three regional stations that accounted for half (75 MW) of the MOGES’s 151 MW and 60 percent of output in 1925–26 (see Graph 7.3).

Glavelektro, Elektroplan, and the Moscow regional planning commission developed two five-year MOGES plans, one in 1922 for 1923–27 and a second in 1925 for 1925–30. As with Leningrad, the plans seriously underestimated demand and the MOGES’s ability to meet it. The major change between the two plans was the perception of fuels. The 1923–27 plan viewed oil as a valuable commodity for export and the 1st Moscow Station as a peaking and reserve plant. The 1925–30 plan viewed oil as a valuable commodity for export and the 1st Moscow Station as a peaking and reserve plant.

71 Robert E. Klasson, TsGANKh f. 9508, op. 1, ed. kh. 14, 4.
73 “Khoronika kommunalni tekhniki,” Kommunal’noe delo, 1925, nos. 11–12, 88.
to 277 MW. Another 90 MW would come from industrial stations or a new large station, fueled by peat, Donets coal, or even Baku oil. By 1930, local fuels would power 148 MW (53 percent) of capacity, compared with 49 percent in 1925; that is, oil-fired capacity would double too, weakening one of the main underpinnings of GOELRO, emphasis on local fuels. As in Leningrad, high-quality and local fuels remained essential in electrifying Moscow.

The shift in perspective from the 1920 focus on local low-quality fuels to 1925, when planners seriously considered the construction of a 50–100-MW oil-fired plant, was significant. A major change from GOELRO’s reliance on local fuels, it marked the end of recovery for the MOGES and the start of an electrified future based on a secure economic foundation. As the coal industry and transportation system rebuilt, the virtues of high-quality fuel looked increasingly attractive, precisely the situation Ramzin warned about in 1920.

Moscow realized the promise of GOELRO’s emphasis on regional stations. Because it was the capital, access to resources proved easier
there than for other cities. More important, its thermal regional stations did not demand the long time and large costs of Leningrad’s Volkhov hydrostation. The first postwar regional stations, the temporary 5-MW Shatura and 12-MW Kashira, began operations in 1920 and 1922, respectively, outside Moscow. Despite the large publicity, their initial output proved modest: they contributed only 7 MkWh (4 percent) of Moscow’s power in 1921–22. By 1924, however, the two stations contributed 65 MkWh (20 percent) of Moscow’s electricity and doubled that percentage and tripled output to 207 MkWh in 1926 after the main Shatura station opened.78

Kashira and Shatura were bold steps into the unknown which reflected Moscow’s desperate need for new sources of electricity, and they suffered accordingly. They began as patchwork stations, “made up of the strangest assortment of parts, collected from all over Russia,” and served as testbeds to determine the feasibility of blending Soviet and foreign technology to burn peat and Moscow brown coal.79 The lack of new Western technology and lack of participation by foreign firms hindered development of both stations.80 Unlike Elektroperedacha, Kashira and Shatura initially began without direct Western support. GOELRO took this act of independence, of designing and building new types of electric stations, reluctantly. Once Western assistance became available, it was used.

Expanding on Elektroperedacha, Shatura demonstrated the successful large-scale harvesting, preparation, and burning of peat. Opening with 16 MW in December 1925, it doubled quickly to 32 MW and added a third 16-MW Czech turbogenerator in 1927.81 Shatura was an impressive demonstration of Russian ingenuity and effective cooperation with foreign firms. The basic equipment was imported, but the research and modifications to burn peat efficiently were domestic.

The TsES started planning Kashira in 1918, but construction did not begin until 1920. Although the station had been planned to open with

78 Klasson, TsGANKh f. 9508, op. 1, ed. kh. 14, 6; “Biulleten,” Elektrichesesto, 1928, nos. 1–2: 35.
the 9th Congress of Soviets in December 1921, the lack of skilled personnel to install the transformers delayed initial operations until July 1922. The installers ultimately came from Sweden. Two 6-MW Brown-Boveri turbogenerators, powered by brown coal, sent electricity 130 kilometers over a 115-kV transmission line.\(^\text{82}\)

As Moscow became more dependent on high-voltage transmission lines, their reliability became an issue. From 1924 to mid-1925, the lines serving Moscow failed seventy-two times, an average of once a week. These outages, which rarely lasted less than an hour, harmed electrical equipment and caused financial and material losses to users. Equally important, they diminished confidence in the MOGES and strengthened factory interest in independent stations. Short circuits resulted from technical problems, including material fatigue, overloading, and poor equipment, but carelessness, hooliganism, and natural disasters also caused many interruptions. Vandalism, apparently mindless, became a serious problem, with accidental electrocution the only deterrent. Glavelektro responded with research on better equipment and propaganda campaigns against the axes and rifles of vandals.\(^\text{83}\)

The first-tier stations recovered and expanded rapidly. By 1924, Moscow and Baku had doubled prewar output. The laggard was Leningrad, which reached that level only three years later, after the Volkhov hydrostation opened. The former capital had lost its technological leadership to Moscow, a shift paralleling the overall transfer of political and economic power. In a graphic demonstration of the long-term consequences of technological decisions, the ex-capital's earlier inability to develop hydropower cost it dearly, whereas the 1886 Company's prer evolutionary investment in peat outside Moscow paid handsome dividends. The decision to concentrate Leningrad's future electricity on the previously untried hydropower meant that the overruns of schedule and budget standard in the introduction of any new technology further crippled the city's recovery. In all three cities, supply failed to meet demand, but, with the exception of Leningrad, this failure stemmed more from the very rapid increase in industrial consumption than from inability to expand output. Utilities elsewhere


faced similar problems but without the same financial and administrative resources.

Cities

Urban electrification occurred within serious financial, material, and organizational constraints. Like other enterprises, utilities under the NEP faced a difficult environment very different from war communism. The foremost change, dictated from Moscow, was economic. Charges were reinstated for city services as enterprises moved from state subsidies to the economic profitability of khozraschet (khoziaistvennyi raschet), financial self-sufficiency. In many ways, utilities were in a better condition than city services such as housing, which suffered actual destruction. The basic plant of utilities remained intact, if run down. The estimated value of municipal property dropped from 2.7 to 2.1 billion rubles between October 1917 and October 1923. The major losses came in streets and transportation (1.7 to 1.2 billion rubles); the value of utilities, however, dropped only marginally (284 to 268 million rubles). Nonetheless, local stations, returned to a devastated economy with a mandate for economic viability, were “close to catastrophe.”

Electric light, power, and traction recovered quicker than the rest of the economy because of their less decrepit state but also thanks to a state commitment of resources, however inadequate that seemed to the managers on the spot. Utilities surpassed 1916 output in 1924–25, and the number of operating tram systems climbed from twenty in 1920 to thirty-eight in 1924. Theoretical capacity remained substantially greater than actual output through 1926 as un repaired equipment and lack of key components such as transformers limited generation.

Two trends characterized the growth of utilities during these years.

85 G. Pisarev, “Kommunalnoe khoziaistvo i ego organizatsionnye osnovy,” Kommunalnoe delo, 1921, no. 1: 16; M. Petrov, “Osnovnoi kapital kommunalnogo blagoustroistva RSFSR,” Kommunalnoe delo, 1926, no. 23–24: 62. This is twice the 139 million rubles counted by Diakin; see V. A. Diakin, Germanskie kapitaly v Rossii (Leningrad: Nauka, 1971), 268–69. Different accounting bases and ruble values may cause the difference.
### Table 7.2. Size of electric stations, 1923

<table>
<thead>
<tr>
<th>Size (kW)</th>
<th>Numbera</th>
<th>Average capacity (kW)a</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–50</td>
<td>641 (60)</td>
<td>21 (2)</td>
</tr>
<tr>
<td>51–200</td>
<td>224 (21)</td>
<td>109 (5)</td>
</tr>
<tr>
<td>201–500</td>
<td>86 (8)</td>
<td>326 (5)</td>
</tr>
<tr>
<td>501–1000</td>
<td>38 (4)</td>
<td>790 (6)</td>
</tr>
<tr>
<td>1000–2000</td>
<td>39 (4)</td>
<td>1,436 (11)</td>
</tr>
<tr>
<td>2001–5000</td>
<td>28 (3)</td>
<td>2,929 (16)</td>
</tr>
<tr>
<td>subtotal</td>
<td>1,056 (99)</td>
<td>205 (45)</td>
</tr>
<tr>
<td>5000+</td>
<td>15 (1)</td>
<td>19,400 (55)</td>
</tr>
<tr>
<td>total</td>
<td>1,071 (100)</td>
<td>526,000</td>
</tr>
</tbody>
</table>


a Percentage of total in parentheses.

First-tier capacity and output increased more quickly than second- and third-tier capacity, widening the gap between the first and other tiers (see Tables 7.2 and 7.3). Moscow, Leningrad, and Baku accounted for 60 percent of installed capacity and 78 percent of produced power in 1926, compared with 55 percent and 62 percent, respectively, in 1913. While first-tier output grew from 431 MkWh in 1913 to 866 MkWh in 1924–25 and 1,121 in 1925–26, second- and third-tier output went from 259 to 266 to 314 MkWh. A second trend was the great increase in the number of utilities as small towns and villages extended power lines from factories, converted mills, and built new stations. This increase in numbers sharply decreased station size in a continuation of prewar trends (see Graph 3.3). Urban utilities nearly tripled to 640 between 1913 and 1926, although installed capacity in the second- and third-tiers increased only by half from 151 to 224 MW. Consequently, average capacity dropped from 683 kW in 1913 to 455 kW in 1920 and to 350 kW in 1926, a sign of the geographic diffusion. Rural stations, a separate category, had an average capacity below 20 kW, a factor of twenty smaller. A broader 1923 survey that included rural stations found that 641 of 1,071 stations (60 percent) were less than 50 kW and had 2 percent of total capacity. The 90 percent under 500 kW had only 12 percent of total capacity, and the 1 percent of stations over 5 MW had 55 percent.

90 "Biulleten," Elektrichesvo, 1923, nos. 7–8: 401–3. The survey also included seventy-three nonreporting stations.
Table 7.3. Capacity and production, October–December 1924

<table>
<thead>
<tr>
<th>City</th>
<th>Capacity (MW)</th>
<th>Output (MkWh)</th>
<th>Per capita kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moscow</td>
<td>116 (26)</td>
<td>92 (32)</td>
<td>217</td>
</tr>
<tr>
<td>Leningrad</td>
<td>101 (23)</td>
<td>53 (18)</td>
<td>212</td>
</tr>
<tr>
<td>Baku</td>
<td>69 (16)</td>
<td>71 (25)</td>
<td>952</td>
</tr>
<tr>
<td>subtotal</td>
<td>286 (65)</td>
<td>216 (75)</td>
<td></td>
</tr>
<tr>
<td>Kiev</td>
<td>19 (4)</td>
<td>9 (3)</td>
<td>83</td>
</tr>
<tr>
<td>Odessa</td>
<td>17 (4)</td>
<td>6 (2)</td>
<td>74</td>
</tr>
<tr>
<td>Rostov-on-Don</td>
<td>8 (2)</td>
<td>4 (1)</td>
<td>70</td>
</tr>
<tr>
<td>Kharkov</td>
<td>7 (2)</td>
<td>6 (2)</td>
<td>66</td>
</tr>
<tr>
<td>Ekaterinoslav</td>
<td>5 (1)</td>
<td>2 (1)</td>
<td>96</td>
</tr>
<tr>
<td>Other</td>
<td>97 (22)</td>
<td>44 (15)</td>
<td>32</td>
</tr>
<tr>
<td>subtotal</td>
<td>153 (35)</td>
<td>71 (25)</td>
<td></td>
</tr>
<tr>
<td>total</td>
<td>439 (100)</td>
<td>287 (100)</td>
<td>118</td>
</tr>
</tbody>
</table>


a Percentage of total in parentheses.

The prerevolutionary preference for DC over AC continued despite Glavelektro’s efforts to impose AC on new and expanded stations. The advantages remained the same: compared with AC’s distant benefits, DC offered municipalities immediate, firm advantages, including lower construction costs and a larger base of DC knowledge and equipment.91 Existing utilities usually rebuilt with the same current to avoid the economic and technical costs of AC conversion, although some cities converted from 1- to 3-phase AC.92 Only a few switched from DC to AC.93

Although industrial load remained concentrated in a few cities, the absolute and relative levels of utility-based industrial consumption increased greatly. This increase grew in large part from the 131 million rubles invested in industrial electrification through 1926.94 More than 90 percent of sixty-three large utilities carried some industrial load by 1925–26. Of twenty-two second-tier cities for which comparative data

92 E. g., Irkutsk and Orenburg; “Kommunalnye predpriiaitiia,” Kommunalnoe delo, 1925, no. 6: 89; no. 1: 34.
93 E. g., Semipalatinsk intended to rebuild with a higher voltage DC system, but the GU Kh advised the city to reequip with 3-phase AC to meet future loads; “Na mestakh,” Kommunalnoe delo, 1924, no. 1: 73.
94 Elektrobank, Finansirovanie elektrokhziaistva (dva goda raboty Elektrobanka) (Moscow-Leningrad, 1927), 10–12, 40.
exist, the industrial load more than doubled in half, increased by a lesser degree in a sixth, and remained the same or decreased in a third compared with 1914. Nonetheless, lighting far outweighed industrial usage in forty-five cities, equaled it in seven, and trailed in only eleven. These eleven cities, however, included five of the seven cities with a capacity over 10 MW and four of the thirteen cities between 2.5 and 10 MW. Only two of forty-three utilities with a capacity less than 2.5 MW had heavy industrial loads. The promise of industry rationalized, mechanized, and modernized by electrification held true primarily for the larger cities, but the utilities of the second tier had progressed toward this goal, albeit from a very small prewar base.

The NEP reopened the important political question of who should control utilities. Before the NEP, Glavelektro controlled urban utilities. The NEP placed Glavelektro and Gosplan on the defensive; their pleas that the GOELRO plan depended on continued direct control of all utilities lost to the cities' claims that the utilities were an integral part of the urban economy and, with the need to balance budgets, of city coffers. Although cities feared Glavelektro's political strength because of Lenin's support, their economic argument eventually triumphed, but not without a fight.

The first round went to the cities. The communal section (komunalnyi otdel) of an ispolkom (ispolnitelnyi komitet, executive committee) provided urban government. Under an 8 April 1920 SNK decree, communal sections controlled all enterprises of "general use with local significance," including lighting, water, and transportation. Enterprises changed from autonomous entities to municipal enterprises under a local authority. The NKVD's GUKKh provided general control and a conduit to the central government. As utilities returned to municipal control, the GUKKh became increasingly important as their representative in the state government.

On 15 April 1920, the VSNKh petitioned "to militarize all state elec-
tric stations under a unified central administration and to consider them enterprises of state importance." 102 Although independent of GOELRO, this proposal meshed with the logic of war communism and the electrical engineers’ efforts to create an all-powerful main electrotechnical committee to implement the GOELRO plan. On 7 June 1921, the ETO won possession of city stations from the notorious NKVD communal sections. 103 The communal sections, upset by this failure, counterattacked. 104 Far more than the promise of rural electrification at the 8th All-Russian Electrotechnical Congress, this effort was a decentralized, broad-based political movement motivated by economic self-interest and self-definition. An article in the GUKKh journal Kommunalnoe Delo declared the transfers “senseless and done only under the influence of the beautiful, celebrated slogan, ‘the electrification of Russia,’ a slogan impractical due to a complete absence of materials and machines. . . . The electrifiers and all those who are so deeply carried away by electrification to shout slogans in the air [are] tearing flesh from a living body.” 105

The angry communal sections viewed the transfers as part of a larger effort by state organs to control local operations. The KGS tried to monopolize construction, the Commissariat of Land tried to control suburban lands and gardens, and the Commissariat of Health tried to direct city activities ranging from sewage to baths. “But the most persistent attack against one of the best parts of the city economy is conducted by Glavelektro.” 106 Glavelektro control led to unusual divisions of responsibility as well as bad feelings. In Nizhni-Novgorod, Glavelektro ran the combined electric and water station, while the communal section operated the distribution network. In Samara and Smolensk, “under the slogan of electrification, [Council for the Econ-

102 “Deiatelnost prezidiuma VSNKh,” Narodnoe khoziaistvo, 1920, nos. 9–10: 33. The verb “militarize” takes on particular meaning because Trotsky, acting commissar of transportation, proposed the militarization of labor to advance economic recovery at the 1920 8th Congress of Soviets that approved the GOELRO plan; see Segal, Leon Trotsky, 244–46.

103 V. Levi, “4-i sezd Gubelektrootdelov,” Elektrichesvo, 1922, no. 1: 50. His interpretation should be regarded as somewhat biased, though not necessarily inaccurate. Levi changed from an antagonist to an advocate of municipal control and became the main writer on electrification for the GUKKh’s Kommunalnoe delo.

104 Resolution of the Third All-Russian Congress of Professional Unions of City Workers, “Sezdy i konferentsiia,” Kommunalnoe delo, 1921, no. 1: 93.


omy] electric sections have taken both the electric station and tram (what does a tram have to do with electrification?)?"

Like proponents of small-scale rural stations, cities opposed not electrification, which would transform the country "into a second North America," but central control by Glavelektro, which "terrorized" local authorities by depriving them of materials and equipment. Pride played a role too: after keeping them operating through the civil war, why should the cities lose their utilities now? More important, the NEP demanded the retention of the profitable electric stations to subsidize other city enterprises—exactly what Glavelektro feared. A lesser factor was trained personnel: unless the staff were transferred with the station, city advocates claimed, Glavelektro lacked the people to operate the stations.

In November 1921, the VSNKh placed the utilities in a region under a gubelektrootdel (regional electric section), assuming that a unified administration of physically separated powerplants served the state and society better than local control. The cities disagreed. In February 1922, Gosplan, Glavelektro, and the GUKKh, responding to pressure from the All-Russian Central Executive Committee and the SNK, established two categories of utilities. Glavelektro retained control of all large, regional, and unified stations. All other stations fell under local control. Glavelektro then negated any amiable resolution by assigning ninety-three urban utilities to the first category; that is, every major city remained under its aegis. The NKVD again petitioned the SNK to return utilities to their cities, albeit with Gosplan oversight and limited joint management by local Glavelektro and GUKKh organs. The NKVD also suggested turning utilities into joint stock companies. The GUKKh protested its parent organization's proposal and demanded single, not joint, management while emphatically opposing private companies. Utilities needed private capital, but private ownership would negate municipal control, a heartfelt prerevolutionary cause of many city officials and electrical engineers. On 30 June 1922, the Council for Labor and Defense ordered the transfer of

112 "Gorodskie elektricheskie stantsii," Kommunalnoe khoziaistvo, 1922, no. 7: 10–11.
twenty-three city utilities from Glavelektro to local control.\textsuperscript{113} Future transfers eventually deprived Glavelektro of all but the Moscow, Leningrad, and Baku utilities. Cities now directly controlled the operations and finances of their utilities. The struggle to guide, if not control, Soviet utilities continued, albeit in several different arenas, none overtly but all quite political.

A fierce struggle erupted in 1923 over station construction and operation among GOELRO, Gosplan, GUKKh, and a new party, the Ukrainian government, which sought to exclude its utilities from central control. As part of its efforts to maintain its economic independence, the Ukrainian government supported the GUKKh’s claims and stated that only stations having all-union significance should need Gosplan’s permission.\textsuperscript{114} This struggle for control of new stations continued until late 1924, when, after further SNK-prompted negotiations, Gosplan, the GUKKh, and Glavelektro agreed on four levels of authorization: stations below 50 kW now required only preliminary permission from local government; stations of 50–500 kW required the approval of the regional authorities; stations of 500 kW–3 MW needed approval from the republic VSNKh and NKVD; and stations above 3 MW were the province of Glavelektro.\textsuperscript{115} In a defeat for Glavelektro and a sign of increasing municipal aggressiveness, the agreement demarcated clear lines of authority among local, regional, republic, and national organs. The small capacities of the non-Glavelektro stations indicated the low levels of present and predicted generation outside the first tier. Demarcation, however, did not end the war for control; Glavelektro and Gosplan tried to expand their influence on utility operations. Glavelektro proposed, for example, to maximize the use of trained personnel by basing them at the regional level instead of individual utilities to respond to the needs of a larger area. Municipalities viewed such efforts at “rationalization” as oppressive financial and administrative burdens designed to increase central power.\textsuperscript{116}

\begin{footnotes}
\item[113] “Ofitsialnyi otdel,” Kommunalnoe delo, 1922, no. 2: 111.
\item[115] “Khronika Tsentr,” Kommunalnoe delo, 1924, nos. 11–12: 54; “O poriadke sooruzheniiia i registratsii elektricheskikh stantsii i nadzora za takovumi,” and “O poriadke soglasovaniia mestnogo elektrostroitelstva s obschimi i mestnymi planami elektrifikatsii,” Sbornik dekretov, postanovlenii, rasporyazhenii i prikazov po narodnomu khoziaistvu, 1925, no. 43: 153; no. 44: 174.
\item[116] Iu. Mitlianskii, “Organizatsionnye вопrosы elektricheskikh stantsii,” Kommunalnoe delo, 1924, no. 6: 12; “Ofitsialnyi otdel,” Kommunalnoe delo, 1924, no. 9: 37; “Khronika Tsentr,” Kommunalnoe delo, 1924, nos. 11–12: 54; Kommunalnye predpriiatiia,” Komm-
Responding to Glavelektro’s proposals, the 1925 All-Russian Conference of Communal Electric Station Managers proposed a GUKKh bureau to manage utility activities. The bureau’s significance was that the GUKKh would perform activities desired by Glavelektro. The issue, again, was control. The GUKKh did create the bureau, but it played only a minor role, which may have been its sponsors’ intention.117

Securing local control was only one issue facing utilities. Others included repairing and expanding existing stations, constructing new stations, and switching to self-supporting finances. As with the first tier, the immediate problem was the deplorable state of present utilities. In 1922, two-thirds of operable Diesel engines needed capital repairs, as did half the working steam engines. Half the country’s turbogenerators were out of service and the other half overworked.118

The restoration of the country’s devastated financial structures helped reestablish utility finances.119 The establishment of a new banking system aided the gradual return of the economy to monetary from commodity exchange.120 Nonetheless, financial solvency became a major problem as utilities had to fund repairs and expansion, guard their income from other city enterprises, and balance operating budgets.121

The introduction of khozraschet and the resumption of tariffs posed two major questions for Glavelektro, the utilities, and the VSNKh. First, it was unclear which indirect costs, particularly amortization, tariffs should cover, and concurrently profit had to be defined and

---


118 “Elektrotekhnicheskaia promyshlennost,” Ekonomicheskaia zhizn, 10 June 1922, 7

119 Ruble stabilization dramatically decreased budgets. In January 1922, the Moscow utilities had 30 billion rubles in cash, which covered only wages; see “Economic Notes,” Russian Information and Review 1, no. 13 (1922): 275. By contrast, the 1923–27 plan estimated expenditures of 6.5 billion rubles; see Glavelektro, Elektrosnabzhennie Moskovskogo, 15.

120 As an example of commodity exchange, Volodga acquired all the equipment for a station, save the turbines, from the Academy of Art for 215 kilograms of meat in 1922; “Kommunalnye predpriiatiia,” Kommunalnoe delo, 1925, no. 5: 52.

121 Including paying workers. The staff of a Georgian station threatened a strike in 1923 when they were not paid for three months; “Tarifno-ekonomicheskaia rabota Gubotdelov,” Kommunalnyi rabotnik 89 (1923): 26.
justified.\textsuperscript{122} Then there were questions of differing economic and political priorities: should tariffs support widespread electrification or fund local needs? Glavelektro wanted low rates to advance electrification. The agency feared, quite justifiably, that the local authorities would use their utilities to subsidize other municipal operations. Glavelektro favored khozraschet but not capitalist operations; that is, tariffs should cover costs but not profit. Municipal governments wanted higher rates to balance their budgets, and the VSNKh presidium wanted higher rates to finance utility needs and reduce the drain on government coffers.\textsuperscript{123}

Questions of accounting for a mixed capitalist-socialist economy did not lend themselves to obvious solutions, yet utilities needed immediate answers. What was profit? Should tariffs be based on class or economic principles? What was the appropriate level of amortization? The answers had serious consequences and sparked long, heated debates.\textsuperscript{124} A class principle guided the reimposition of tariffs in 1921–22 with different rates for workers, bourgeoisie, and other users. By 1925, utilities set tariffs to cover costs, increase efficiency, and maximize load. A common definition of costs included amortization, funds for repair, and a 10 percent profit on capital.\textsuperscript{125}

Another question without easy answers was the appropriate degree of utility integration with other city enterprises. Integration promised savings from shared facilities, such as repair shops, and a higher load factor from electrifying city enterprises.\textsuperscript{126} Administratively, unification promised decreased overhead and more rational use of limited financial and material means.\textsuperscript{127} The extent and benefits of unification, however, depended greatly on local conditions.\textsuperscript{128} Combining too

\textsuperscript{122} I. A. Skavani, “K voprosu o sebestoimosti i tarifikatsii energii na russkikh tsentralnykh elektrostantsiiakh,” \textit{Elektrichessto}, 1924, no. 4: 195.


\textsuperscript{126} Water supply was of particular interest because electricity powered only one-third of the country’s 325 stations; see N. Bragintsev, “Elektrifikatsiia vodoprovodov,” \textit{Kommunalnoe delo}, 1925, no. 4: 7–16.


\textsuperscript{128} E. g., Vologda merged its electric station, water station, baths, and slaughterhouses ("Tresty," \textit{Kommunalnoe delo}, 1925, nos. 15–16: 94), whereas Arkhangelsk only united its electrified enterprises into an electrical trust ("Kommunalnye predpriiatia,” \textit{Kommunalnoe delo}, 1925, no. 20: 53).
many functions in one office could be counterproductive. As Kazan
discovered, centralizing all municipal accounting left the utility de­
pendent on an outside office of decidedly low competence.129

Another disadvantage of integration was financial. Utility income
tempted money-strapped municipal budgets. In 1923–24, utilities
generated over two-thirds of the surplus from city enterprises in Mos­
cow gubernia.130 Similarly, 125 utilities contributed one-third of the 9.5
million ruble surplus for 110 Ukrainian cities in 1923–25, a share ex­
ceeded only by the 338 abattoirs.131 On this issue, Glavelektro and
utility managers agreed. In December 1925, the 1st All-Russian Con­
ference of Communal Electric Station Managers declared “intolerable
any kind of assignment from [utility] profits to local budgets before
the reconstruction and widening of electric stations on a scale such
that the stations can serve fully local population and industry.”132

Just as tariffs incorporated prerevolutionary criteria, so did load fac­
tor. Increasing load—and not just output—became a major priority
for economical operations. As the 1886 Company had discovered de­
cades earlier, lighting alone was insufficient. The GUOKKh urged util­
ities to increase their load factor by hooking up industry, kustar work­
shops, and other users and suggested that communal sections
arrange favorable loans for potential users to purchase motors and
other equipment from the electrotechnical manufacturing trusts.133 In
an extension of GOELRO's minimum program, some utilities con­
structed transmission lines to unify separate stations.134 Availability
and affordability of transformers and cable determined the feasibility
of such networks. Attracting the industrial participation necessary for
approval from the planning organs often required financial incen­
tives.135 The overall rise in industrial load shows that utility-based in­
dustrial electrification did diffuse outside the first tier.

Although the Volkhov hydrostation remained the biggest example
of an unprofitable short-term investment, some local projects ex­
ceeded budgets and then requested more money, usually granted to

133 "O prisoedinении k elektricheskoi stantsii motornoi nagruzki," in "Ofitsialnyi
otdel," Kommunalne delo, 1924, no. 9: 37.
134 E. g., linking the Rostov-on-Don city station to the Artem mines station and the
future Shterov regional station; "Kommunalnye predpriiatiiia," Kommunalne delo, 1925,
no. 8: 59.
135 "Kommunalnye predpriiatiiia," Kommunalne delo, 1925, no. 7: 64.
prevent a total loss. Understandably, Gosplan and Elektroplan demanded more financial and operational data from utilities before approving proposals and rejected requests for credit if load estimates seemed suspiciously optimistic.

Financing

By 1924, utilities had recovered from the tribulations of the previous decade. As second- and third-tier stations started to expand, they encountered a major obstacle in an area familiar to prewar and Western utilities—securing adequate finances. The problem was threefold: lack of funding hindered investment, regional stations consumed the lion’s share, and Glavelektro increasingly controlled the flow of funding. Before 1917, utility financing came from a variety of domestic and foreign sources. In the 1920s, funding came from four sources: the state budget, state banks, regional joint stock companies, and local joint stock companies. The differences between 1914 and 1924 were the concentration of financing in central state organs, the absence of foreign investment, and the minor role of private capital. Because it was so limited and controlled, credit played a major role in shaping electrification after 1925 as funding priorities increasingly intertwined with state priorities of planning and foreign trade. Unlike prewar conditions, these financial constraints were overtly political as well as economic.

The hierarchy of tiers was reflected in the emergence of different credit agencies for different strata of utilities. Regional stations received direct state funding and loans from Elektrobank. City and local stations sought credit directly from the state, from Elektrokredit and its successor, Elektrobank, from the Central Communal Bank, and from regional and local joint stock companies.

GOELRO did not discuss the actual mechanics of financing, because of its lack of experience and assumptions of foreign involvement. Realization of the need for specific financial mechanisms appeared slowly. In February 1922, Krzhizhanovskii called for a foreign-funded bank for electrification. European capital would participate because “Russia can be a powerful consumer of European industry [while] the base of European raw materials is moving to the East.” Materials and markets: what better enticements for the capitalist world?

136 Ikonnikov, Sozdanie i deiatelnosti obedinennykh organov TsKK-RPI, 334.
137 “Kommunalnye predpriiatia,” Kommunalnoe delo, 1925, no. 7: 64–65; no. 8: 57–58.
Early in 1922, a Glavelektro commission proposed a state-controlled "Elektrobank," based on German and Japanese models, to channel 60 million rubles of capital from state and public organizations, individuals, and foreign sources. To encourage private investment, this electro-industrial bank would pay dividends of 8 percent. Neither direct foreign credit or equity would be permitted, but the proposed bank would directly import and export goods and materials, bypassing the monopoly of the Commissariat of Foreign Trade.

The establishment of Elektrokredit in December 1922 must have been a disappointment. This was not a bank but a joint stock company initially allowed only 500,000 rubles in capital, which expanded to 2 million rubles within a year and focused on towns and villages. Elektrobank had bowed to Russia's strained financial state in favor of the smaller, less ambitious Elektrokredit. These limited horizons should not obscure the fact that, for the first time, Russia had a financial institution dedicated exclusively to electrification.

Stockholders subscribed to Elektrokredit more slowly than predicted. Its promoters anticipated equal investment between government organs and cooperatives; instead, cooperatives bought only one-third of the initial offering and the October 1923 offering of 1.5 million rubles. Glavelektro, the GUKKh, and Tsentrosoiuz (the central union of cooperatives) held two-thirds of the shares, with Glavelektro alone holding over one-third. City governments and cooperatives subscribed from self-interest: to receive loans and assistance, they had to belong.

Although interest in investing was low, interest in receiving was high. Elektrokredit received more than one hundred requests for funding in its first two months. Quite reasonably, it concentrated on

---


141 Officially, the All-Russian Joint-Stock Company for Financing Local Electrification.


143 Elektrokredit, Iz praktiki kooperativnoi elektrifikatsii (Moscow: Tsentrosoiuz, 1923), 16; "Khronika Tsentra," Kommunalnoe delo, 1924, no. 6: 49; "Tsentrosoiuz i finansirovanie," Ekonomicheskaia zhizn, 10 November 1922, 3; "Iz zhizni ‘Elektrokredita’," Elektrifikatsiia, 1923, no. 3: 36–37; nos. 5–6: 33; 1924, no. 4: 27–28.
short-term loans promising immediate results, such as connecting a village with a nearby factory station or completing construction halted for lack of funds. In its first year, Elektrokredit made thirty-four loans, ranging from 465 to 126,000 rubles, for a total 546,000 rubles. The loans lasted from six months to three years, limiting the financial attractiveness of many projects. Approximately one-quarter of Elektrokredit’s activities involved trade-in-kind, supplying materials and equipment in lieu of money. Its inability to obtain long-term credit and even short-term loans from the Commissariat of Finance and Gosbank, the state bank, greatly hampered Elektrokredit.

These flaws, coupled with a demand greatly exceeding resources and an improving economy, led to Elektrokredit’s absorption into the newly created Elektrobank in May 1924. An actual bank, Elektrobank greatly strengthened the financial resources available for electrification (see Table 7.4). At first a small player in a big sea, Elektrobank soon became a big player in a small lake. In 1925, five state banks financed electrification, including the much larger Gosbank and Prombank and the Central Communal Bank. One year later, Elektrobank had reduced the players to three. Its monopolizing efforts followed three lines: establishing zones of demarcation with other state banks, obtaining state funding, and coordinating funding with state plans.

Elektrobank sought to control not only all loans but also the state budget for electrification. By 1927, its disclaimers about not wanting to monopolize, only to help electrify, had evolved into statements on the need to “concentrate credit in one center to coordinate the financial needs of all areas of the electrical economy (basic industries, electrotechnical industry, construction, use), and this center must be Elektrobank.” Elektrobank advanced its centralized control, despite early years “burdened by an atmosphere of skepticism and doubt and more than cold relations from our older brothers in the credit area.”

Agreements with other state banks, the Commissariat of Finance, and regional joint stock firms assuaged these doubts. Elektrobank’s main

146 The first two banks held 83 percent of the 2.6 billion rubles in state banks on 1 September 1925; “Finansy i kredit,” Ekonomicheskia zhizn, 6 January 1926, 3.
147 Elektrobank, Nekotorye itogi deiatelnosti Elektrobanka (Moscow: Elektrobank, 1925), 12; Elektrobank, Finansirovanie elektrokhозяйств, 13.
<table>
<thead>
<tr>
<th>Bank</th>
<th>1925</th>
<th>1926</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elektrobank</td>
<td>32.4</td>
<td>64.7</td>
</tr>
<tr>
<td>Gosbank</td>
<td>15.1</td>
<td>18.8</td>
</tr>
<tr>
<td>Central Communal Bank</td>
<td>1.2</td>
<td>5.2</td>
</tr>
<tr>
<td>Prombank</td>
<td>7.6</td>
<td>4.3</td>
</tr>
<tr>
<td>Moscow City Bank</td>
<td>2.2</td>
<td>4.1</td>
</tr>
<tr>
<td></td>
<td>58.1</td>
<td>97.1</td>
</tr>
</tbody>
</table>

Sources: Elektrobank, Finansirovanie elektrokhooziaistva (dva goda raboty Elektrobanka) (Moscow-Leningrad, 1927), 16. For the Central Communal Bank, see “Mestnye finansy,” Kommunalnoe delo, 1926, no. 7: 43.

* Percentage of total in parentheses.

** Elektrobank listed 0.7 million rubles.

potential rival was Prombank, created in 1922 to finance industrial development. From 1923–26, Prombank lent 15.8 million rubles to state industries in electrification, electrotechnology, and films. If it wanted, Prombank could have been a very serious factor in electrification, but other interests beckoned until 1928 when it absorbed Elektrobank. The August 1926 Elektrobank–Prombank agreement eliminated conflict by delineating industrial clienteles and responsibilities, thus reducing the options available to loan seekers. Prombank reduced its lending for electrification, and Elektrobank reduced its lending for nonelectrification activities from 30 percent in November 1924 to 5 percent in October 1926.

Elektrokredit and the Central Communal Bank made decisions without consulting Gosplan and Glavelektro. In contrast, Elektrobank viewed credit as a powerful planning tool and formed tight links with Gosplan, Glavelektro, and regional planning organs to direct the development of electrification. A January 1926 agreement with the

149 For 1923–24, see Sev.-Zap. oblastnaia kontora Prombanka k otchetu za 1923–24 god (Leningrad: Prombank, 1924), 11; for 1924–26, see Elektrobank, Finansirovanie elektrokhooziaistva, 16.

150 Elektrobank, Finansirovanie elektrokhooziaistva, 12, 34; and Nekotorye itogi deiatelnosti Elektrobanka, 17–18, 45.

Commissariat of Finance gave Elektrobank the financial carrot to accompany the Glavelektro planning stick; by October 1926, Commissariat of Finance funds constituted 44 percent of Elektrobank's resources and primarily funded regional stations. These formal links greatly strengthened Elektrobank's financial and political base while giving Glavelektro and Gosplan additional indirect control over local utilities. The centralization of financing aided the centralization of control.

With a modus vivendi with the main state banks, major funding from the Commissariat of Finance, and close links with Glavelektro, Elektrobank's only obstacle to total financial control was the Central Communal Bank. Founded in 1924 to provide municipalities with long-term loans, the Central Communal Bank concentrated on housing and city enterprises. In 1924–25, the bank lent 1.2 million rubles for local electrification, one-quarter of its credit for municipal enterprises. In 1925–26, electrification received 5.2 million rubles, a fourfold increase. Although lending an order of magnitude less than Elektrobank, the Central Communal Bank represented a financial base outside Elektrobank's control. If only loans to city utilities are considered, the difference between the banks shrank to a factor of two (Elektrobank's 12.2 million rubles to the Central Communal Bank's 6.4 million rubles), and the newcomer's investment was increasing.

Glavelektro and Elektrobank tried to remove the Central Communal Bank from electrification by charging that it wasted resources with parallel development and that investment in regional stations was more profitable. The Central Communal Bank countered by claiming utilities as an integral part of city economies. Because of its limited assets, the Central Communal Bank could not meet municipal needs, thus leaving urban utilities financially dependent on Elektrobank and Glavelektro.

Elektrobank viewed electrification—and its role—in visionary concepts easily taken from GOELRO and Glavelektro. Initially, it viewed its priorities as agricultural cooperatives, city governments, industry, and regional stations. It quickly reversed these priorities to concentrate on the more productive "factories and workers"; hence, "rural

152 Elektrobank, *Finansirovanie elektrokhozjajstva*, 36, 40.
153 Elektrobank, *Nekotorye itogi deiatel'nosti Elektrobanka*, 16.
electrification has to take last place.” By 1927, Elektrobank had fully adopted the centralized, rationalizing attitude of Glavelektro and sought the “strict coordination” and subordination of all electric stations to regional stations under the rubric of economies of scale.

With major funds coming from the Commissariat of Finance and lesser sums from Gosbank, Glavelektro, and state industries, available credit grew massively from 4.2 million rubles in November 1924 to 74 million rubles in October 1926 (see Table 7.5). Although not offering the ten–twelve years desired by recipients, Elektrobank shifted from short-term to medium-term loans of four or five years, a significant increase from Elektrokredit’s three-year maximum. More important, Elektrobank shifted funding priorities from rural and city stations to industrial electrification and the Shatura, Shterov, Cheliabinsk, and Zemo-Avchalsk regional stations. Urban, rural, and kustar stations lost ground to the big producers and consumers of electrical energy. On average, an industrial loan was five times larger than a municipal loan and twelve times larger than a cooperative loan. Despite this bias, Elektrobank loans enabled more than sixty cities and towns to repair, expand, and in some cases construct new stations.

Regional joint stock companies offered another source of combined financial and technical assistance. Their stockholders were Glavelektro, Elektrobank, electrotechnical industries, local governments, cooperatives, and individuals. In the Ukraine, Elektrika had a capital fund of 600,000 rubles, half as much again as the Leningrad-based Elektropomoshch. Small compared with Elektrobank resources, these companies were substantial at the local level.

The state budget remained a minor player in the debates over financing. State funds went directly to regional stations and to such agencies as Glavelektro and the GUKKh. Electrification’s share of the state budget hovered steadily around 1.8 percent from 1922 to 1927.

156 Elektrobank, Finansovoi plan i smeta dokhodov i raskhodov na 1924/25 god (Moscow: Elektrobank, 1925), 8–9.


158 Elektrobank, Nekotorye itogi deiatelnosti Elektrobanka, 6, and Finansirovanie elektrokhозiaistva, 25, 36. Cooperatives invested 250,000 rubles and individuals 74,000 rubles.

159 “Mestnye finansy,” Kommunalnoe delo, 1926, no. 4: 60; Elektrobank, Nekotorye itogi deiatelnosti Elektrobanka, 11, 14, and Finansirovanie elektrokhозiaistva, 40.

160 Elektrobank, Nekotorye itogi deiatelnosti Elektrobanka, 14, 41.

161 “Voprosy elektrostroitelstva i elektrifikatsii,” Elektrifikatsiia, 1924, nos. 9–10: 19.
The NEP Years, 1921–1926

Table 7.5. Elektrobank long-term credit, 1924–26

<table>
<thead>
<tr>
<th>Recipient</th>
<th>1924–25 (million rubles)(a)</th>
<th>1925–26 (million rubles)(a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional stations</td>
<td>0.02 (0.7)</td>
<td>4.1 (31)</td>
</tr>
<tr>
<td>City stations</td>
<td>1.7 (47)</td>
<td>3.8 (29)</td>
</tr>
<tr>
<td>Industry</td>
<td>0.7 (20)</td>
<td>3.4 (26)</td>
</tr>
<tr>
<td>Rural and kustar</td>
<td>1.2 (33)</td>
<td>1.8 (14)</td>
</tr>
<tr>
<td></td>
<td>3.6</td>
<td>13.1</td>
</tr>
</tbody>
</table>

Source: Elektrobank, Finansirovanie elektrokhziaistva (dva goda raboty Elektrobanka) (Moscow-Leningrad, 1927), 40.

* Percentage of total in parentheses.

growing from 23 to 102 million rubles.\(^{162}\) By October 1926, six years after GOELRO began, at least 450 million rubles had been invested in electrification, with 6 percent (29 million rubles) for rural and urban utilities, 29 percent (131 million rubles) for industrial electrification, and 51 percent (229 million rubles) for regional stations (see Table 7.6).\(^{163}\) This sum accurately reflects state priorities in regional stations and the conversion of industry from steam to electric power. These priorities benefited the first tier at the expense of less industrialized areas.

Despite the increasing funding, demand chronically outstripped supply by at least a factor of ten. State credit for municipal utilities in 1923–24 totaled only 1.4 million rubles for forty-five loans, one-eleventh of the 16 million rubles requested. In 1924–25, the Central Communal Bank received requests for 43 million rubles from municipal enterprises but could fund only 4.7 million. For 1925–26, only seventy-five (10 percent) of more than seven hundred proposals from village and cooperative companies for electrification shared 6 million rubles. For 1926–27, Glavelektro funded only one-quarter of the 46 million rubles in requests for rural electrification.\(^{164}\)

Inadequate financing did not limit only credit agencies. Glavelektro consistently received only a quarter to a half of its requested budget.

\(^{162}\) Davies, Soviet Budgetary System, 83.

\(^{163}\) Elektrobank, Finansirovanie elektrokhziaistva, 10–12. 40.

from the financially strapped government.\textsuperscript{165} Inadequate financing adversely affected the pace of electrification by delaying reconstruction, slowing expansion, and hindering new construction, while the centralized control of Elektrobank in cooperation with Glavelektro and Gosplan served as a powerful tool to direct resources toward regional stations and away from the smaller local stations. From the center’s point of view, such a move made excellent sense. From the local viewpoint, Elektrobank was strangling the reconstruction and expansion of utilities.

Fuel Choices

\textbf{Despite official endorsement of hydropower and peat, utilities returned to coal and oil.} In principle, local fuels offered independence from railroads and fuel shortages. In reality, utilities preferred Donets coal and Baku oil, which were easier to handle and burn. As the economy and railroads recovered, so did interest and access to these pre-war high-quality fuels. Despite the rhetoric and rationale for local fuels, utilities overwhelmingly continued to use oil and coal.

Local fuels suffered from unfamiliarity, variable quality, inadequate specialized equipment and trained personnel, unattractive costs, and

\begin{table}[h]
\centering
\begin{tabular}{lrr}
\hline
Recipient & \multicolumn{1}{c}{Million rubles}\tabularnewline & \textsuperscript{a} \tabularnewline\hline
Regional stations\textsuperscript{b} & 229 (51) \tabularnewline Electrification of industry & 131 (29) \tabularnewline Bank credits\textsuperscript{c} & 48 (11) \tabularnewline Rural and urban stations\textsuperscript{b} & 29 (6) \tabularnewline Electrotechnical industry & 20 (4) \tabularnewline Railroad electrification & 5 (1) \tabularnewline\hline
\textbf{Total} & \textbf{452} \tabularnewline
\hline
\end{tabular}
\caption{Investment in electrification, 1920–26}
\end{table}

\textit{Source:} Elektrobank, \textit{Finansirovanie elektrokhозиаства (dva goda raboty Elektrobanka)} (Moscow-Leningrad, 1927), 10–12, 40.

\textsuperscript{a} Percentage of total in parentheses.

\textsuperscript{b} From the state budget and banks.

\textsuperscript{c} Unidentified by destination, but probably industry.

no established organizational framework. Glavelektro could have resolved these deficiencies by a firm institutional commitment to educate utilities, provide skilled staff, improve the quality and availability of equipment, and structure prices. Without such a political commitment, more economic factors prevailed. Indeed, the state actually worked against itself: financial assistance for oil and coal in 1925 exceeded aid to peat and local coal by a factor of six. As a result, prices among fuels differed less in 1924 than in 1913, lessening the attraction of low-quality fuels. Consequently, as utilities recovered, they reduced their fuels from as many as four to one high-quality fuel. In October 1924, conventional fuels powered most utilities: oil and coal fired sixty-three (59 percent) of 107 utilities, wood fired seven stations, and peat one station. Water powered seven stations, with an average size of 500 kW, one-third the thermal station size. As reminders that the civil war “fuel hunger” still lingered, the remaining twenty-nine stations burned both high-quality and low-quality fuels (e.g., oil and wood) with steam turbines and internal combustion engines. Two years later, the number of mixed stations had dropped as fuel supplies improved. A 1925–26 survey of seventy-eight stations found that oil and coal powered 70 percent of capacity directly and 22 percent to some degree. Wood fueled five cities and only eight cities used two or more fuels.

Different institutional viewpoints produced different views of oil. Gosplan and Glavelektro saw the liquid foremost as a “valuta fuel” for export and urged the conversion of oil-fired stations to local fuels. Utilities viewed oil as an excellent fuel because it had the highest energy content of all fuels and was easy to transport, store, and burn. Consequently, oil-fired Diesel engines remained popular among the local and urban stations.

Rural electrifiers envisioned a major role for “green coal” (mini hy-

---

166 Fifty-seven million versus ten million rubles; Gorev, “Elektrifikatsiia SSSR,” 180.
167 Electricity from coal cost Elektrotok less than from peat at the new Red October station; ibid., 181. A later report claimed, however, that 1925–26 fuel prices in the Central Industrial Region maintained approximately the same ratio between high- and low-quality fuels as 1913 prices; see M. K. Polivanov, Raionnye elektricheskie stantsii i podstantsi (Moscow: Elektro-promyshleniye kruzhok I. N. Kh. imeni G. V. Plekhanova, 1927), 19.
168 V. Levi, “Pokazateli raboty elektricheskikh stantsii,” Kommunalnoe delo, 1926, no. 6: 19, 21–22. Excluded were Moscow, Leningrad, and Baku.
dropower), as opposed to the large-scale “white coal.” Green coal proved the major exception to the reversion to coal and oil. Many villages introduced electric light and power by converting a mill or building a small hydroelectric station. Of the Moscow region’s thirty rural stations in January 1923, oil fueled thirteen and minihydropower served the remaining seventeen. Since it used existing equipment and peasant services, hydropower was significantly cheaper than oil, providing electricity for 10 kopecks versus 35–50 kopecks per kWh. Minihydropower stations averaged an order of magnitude smaller than thermal stations.

It is ironic but not surprising that only the largest and smallest electric stations in the Soviet Union fully embraced the autarkic concept of local fuels while most utilities remained wedded to their prewar fuels. The color coals—white, gray, brown, and green—powered the newest stations. They could embody the new principles because they began de novo instead of having to modify existing institutions and equipment. The small scale of investment, easy access to supplies, and lack of alternatives made local fuels attractive for rural stations. The investment and push for locally fueled regional stations came from the central government. In the middle stood existing utilities, their equipment and personnel dedicated to the traditional high-quality oil and coal.

Rural Electrification

Although regional and rural stations shared the common denominator of dependence on the Soviet regime, rural electrification developed as a world apart from the Kashiras and Volkhovs in scale, setting, customers, and economics. Small stations promised political, economic, and social benefits. Politically, rural stations served as visible signs of progress, showing the peasant that the interests of the people were the interests of the party while promoting cooperatives over individual farming. Economically, rural electrification would

174 In Tula gubernia, the hydrostations averaged 9 kW and the thermal stations 100 kW; “Khronika mest,” Kommunalnoe delo, 1924, nos. 11–12, 90.
175 “Elektromotor v derevne,” Izvestia, 9 April 1926, 4.
improve the efficiency of agriculture and revitalize local industry.\textsuperscript{176} Socially, electrification would serve as a civilizing agent to close the town–country gap. Despite these proclaimed benefits, the small amount of resources dedicated to rural electrification combined with the problems of literally blazing new trails resulted in only modest gains that fell far short of the visions.

The development of rural electrification was a story of the evolution of local institutions operating within a broader, national framework of legal authority, financial support, industrial suppliers, and propaganda. It was also a tale of local initiative and institutional inadequacies, of Moscow-based organizations venturing forth with detailed plans and returning chastened by the realization that planned development could not effectively be imposed on the countryside. Lacking tsarist precedents and specific knowledge about Western activities, Soviet rural electrification after much trial and error developed guiding principles based on bottom-up initiative to mobilize local resources, supported by higher-level organizations with financial, technical, administrative, and educational assistance. By 1925, administrative and legal procedures were well developed. New stations electrified hundreds of villages, significant progress but only a small fraction of the number needed. Rarely uneventful, rural electrification nonetheless attained an aura of normalcy, complete with standard problems.

The institutions ranged from Glavelektro and Elektrokredit in Moscow to scores of governmental bodies and joint stock companies at the lowest levels supported by regional administrative organizations. The Soviet government did not establish a dedicated high-level body for rural electrification, an indicator of the technology’s low priority. The most interested central organization, Glavelektro, treated rural electrification as a secondary matter. Lower-level organizations, such as Elektroselstroi, developed to transfer resources from the center. Cooperatives, a long-standing rural institution trusted by the peasants and ideologically acceptable to the party, provided outside experts and organized joint stock companies that actually operated village utilities. Notably absent from electrification were the Central Bank for Agricultural Credit, which favored other areas of investment such as fertilizers, and the Commissariat of Agriculture, which let its offspring Elektroselstroi carry the torch.\textsuperscript{177}

\textsuperscript{176} I. Ia. Perelman, \textit{Elektrifikatsiia kustarnoi promyshlennosti} (Moscow: Gosudarstvennoe izdatelstvo, 1921).

\textsuperscript{177} I. A. Kirillov, \textit{Tsentralnyi bank selsko-khoziaistvennogo kredita} (Moscow: Kooperativnoe izdatelstvo, 1925), 58–59.
Compared with the GUKKh–Glavelektro battles, rural–center relations were harmonious. In such a youthful field, debates focused on how best to create new organizations rather than on control of utilities. The rural struggles were not as fierce because the actors shared common goals and had less to lose. Rural electrifiers needed all the help they could get, yet their bailiwick was too small to covet. As a "station of local significance" (500 kW or less), the rural station rarely attracted the direct attention of Glavelektro or Gosplan. The lack of a central state body gave local organs more leeway but also limited the flow of resources from Moscow. Instead, a series of decrees and resolutions provided a national framework for small stations. Authority for utility construction and operations devolved to the regional, local, and village levels.

In mid-1924, the SNK approved a model agreement for a joint stock company or a limited-liability partnership to supply electricity. Elektrifikatsiia printed model forms so interested groups could begin on a firm legal basis; aspiring electrifiers had only to fill in the blanks and send the form through a specified review process. The application was automatically approved unless an objection was filed within a month. The applying company obtained a monopoly on production and distribution unless superseded by a regional station. In thirty or fifty years, ownership transferred to the government. Glavelektro and the regional ispolkom had rights of technical and economic inspection. These agreements gave the government greater rights than prerevolutionary concessionary agreements, but otherwise they were similar.

Glavelektro feared the construction of stations in disregard of the

---

178 A. N. Rumiantsev, "Organizatsiia finansirovaniia melkogo elektrostroitelstva i planovoiia elektrifikatsiia," Elektrifikatsiia, 1926, nos. 5–6: 5.
179 For an overview, see V. Iurchenko, "Obzor sovetskogo zakonodatelstva po elektrifikatsii," Elektrifikatsiia, 1924, nos. 7–8: 3–8, and his "Dekrety i polozhenii po elektrifikatsii," in V. Z. Esin, Elektrifitsiruite derevniu! (Moscow: Elektrokredit, 1924), 15–16.
180 E. g., for Moscow gubernia, see "Po provintsii," Kommunalne khoziaistvo, 1924, no. 10: 31.
182 See Elektrifikatsiia, 1924, nos. 7–8: 8–12; no. 11: 33–37.
183 "Instruktsiia o poriadke registratsii tovarishchestv po elektronsnabzheniiu s ogranicennoi otvetstvennostiu," Sbornik dekretov, postanovlenii, raspordazhenii i prikazov po narodnomu khoziaistvu, 1925, no. 16: 121–22.
184 Thirty years for a thermal station and fifty for a hydrostation, reflecting the latter's greater investment; "Khronika Tsentra," Kommunalne delo, 1924, no. 9: 44.
national plan of electrification. Opening a regional station would waste the investment in a local station. Planning organs did veto stations in these cases.\textsuperscript{185} With an eye to the long term, Glavelektro wanted technically compatible stations built to link with future regional networks. Peasants, however, looked at the hard, immediate cost rather than a vague, distant benefit. Instead of paying higher initial costs of AC for an easier transition to a future grid, villages preferred DC.\textsuperscript{186} Of 651 rural stations in 1926, only sixty-nine (11 percent) operated on AC.\textsuperscript{187} For the small loads and short transmission distances of village electrification, DC stations remained economically more rational than AC. Initial low cost meant near-term application, and a village could switch to AC when the population grew richer.\textsuperscript{188}

Funding also proved a bottleneck. The costs of electrifying varied greatly: converting a mill demanded only a few thousand rubles, whereas building a new station and equipping local industries with motors could cost a hundred thousand rubles.\textsuperscript{189} Local companies expected and received donations from peasants of labor, materials, and money.\textsuperscript{190} Nonetheless, rural electrification needed outside financing.\textsuperscript{191} Rarely was only money provided. Creditors quickly discovered the necessity of packaging technical and managerial support with financing, a lesson learned decades earlier in the West.

Rural electrifiers expected the central government to provide organizational assistance, financing, material aid, and propaganda.\textsuperscript{192}

\textsuperscript{185} One of Elektroekspluatatsia's initial agreements in 1923 was voided because the Kashira regional station would soon supply the region; Elektroekspluatatsia, \textit{Otchet pravleniia aktionernogo obschestva elektricheskih predpriiatii 'elektroekspluatatsiia' obschemu sobraniiu aktsionerov 29 dekabria 1924 g. za pervyi operatsionnyi god (5 iyunia 1923 g. - 1 oktiabria 1924 g.)} (Moscow: Elektroekspluatatsia, 1925), 12.


\textsuperscript{187} "Biulleten," \textit{Elektrifikatsiia}, 1928, no. 11: 38. The current of ninety-nine stations was unknown.

\textsuperscript{188} Iu. V. Skobeltsyn, "Snabzenie elektricheskoi energiei selskikh mestnostei ot standartnykh moshchnostei," \textit{Elektrifikatsiia}, 1924, no. 4: 211; Aktionernoe obschestvo po elektrifikatsii selskogo khoziaistva, \textit{Elektrostroy i ego deiatel'nost} (Moscow: Novaia deiatel'nost, 1924), 15–16.


\textsuperscript{190} \textit{Elektrostroy i ego deiatel'nost}, 6.

\textsuperscript{191} Trudy 1-go Vsesoiuznogo sezda po sel'skikh khoziaistv (Moscow: Izdatel'stvo Gosudarstvennogo komissariatu po elektrifikatsii, 1924), 15–21.

\textsuperscript{192} A. Kulikovskii, "O role gosudarstva v elektrifikatsii derevnii," \textit{Ekonomicheskaia zhizn}, 22 April 1922, 1.
Glavelektro and Elektrokredit promoted rural electrification. In 1923, they published *Elektrifikatsiia*, a propagandizing, popular science journal for rural electrification. In addition to funding, Elektrokredit offered technical and administrative assistance and encouraging advice, such as including a wide range of politically important and “literate people,” such as teachers, in preparatory work to create a network of powerful supporters. Elektrokredit warned, “The path to electrification will have many obstacles and the main one is lack of money, but do not lose heart. What can’t be done in one year perhaps can be done in two or three.”

To assist rural electrification, industry and government supported regional companies. These firms—underfunded, inexperienced, and caught in changing political currents—provided services to customers even less knowledgeable. The most visible firms were Elektroelststroi (Electro-agricultural Construction) and Elektroeksploataatsiia (Electric Operation), both based in Moscow, Elektrika (Electric) in the Ukraine, Elektropomoshch (Electro-help) in the north, and Elektrokrai (Electro-region) in the north Caucasus. By 1925, over one hundred such firms organized local companies, provided technical inspections and advice, aided financing, ordered equipment and materials, and assisted construction. An independent Moscow-based group, the Society to Assist Electrification (Nauchno-Tekhnicheskoe Obshchestvo Sodeistviia Elektrifikatsii), tried to function as a mini-TsES. According to a commentary on the problems facing rural electrifiers, the society suffered from overworked members, poor links with provincial workers, extremely limited resources, and a one-year delay in having its statutes approved.

Cooperatives and local joint stock companies actually brought the electric station to a small town or rural region. Their shares were subscribed by the local ispolkom, cooperatives, individuals, and regional bodies. Peasants could buy inexpensive shares, which provided additional capital and created a base of committed individuals. Additional funding came from the better-financed regional companies, themselves financed by industrial and state funds.

194 *Elektroelststroi i ego deiatel’nost, 8; Perekhod k NEPu*, 289.
196 The Ukrainian Vintzelelektro sold shares for 100 rubles to the regional ispolkom and 10 rubles to peasants; “Korrespondentsii,” *Kommunalnoe delo*, 1925, no. 1: 49.
Cooperatives played a major role in introducing electricity. For example, Tsentrosoiuzkartofel (the central union of potato cooperatives), funded by Elektrokredit, built seventeen stations in the Central Industrial Region from 1920 to 1924 for processing potatoes and lighting. Kustar handicrafts provided the low-technology materials and equipment needed for these small utilities. The value of kustar electro-technical goods from 1921–22 to 1925–26 increased sixfold to 24 million rubles, or one-fifth of all electro-technical goods. Local companies handled the actual construction, and villagers contributed labor, materials such as wooden poles, and sometimes money. By December 1926, cooperatives owned and operated nearly half of the 651 rural stations.

The activities of Elektroselstroi and Elektroekspluatatsiia provide a telling glimpse into the demands of small-scale electrification. Both endured harsh teething troubles. One remained committed to rural electrification, but the other became a convert to regional stations and existing utilities. As part of its restructuring under the NEP, the Commissariat of Agriculture transformed its section for rural electrification, Elektrozem, into Elektroselstroi in June 1922. Elektrozem’s failure to develop the rural equivalent of the tsarist model agreement may have contributed to this change. Elektroselstroi’s first year was dominated by efforts to obtain its promised financial and material dowry and to repulse an amalgamation attempt by Gosselsindikat, a newly created joint stock company also spawned from the Commissariat of Agriculture. The main operations were in the Moscow region, though Elektroselstroi had a Petrograd office and three colonies for electric plow research.

In late 1923, Elektroselstroi started negotiations on cooperation with ASEA, the Swedish General Electric Company. In June 1924, the

---

198 Elektrobank, Finansirovanie elektrokhziaistva, 6.
201 Elektroselstroi, Gosudarstvennaia montazhno-stroitelnaia kontora po elektrifikatsii sel’skogo khoziaistva ‘Elektrselstroi’ za 1 1/2 goda ee suschestvovania (Moscow: Narkom zemledelia, 1923), 4–6, 8, 25–31. See also Elektroselstroi i ego deiatelnost, 30.
202 This is probably the General Electric cooperation listed by Antony C. Sutton in Western Technology and Soviet Economic Development (Stanford: Hoover Institution Publications, 1968), 186.
government firm became a 2 million ruble joint stock company with access to foreign funding, technology, and experience. Elektroselstroi worked closely with Elektrokredit, the Commissariat of Agriculture, and private and German sources of capital and technology.²⁰³ Elektroselstroi received 251 inquiries in its first eighteen months, of which 103 turned into clients and 28 signed contracts to draw up projects and build stations.²⁰⁴ If fully implemented, the projects would cost 2.9 million rubles, equivalent to Elektrokredit’s total loans in 1923, but cash flow problems canceled some projects.²⁰⁵

Elektroekspluatatsiia was formed by the Moscow Soviet in June 1923 but was sent into the world without theoretical or practical guidelines. Important questions about relations with Glavelektro and the source and nature of credit remained unanswered one year later, but the firm had learned what not to do. Funded primarily by future station owners and electrical equipment manufacturers, it quickly learned about the drawbacks of bartering and the need to obtain loans before the summer construction season, when money arriving a month late could cause a year’s delay.²⁰⁶ Initially, Elektroekspluatatsiia operated like a concession, seeking 30- to 36-year monopoly agreements, but it soon abandoned this approach on grounds of inadequate foreign funding and the inherent dangers of monopolies. More likely, foreign investors were not interested in long-term concessions for small Soviet stations. Elektroekspluatatsiia quickly focused on projects that promised a full return on capital within ten years, twice Elektrobank’s timeframe. Clients, not outsiders, would invest in a station constructed and controlled by Elektroekspluatatsiia and operated by the client. Station control would revert to the client when the loan was repaid.²⁰⁷

Despite networks of representatives and 612 inquiries, Elektroekspluatatsiia signed only sixteen construction projects and eight hydrological surveys in its first year. The company was the equivalent of a mine canary, finding problems everywhere. Local craft guilds proved costly and produced poor work; state electrotechnical trusts were unreliable; obtaining credit proved difficult; the legal framework

²⁰³ Elektroselstroi, Gosudarstvennaia montazhno-stroitelnaia kontora, 18–19, 23; “Mestnaia elektrifikatsiia,” Elektrifikatsiia, 1924, nos. 9–10: 37; Elektroselstroi i ego deiatelnost, 7–8.
²⁰⁴ Seventeen agreements to build stations, six for planning work, four to operate electric plows, and one to build and operate a concessionary station.
²⁰⁵ Elektroselstroi, Gosudarstvennaia montazhno-stroitelnaia kontora, 15, 21, 23.
²⁰⁶ Elektroekspluatatsiia, Otchet pravleniia, 4, 13–14, 16–18, 29.
²⁰⁷ Ibid., 5–6.
remained uncertain; relations with its main clients, the ispolkom, were fraught with conflict, particularly over money; relations with Glavelektro and its organs proved equally demanding; the stations did not operate as efficiently as predicted; and qualified personnel were extremely rare. This Job-like litany of woes offers an idea of the problems inherent in local electrification. It comes as no surprise that by 1925 Elektroekspluatatsia supported regional stations wholeheartedly over local stations and refocused its activities on areas with existing stations and a developed kustar industry.208

Elektroselstroi and Elektroekspluatatsia discovered that local electrification could not be dictated from above—that it grew best from below, aided by outside organizational, technical, and financial assistance. Local initiative existed in the countryside, but the technical and economic means and social organization did not. Introducing technical change successfully required institutions to transfer the technology and arrange for its reception. Affordable credit and equipment were more important than comprehensive plans.209 These firms learned the hard way that the economic feasibility of stations depended on industrial consumption as well as lighting. But there would be no industry without inexpensive electrical equipment and inexpensive railroad transportation to foster trade with the city.210 Rural electrification found itself in the same fix as regional stations: increasing productivity was impossible without the assistance of other sectors of the economy. The cart could not come before the horse.

Despite these problems, electric light and power did penetrate the countryside. Success stories filled Elektrifikatsiia—a rural handicrafts shop equipped with electric motors, peasant homes illuminated by electric light. After five years of GOELRO, electricity flowed in 1,150 villages and 84,000 homes.211 Although nearly a fourfold increase since 1917, this still covered only a small fraction of Russia’s 84 million peasants in 18 million households.212 Together, the 651 independent rural stations, 77 factory stations, and 140 substations connected to a regional station supplied 17.9 MW in 1926, a tenfold increase in less than a decade but still “only a drop in the sea. . . . we need tens of tens of thousands of electric stations with hundreds of thousands

210 Esin, Elektrifikatsiia derevnii!, 3–5; Elektroselstroi i ego deiatelnost, 4.
212 “Voprosy elektrostroitelstva,” Elektrifikatsiia, 1924, nos. 9–10: 19.
of electric motors.”213 The electrotechnical chasm between town and country had only started to be bridged.

By 1926, experience and the NEP’s market orientation had significantly revised electrification’s intended rural role. The political and social goals of transforming the countryside had slipped behind the economic imperatives of increasing station efficiency and profitability. The basic problems of poverty, a technologically illiterate peasantry, and inadequate credit remained, but increasing load factors had become equally important. Electric lighting alone did not a profitable (or at least loan-repaying) enterprise make—that required daytime industrial loads.214 The economics of efficiency had filtered down to the countryside, pushed by the demands of making a return on investment.

Emphasizing broad structural policies remarkably similar to those of the American reindustrialization debate of the 1980s, Glavelektro urged a state focus on tax policy, transportation, and other indirect measures to assist the economic development of cooperatives.215 This reorientation reflected a realization by some rurally oriented electrifiers that detailed plans were pointless and that the state should improve the country’s infrastructure instead of dictating plans.216 Economic criteria had undermined social goals in the absence of a strong political commitment.

The Foreign Role

The flow of Western electrotechnology resumed during the NEP, but neither on the scale desired nor with the prewar degree of foreign control. Foreign firms now dealt with the Commissariat of Foreign Trade as well as with state trusts and firms. Independent foreign investment ceased to exist; Western firms entered into state-approved agreements. Soviets, not foreigners, made the decisions. The advisers and critical equipment, however, remained Western.

GOELRO assumed, with important caveats, the participation of foreign financing and technology. With the exception of ASEA’s agree-

Table 7.7. Electrotechnical sales, 1913–26

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic</th>
<th>Imports</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>State</td>
<td>Local</td>
<td></td>
</tr>
<tr>
<td>1913</td>
<td>80 (60)</td>
<td>54 (40)</td>
<td>134</td>
</tr>
<tr>
<td>1916</td>
<td>96 (71)</td>
<td>39 (29)</td>
<td>135</td>
</tr>
<tr>
<td>1921-22</td>
<td>5 (24)</td>
<td>4 (19)</td>
<td>12 (57)</td>
</tr>
<tr>
<td>1922-23</td>
<td>16 (44)</td>
<td>6 (17)</td>
<td>14 (39)</td>
</tr>
<tr>
<td>1923-24</td>
<td>40 (63)</td>
<td>9 (14)</td>
<td>15 (23)</td>
</tr>
<tr>
<td>1924-25</td>
<td>54 (61)</td>
<td>14 (16)</td>
<td>21 (24)</td>
</tr>
<tr>
<td>1925-26</td>
<td>85 (62)</td>
<td>24 (18)</td>
<td>28 (20)</td>
</tr>
<tr>
<td>Postwar</td>
<td>200 (58)</td>
<td>57 (16)</td>
<td>90 (26)</td>
</tr>
</tbody>
</table>


Percentage of all sales in parentheses.

Kustar industry and other nonstate enterprises.

ment with Elektroelstroj, major foreign involvement did not occur. The political difficulties of diplomatic recognition, Soviet repudiation of tsarist foreign debt, nationalization of foreign industries, unattrac-
tive concessions, and fear of Bolshevik-fermented revolution made foreigners reluctant to invest and foreign governments hesitant to offer trade privileges.217 Soviet financial policy, which tried to maximize exports and minimize imports, further restricted trade, as did Communist fear of an alliance between foreign industrialists and Russian peasants whereby inexpensive foreign goods would undercut state industries.218 Nonetheless, foreign firms sent technologists and technologies to Russia. The pages of Elektrichestvo again filled with advertisements from familiar firms: Siemens and Halske, AEG, Metropolitan-Vickers, General Electric, and ASEA. As Table 7.7 shows, imports more than doubled in value from 1921-22 to 1925-26, but their market share dropped sharply from 57 to 20 percent as domestic production recovered and then surpassed prerevolutionary output.219 Although im-
ports had a smaller market share and value than in 1913, they played

217 Carr, Bolshevik Revolution, 1: 276–89.
219 Elektrobank, Finansirovanie elektrokhoziaistva, 6.
a vital role in the restoration of utilities and construction of regional stations.

Imports were essential for Soviet electrification. The spare parts that restored utilities in the early 1920s came from abroad. Urban stations sought imports because they were less expensive, more reliable, delivered faster, and built better than their domestic equivalents.\textsuperscript{220} More important from Glavelektro’s perspective, regional stations depended on foreign technology and expertise. As Table 7.8 illustrates, imports provided key components for six of the first seven regional stations. Only Kizel did not import equipment; instead, it used machinery from the old Oranienbaum station. Without Western technology, the GOELRO plan could not be realized.

The West, defined increasingly as the United States, continued to serve as a model as well as a source of technology. What better affirmation of the vigor of Soviet construction could there be than to label it American? At the Volkhov hydrostation, a propagandist proclaimed, “Here you see the current America—noise, thunder—all, all

\textsuperscript{220} E. g., Tomsk received a foreign turbogenerator more quickly at half the cost of a Soviet system; “Kommunalnye predprijatiia,” \textit{Kommunalnoe delo}, 1925, no. 20: 53.
America. In a word, there is not a Russian approach but an American tempo." 221 Yet, even as Fordism, Taylorism, and "Amerikanizm" captured the enthusiasm of Soviet modernizers, the decreased reliance on German technology presaged a shift in priorities from the technologies of the second industrial revolution to those of the first—from the science-based chemical and electrical technologies to metallurgy and mining. 222

The GOELRO Plan, 1924–1926: Repudiation and Reaffirmation

The 1924–26 period was crucial for all three tiers of utilities as the Soviet government had to answer the fundamental question whether local governments and profitability or the state should determine the pace and path of industrial development. 223 Under what rules would electrification operate? Would municipalities and the market, serving priorities not necessarily the state’s, or the party drive the development of electrification? One direction was decentralized electrification based on local demand and regional stations only in a distant future. Rural and urban utilities supported this approach; for them, short-term economics were major considerations. The other direction was centralized electrification, based on regional stations and the GOELRO plan. Gosplan, Glavelektro, Elektrobank, and the Communist party supported this top-down development. Ultimately, this was a political question, decided by the party.

By 1925, a normalcy of sorts had returned as generation surpassed the 1913 level. 224 The immediate post–civil war shortages had eased and administrative structures had stabilized. Most utilities had completed major repairs and reconstruction and turned to expanding their capacity and clientele. Instead of shortages of food and fuel, utilities now suffered from shortages of credit, skilled personnel, and materials, although high fuel prices, uneconomical tariffs, and poor statistical and accounting procedures also restrained expansion. The failure of the domestic electrotechnical industry to fulfill orders had

223 Bettelheim, Class Struggles, 278.
also placed a "series of electric stations in an extremely grave situation and caused them enormous losses." Inferior materials, inadequate testing, and poor construction were not unknown, and utilities learned the hard way to test equipment at the factory before delivery.\textsuperscript{225} Although not trivial, these shortages were normal problems of capital and economics with prerevolutionary and Western antecedents.

In attempting to expand, urban utilities began to feel their secondary status compared with regional stations. The lower tiers rebelled against the GOELRO plan in 1924–25 but contained their actions within narrow administrative bounds, ensuring eventual defeat. This repudiation of the centralized electrification of the GOELRO plan was a remarkable outburst of independence by the utilities, which viewed Glavelektro as pursuing a distant dream at their immediate expense.

In June 1924, the All-Union Conference on Electricity Supply met in Moscow, the first major electrotechnical meeting since the 8th All-Russian Electrotechnical Conference in October 1921. Glavelektro and the GUKKh had planned the conference since July 1923 to improve local–center relations, establish standards and procedures, and help rationalize the electric supply.\textsuperscript{226} The conference certainly improved local–center communications, if not relations. Glavelektro and the local utilities discovered that they operated on different wavelengths. The center talked about future promises, while the utilities saw those promises contributing to their present problems.

From the local perspective, regional stations consumed too much and returned too little. By contrast, local stations provided a quicker return on investment and served a much wider population. The delegates called for an alternate, decentralized approach to replace the GOELRO plan: "The basic task of electrification in the country now lies in the reconstruction and construction of local stations, meeting existing demands, and, in turn, providing an unfocused market for the fuel and metal industries. By the construction of medium stations according to established technical norms, we create users for future regional stations and thus prepare for large-scale electrification."\textsuperscript{227}

The key issue now was not direct control but financing, followed by


\textsuperscript{227} Iu. Mitlianskii, "Vsesoiuznaia konferentsiia po elektrosnabzheniiu i mestnye stantsii," \textit{Kommunalnoe delo}, 1924, nos. 7–8: 20.
materials and personnel. The delegates declared the “situation of pro-
vincial stations extremely serious, in several cases verging on the cata-
ostrophic, owing to a complete lack of credit needed for reconstruc-
tion.”228 To solve the funding squeeze, the conference recommended
redirecting state funds from regional to local stations. Existing con-
struction, such as the Volkhov hydrostation, should be completed,
but new projects, such as the Svir hydrostation, should be halted un-
til new small stations had satisfied local needs.229 The conference did
not reject regional stations but relegated them to a future, more ad-
vanced phase of development. Rich countries could afford to con-
struct regional stations first and then bring industry to them, but “we
should be careful of such and should build only where the market is
ripe.”230 In the Soviet Union, local stations would prepare the way by
raising electrical consumption first. Regional stations would substitute
local for imported fuels, not electrify unindustrialized areas.

The utilities declared that they needed more money but with less
state supervision. Municipal decisions, made without the “guardian-
ship and interference” of central organs, would ensure the best use of
funds.231 More long-term credit, combined with an increase of the cap-
ital of the Central Communal Bank and the reconstruction (perestroika)
of the Russian electrotechnical industry, would advance local electri-
fication far faster than would regional stations. Foreign equipment
and capital would further increase the tempo of growth. The utilities
also sought more money from local governments, industry, and other
present and future users, including prompt payment by the military
and local governments, to ease daily operations.232

The repudiation of GOELRO extended to its roots in the prewar
fuel crises. One speaker advocated building local stations specifically
to assist the coal industry.233 This argument stood firmly against the
events and technocratic engineering mindset of the previous decade,

228 Ibid., 19.
229 “Rezoliutsii Pervoi Vsesoiuznoi konferentsii po elektrosnabzheniiu,” Elektrichestvo,
1924, no. 9 (conference supplement): 3.
230 V. Levi, “Mestnoe elektrostroitelstvo i elektrifikatsionnaia politika,” Kommunalnoe
delo, 1925, nos. 13–14: 11. Levi rhetorically asked, what if Leningrad had received 40
million rubles instead of the still incomplete Volkhov? He concluded that electric supply
would have increased more quickly but hastened to note that the hydrostation was
not a mistake, “as its importance is not only economic.”
231 “Rezoliutsii Pervoi,” 15. City utilities would remain in the GUKKh framework,
however, leaving no doubt where the interference came from.
232 Ibid., 1, 15–17; D. Sheinis, “Podgotovka k sezdu,” Kommunalnoe delo, 1925, no. 1:
3.
though one year later Elektroplan followed by contemplating a large conventionally fueled station for Moscow.

Other conferences in 1924–25 supported the reallocation of resources from regional to urban stations. By their preference for the Central Communal Bank over Elektrobank as the credit center for electrification, the utilities firmly declared that they were an integral part of their local economies, a position supported by municipal governments. The firm bias by utilities against regional stations contrasted sharply to the increasing centralization of authority among Glavelektro, Gosplan, and Elektrobank.

Within Glavelektro, interest had increased in supporting conventional stations, partly because the implementation of the GOELRO plan had proceeded far more slowly than desired. A 1925 overview by Krzhizhanovskii, Shulgin, and V. Z. Esin, three founders who moved to Gosplan, showed that the plan's creators viewed it quite differently than in 1920. A more militant and political yet pragmatic view dominated, reflecting the changed environment and electrification's evolving status. Regional stations remained the key electrification technology, but small rural stations gained in status based on political instead of economic and social goals. Simultaneously, Shulgin stated that electrification's role in industrial development should be determined by immediate demand, return on investment, and other economic factors. Central tasks should be limited to state-scale transportation systems and regional stations. These principles agreed with the utilities' major demands, not with the concepts of a command economy. None of these viewpoints was new; their acceptance by the Gosplan and Glavelektro leadership, however, was.

As Table 7.9 shows, GOELRO achieved 10 percent of its planned capacity in its first six years after the completion of the Volkhov. Although, the 164 MW was less than half of the 314 MW originally planned for those seven stations (see Table 7.1), it was twice as great as the 80 MW added to urban and rural stations since 1913. The


Table 7.9. Status of regional stations, October 1925

<table>
<thead>
<tr>
<th>Status</th>
<th>Stations</th>
<th>Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating, under construction</td>
<td>Kashira, Kizel, Nizhegorod, Red October, Shatura, Shterov, Volkhov</td>
<td>164 (11)</td>
</tr>
<tr>
<td>Just starting construction</td>
<td>Cheliabinsk, Saratov, Kharkov</td>
<td>235 (16)</td>
</tr>
<tr>
<td>Planning phase</td>
<td>Dniepr, Svir</td>
<td>350 (24)</td>
</tr>
<tr>
<td>Not started</td>
<td>15 stations</td>
<td>695 (48)</td>
</tr>
<tr>
<td></td>
<td>27 stations</td>
<td>1,444</td>
</tr>
</tbody>
</table>

Source: Glavelektro, Obzor sostoianiia rabot po krupnomu elektrostroitelstvu na 10go oktiabria 1925 g. (Moscow, 1926), 6, 8.

* Percentage of planned capacity in parentheses.

Concentration of resources on regional stations had produced corresponding results. Only half of GOELRO’s regional stations would be operating in 1930, according to Gorev’s prognosis in January 1925.238

The 1920 GOELRO plan was polemical, but it was the polemic of technocrats and engineers transforming society. The more traditional political polemics of the 1925 Krzhizhanovskii represented party more than technocratic concepts as he outlined a Soviet victory over capitalism. Electrification remained the answer, but now the question was who would win the worldwide economic war for the future. The West remained both a source of emulation and a threat, with “Ford and his system the main elements of this struggle against us.” The “rationalization of the Western economy on the basis of the development of energy has turned a special blade against us,” a danger to be deflected by a planned, nationalized Soviet economy reconstructed on a rational energy base.239

Five years of a state plan for electrification had not transformed the country but instead revealed the dependence of electrification on other sectors of the economy. Implementation, Krzhizhanovskii acknowledged, had fulfilled less than half its goals because of the poor economy and the opposition caused by the “enormous inertia of all

those hoary habits of thought which are so natural in [this] agrarian, economically backward country.” Poor harvests, slower railroad re-
construction, and less oil production than predicted had cut economic
growth and exports. Unmentioned but equally important was state
investment in electrification, which reached less than half of what
GOELRO had planned. Measured against national goals, progress
was poor. Measured against postwar Western advances, Russia had
actually fallen farther behind, though Western engineers agreed it
was on the right track.

In 1921, the Communist party assumed that the elimination of the
town–country gap would promote the transition to communism. As
the NEP failed to remove this gap, the state and party leadership
realized that the survival of the state depended on integrating the
peasants into the national economy. For Krzhizhanovskii, the issue
was simple: “Unless we want to be turned into a colony of Western
capitalism, we need the decisive and quickest industrialization and
reconstruction, but this means mastering the peasant market so that
wide layers of peasants can see the advantages of a large-scale state
economy.” Improving the peasant economy demanded rising above
the “three backward forms of agriculture”—the wooden plow, sickle,
and flail—by the rapid growth of small stations, whose political sig-
nificance was now “impossible to underestimate.” Political needs
demanded rural electrification, despite its financial problems. As with
regional stations, political and social goals dictated less rigorous eco-
nomic criteria.

Despite the slow realization of regional stations and strong pressure
from below for local stations, Glavelektro and Gosplan continued to
focus on regional stations, the GOELRO raison d’être. The partial re-
treat sounded by Glavelektro and Gosplan proved temporary as the
party debate in 1924–26 about the future economy moved from the
NEP toward more directed, large-scale industrialization.

240 Ibid., 12, 9.
242 More precisely, “the overall thrust of the London [1924 World Power Conference]
is that we were completely right”; Krzhizhanovskii, Gorev, and Esin, Chetyre goda, 13–
14.
244 Krzhizhanovskii, “Perspektivy elektrifikatsii,” in Krzhizhanovskii, Gorev, and
Esin, Chetyre goda, 15.
245 Ibid., 16; V. Z. Esin, “Elektrifikatsiia i mekhanizatsiia v selskom khoziaistve,” in
ibid., 37.
The NEP Years, 1921–1926

The communist party announced the end of restoration (vosstanovlenie) and a shift to reconstruction (rekonstruktsia) in 1925–26 with greatly increased investment in large-scale industrial enterprises. The 14th Party Congress in December 1925, "a decisive landmark in the progress of Soviet planning" according to E. H. Carr, approved this rapid, planned expansion of industry to underpin economically socialism in one country. This decision renewed promotion of large-scale projects and the control of economic development by credit. In both areas, Gosplan, Glavelektro, and Elektrobank led the way.

To conform to the changing political and economic environment and Gosplan’s 1926–30 control figures, Glavelektro reviewed the original GOELRO plan in early 1925. Gorev, head of the section on energy, presented this variant to the Gosplan presidium in July 1926, several months behind schedule. The Gosplan presidium, chaired by Krzhizhanovskii, approved the proposal as “the first approximation of a long-term plan of electrification subject to more precise definition with the completion of the development of a long-term general plan of the national economy.” In December 1926, Krzhizhanovskii and Gorev presented Gosplan’s ambitious five-year electrification plan to the SNK. The two engineers stated that the new electrification plan would link closely with other developmental plans not yet elucidated. The 1926–31 plan called for 930 million rubles to construct regional stations totaling 1,278 MW, a nearly fivefold increase in funding. The capacity of local utilities would double from 350 to 754 MW, and that of industrial stations would increase from 750 to 1,000 MW. This expansion would provide the energy for industry not yet created; social transformation would be a secondary goal.
In a victory for advocates of regional stations and forced industrialization, Glavelektro under Trotsky in July 1925 began preparing a six-year, 130 million ruble plan for the massive Dniepr hydrostation. In a complex blend of Ukrainian nationalism, industrialization planning, and maneuvering for leadership of the Soviet Union, the state and Communist party approved construction of the Dniepr project in November 1926.

As in 1920, electrification led economic planning; this time it had to wait for the other sectors of the economy. Instead of GOELRO preparing a national plan for electrification-based industrialization, Gosplan now handed Glavelektro its marching orders. The change in stature from 1920 to 1926 was great: electrification was no longer the basis of the plan but part of a larger plan.

From the perspective of 1914 and 1917, an observer would speak glowingly about Soviet electrification in 1925-26. The government had created a national plan for electrification based on regional stations and hydropower. A formidable institutional framework existed and utilities had surpassed their prerevolutionary levels of output.

From GOELRO's perspective in 1920, impressions were less favorable. GOELRO as a plan existed more on paper than in actuality, and a leading opponent of Stalin headed the major electrification organization, which exercised less control than desired. Regional stations had exceeded their cost and time schedules, budgetary and other constraints had scaled back plans, and local and urban utilities had rebelled against Glavelektro. Foreign transfers of funding and technology remained far below expectations. Even worse, electrification was increasingly subordinated to the demands of heavy industry.

Financing proved a major weakness; European capitalists did not succumb to the lures of Siberian wood, Baku oil, and Ukrainian grain. Consequently, electrification had to compete for limited Soviet resources and never received the funding the GOELRO planners assumed. Until 1925, Soviet writers described the necessity of foreign investment. After 1925, an emerging defiant attitude asserted that "energy is the base of one of the most important commanding heights which must be in the hands of the government."


253 Rassweiler, Generation of Power, 30-58.

254 Elektrobank, Nekotorye itogi deiatelnosti, 5.
Nonetheless, significant progress had been made. Soviet electrification rested on a firm institutional foundation, industrial users had increased, and new construction was incorporating the lessons learned from the first round of regional stations.²⁵⁵ The official opening of the Volkhov station in December 1926 symbolized the first harvest of hydropower. Electric light and power grew faster than the rest of the economy, including railroads, which did not regain prewar levels of productivity until 1926–27.²⁵⁶ This higher growth showed that allotment of resources to electrification had produced significant economic benefits. From an urban viewpoint, the key was not that electrification grew quicker but that its growth would have been greater and more geographically diffused had resources not been so skewed toward regional stations.

Just as 1914 proved as important as 1917 in shaping Russian electrification, so 1925 was as important for Soviet electrification as 1928, the start of the five-year plans. The halfway point in the NEP, 1925 marked a return to normalcy for utilities as interest shifted from recovery to expansion. Yet 1925 was also a year of change. Glavelektro’s political and economic underpinnings, fluid through the early 1920s, were about to change again. Slow progress in constructing regional stations, the revolt of the utilities, and the increasing political significance of the peasantry forced reconsideration of a more locally oriented approach. The lack of political support from below, as demonstrated by the 1924 conference on electric supply, added momentum to revamping the GOELRO plan.

The basic problem facing the Soviet government and Communist party was that, if not controlled, most investment would go to the utilities of the second tier. Yet for large-scale industrialization, the country needed regional stations, especially in Moscow and Leningrad, still the country’s major industrial centers. To strengthen its political base in rural Russia, the state wanted small rural stations, which were more costly to install and operate than central stations. To industrialize or socially transform, the government and party would have to violate the NEP’s principles of decentralization, ideologically not a difficult task. The question was where to direct limited resources. Despite heated opposition, the state and party concen-

trated resources on regional stations. The rebellion of the lower tiers failed to change Soviet electrification policy. The urban utilities did not create a supportive political network throughout the government and party but operated within the existing administrative framework. By not creating a larger coalition, the utilities’ decentralizing drive had to compete against the centralizing tendencies of Gosplan, Glavelektro, and Elektrobank without mitigating political and administrative allies. Worse, the Communist party’s decision to force the pace of heavy industrialization increased the importance of regional stations at the expense of municipal utilities. Closure of the debate between conventional and regional stations ultimately—and effectively—came from above.

Glavelektro’s 1926 revision shifted the original GOELRO goals while reaffirming its emphasis on regional stations. Most significant, electrification and its wide-reaching plans were now subordinated to less developed, more general plans for industrialization as part of the party’s shift to centralized heavy industrialization and planning. Politically, electrification now was not the means to industrialization but a supporting foundation. Although it was discussed with GOELRO in 1920, only now was electrification’s subordination fully accomplished.

The leaders of GOELRO, particularly Krzhizhanovskii, continued their work, but from the higher administrative heights of Gosplan in 1925. In a demonstration of the integration—and subordination—of the electrification enthusiasts into the government, their larger constituencies, responsibilities, institutional interests, and work differed from those of GOELRO in 1920. A lack of political support now distinguished electrification from technologies with greater support, such as its old nemesis, the railroads, and metallurgy. In the first years of the NEP, priority went to rebuilding the old, not boldly building the new. Lenin’s weakening power until his death in 1924 deprived electrification of its most powerful patron. The association of Glavelektro with Trotsky weakened political support for the main agency for electrification, as did the continual changes in chairmen. Moreover, wide-ranging debates about the future economy and a struggle for leadership had filled the political vacuum of 1920.

The initial failure of the new state technology to fulfill its proponents’ utopian visions had several causes. Very important was the neglect of electrification’s dependence on other sectors of the economy, including the railroads, to provide utilities with resources to build and operate power stations. GOELRO based its plans on assumptions of centralized authority which bore little resemblance to the often strained industrial relations of the early 1920s. Its implemen-
ters had to contend with the NEP’s more politically and economically decentralized environment. “Objective” economic factors, primarily a lack of expected domestic and foreign financing and foreign technology, further hindered growth.

The strength of the center consisted in directing resources into regional stations at a time when economic and political factors strongly favored investment in local utilities. The center exerted control not just by restricting local utilities but by eliminating potential industrial competition. From Moscow’s point of view, denying factories the right to build or expand their stations to preserve a market for regional stations maximized limited resources. A planned economy in electrification meant not just favoring one type of power generation, but also stunting the development of alternatives.

The creation of organizations to plan, implement, and operate an electrified country demanded time and the resolution of issues ranging from profits to center–local relations. Some issues that appeared narrowly technical, such as standardization and inspection, actually involved conflicts between different political and economic interests over power and authority. Although local authorities won many issues, the overall control of the central organs, particularly Glavelektro and Gosplan, increased. Where Glavelektro faltered was in similar struggles against other central organs and interests.

The regional stations proved to be too much too soon. They consumed large quantities of money, materials, and skilled personnel at a time when all three were in short supply. Local stations fought regional stations on economic grounds for economic reasons: regional stations consumed the lion’s share of limited resources. If the pie could not feed everyone, the utilities would fight for their fair slice.

Electrification had progressed greatly since 1913, 1917, and 1920. Electrical engineers could and did take pride in their accomplishments, even if they did not reach original expectations. The challenges facing electrification as the state technology and means of socialist transformation, however, threatened to diminish its importance. In 1920, electrification became the tool of the state. In 1926, it became only another tool.