UDC 621.3 (09) + 921.3(477)
DOI https://doi.org/10.32782/2663-5984.2025/1.60

Tverytnykova O. Ye.
National Technical University "Kharkiv Polytechnic Institute"

EVOLUTION OF THE ELECTRICAL INDUSTRY IN UKRAINE DURING THE FIRST HALF OF THE 20TH CENTURY

The article examines the stages of formation and development of the electrical engineering industry in the territory of Ukraine, which began to take shape at the turn of the 19th and 20th centuries and gradually became one of the leading sectors playing a key role in the country's economic development. Today, the issues of restoring and modernizing Ukraine's electrical industry complex are highly relevant. Therefore, studying the historical experience of the industry's development in the first half of the 20th century, especially its recovery in the early post-war years, is of great value. The article summarizes information about the activities of the electrical industry complex and establishes that by the 1930s, more than twenty electrical engineering enterprises were already operating. These enterprises ensured the mass production of turbogenerators, hydrogenerators, transformers, electric motors for various purposes, cable products, and electrical measuring equipment.

Special attention is given to the post-war reconstruction of the industry during 1943–1951. To supply industrial facilities in metallurgy, mining, chemical, transport, and energy sectors – damaged during World War II – existing enterprises were modernized and new plants were built. Significant emphasis was placed on training specialists and establishing research units. An analysis of the product range reveals a wide assortment of items: electric motors of various capacities; hydrogenerators; turbogenerators; high-voltage and low-voltage equipment; electrical engineering devices; transformers; high-voltage mining equipment; electrical measuring instruments; and cable products. The creation of research centers within industrial enterprises played an important role in accelerating the development of electrical engineering production.

Key words: *history of science and technology, electrical engineering, industry, post-war reconstruction, enterprise, production, industry, scientific support, innovations, scientific heritage, turbine construction.*

Problem Statement. Electrical engineering is one of the priority sectors that determine the level of scientific and technological progress. The implementation of technical innovations, improvements of energy efficiency, and automation of production process are based on the achievements of electrical engineering. In the territory of Ukraine, the electrical engineering industry began to take shape at the turn of the 19th and 20th centuries and gradually became one of the leading sectors playing a key role in the country's economic development.

By the early 1950s, a network of electrical engineering enterprises was operating, producing equipment for the generation, transmission, and consumption of electricity, electric motors of various capacities and purposes, electrical measuring instruments, cable and insulation products. The products of electrical engineering enterprises were used across various sectors of the industrial complex, as well as in everyday life, medicine, and transportation. Today, the issues of restoring and modernizing Ukraine's electrical industry complex are highly relevant. The production of high-tech and knowledge-intensive products is impossible without upgrading equipment and creating a theoretical foundation for the implementation of advanced technologies. Therefore, studying the experience of development of the electrical engineering industry in the first half of the 20th century, especially its recovery in the early post-war years, is of great importance.

Analysis of recent research and publications. The issues of the formation and development of industry in the territory of Ukraine have attracted the attention of Ukrainian researchers. The historiography of the studied problem is represented by a range of diverse publications. The study of factory-based industry is addressed in publication [1], where the author explores the development of the manufacturing sector, which became most widespread in the Ukrainian provinces of the Russian Empire in the second half of the 19th – early 20th century. A noteworthy contribution is the comprehensive three-volume work by O.O. Nesterenko [2]. This monograph presents an analysis of the formation of industry in Ukraine, starting from the development of crafts and factory production to the establishment of an industrial

complex in the 20th century. The formation of the cloth and leather industries in the Dnipro region of Ukraine is covered in the publications by V. Levytskyi [3–4].

Certain aspects of industrial development in Ukraine are examined in a collective monograph edited by L.O. Gryffen [5], which analyzes the development of mechanical engineering, metallurgy, electrical engineering, sugar production, tractor manufacturing, shipbuilding, and more. The topic of mechanical engineering development is the focus of the publication by M.O. Samofalova [6], where the author emphasizes that the involvement of foreign capital, the introduction of Western technologies, and the modernization of production processes contributed to the growth of the mechanical engineering sector in the second half of the 19th – early 20th century.

An interesting study of industrial processes in the Western region of the Ukrainian Soviet Socialist Republic is presented in [7]. Based on a large body of archival documents, O. Malyarchuk and Vasyl Ostapiak reconstruct the process of building power plants and industrial enterprises in the Western region. It is shown that alongside economic growth, there was a depletion of natural resources. Various aspects of the development of the electronics industry are explored in studies [8–9]. The historiography of the issue is complemented by research on the development of Ukraine's electrical engineering sector in the second half of the 20th century. In addition to scientific support and institutional structuring of the industry, the achievements of the electrical industry complex are outlined [10].

The aim of the article the study focuses on the stages of development of the electrical engineering industry from the late 19th century to the first half of the 20th century. Special attention is given to the post-war reconstruction of the sector during the period from 1943 to 1951.

Presentation of the main material. The formation of the electrical engineering industrial complex in the territory of Ukraine began in the late 19th century with the establishment of the "Kolpa" plant in Zaporizhzhia, which produced cable products. In addition, there were railway workshops operating in Kharkiv, workshops for the repair and production of telegraph devices and communication equipment for the railway in Kyiv, the large Bobrynsky workshops for locomotive and wagon repair, and repair workshops in the city of Smila, Cherkasy region.

By the early 20th century, a cable plant had been opened in Kyiv, and in 1914, an electromechanical plant was relocated from Riga to Kharkiv (Table 1) [10, p. 52].

Table 1

Formation of the Electrical Industry in the territory of Ukraine in the late 19th Century – 1940 *

Year	Region	Enterprise Name (Original and Current)	Products
1863	Zaporizhzhia	Kolpa Plant (Zaporizhzhia Cable Plant)	Cable products
1869	Kharkiv	Kharkiv Main Railway Locomotive and Wagon Workshops (Elektromashyna Plant)	Electrical machines and equipment
1875	Kyiv	Workshops for Repair and Production of Telegraph Devices and Railway Communication Equipment (TRANSSIGNAL Electrical Engineering Plant)	Electrical equipment for railways
1876	Cherkasy	Large Bobrynsky Workshops for Locomotive and Wagon Repair (Smila Electromechanical Plant)	Traction electric motors
1900	Kyiv	Kyiv Cable Plant 'Ukrkabel'	Cable products
1914	Kharkiv	Russian-Baltic Electrical Engineering Plant (Kharkiv Electromechanical Plant)	Large electric motors
1915	Donetsk	Alekseyev Mechanical Workshop for Mine Equipment Repair (Donetsk Electrical Engineering Plant)	Transformers for mining industry
1916	Kharkiv	Telegraph-Telephone Workshops of the North-Donetsk Railway (Kharkiv Electrical Engineering Plant 'Transzvyazok')	Electrical products for transport communication
1932	Kharkiv	Mechanical Plant 'Zbroyar' (Kharkiv Electrical Engineering Plant 'Ukrelektromash')	Asynchronous electric motors
1936	Donetsk	Electrical Engineering Workshops of the Severodonetsk Railway Communication Service (Artemivsk Electrical Engineering Plant)	Electrical equipment for transport
1936	Kharkiv	'Elektrostank' (Kharkiv Electrical Apparatus Plant)	Low-voltage equipment
1939	Zakarpattia	Prykarpattya Plant ('Prykarpatkabel')	Cable and conductor products
1940	Lviv	Artels 'Burilnyk' and 'Kamenotes' (Electrohousehold Appliance Plant)	Special electric motors

**This and following tables were created by the author*

However, the scientific and technical departments of all industrial enterprises operated based on technologies and developments of foreign electrical engineering corporations, which hindered the development of the domestic electrical engineering sector. Additionally, there was a shortage of specialized raw materials necessary for production. Complex electrical equipment was mostly manufactured outside Ukraine. An analysis of the product range reveals weak development or complete absence of certain branches of the electrical engineering industry. There was no established production of generators for power plants, hydrogenerators, high-voltage insulators, high-capacity transformers, lighting equipment, electrical insulation, or high-voltage equipment.

This is evidenced by the percentage of imported electrical products: 93% of electrical measuring equipment and 60% of electrical machines, transformers, and generators were supplied from abroad. Ukrainian enterprises accounted for only 2.5% of global electrical engineering production [5, p. 329].

The revival of research activities in the 1920s created favorable conditions for the further development of the electrical engineering sector. During the 1930s, several key directions emerged in the territory of Ukraine, including: electromechanics (turbogenerators, hydrogenerators, transformers, electric machines, serial electric machine building, electric drives); power engineering (high-voltage technology, design and operation of electrical systems); electrical measurement technology.

More than 20 electrical engineering enterprises were operating at the time. In Kharkiv, for example, the Electrotechnical Plant (Mechanical Plant "Zbroyar") produced asynchronous electric motors; the Electroapparatus Plant manufactured low-voltage equipment; the Prykarpattya Plant specialized in cable and conductor products; and the Pervomaisk Electromechanical Plant produced explosion-proof asynchronous motors and electric motors for various applications [11].

After the end of World War II, the reconstruction of the electrical industry began. The overall condition of the electrical engineering sector was quite difficult. The challenges of the early post-war years significantly affected the industry. Large enterprises resumed operations after returning from evacuation, and new plants began to be built. However, development was hindered by the loss of design and technical documentation and the shortage of qualified personnel. As a knowledge-intensive sector, electrical engineering required not only material and financial support but also scientific backing. The primary task in the post-war years was to resume the production of pre-war product types, but global trends demanded qualitatively new approaches. The lack of sufficient scientific potential and minimal interaction between industrial enterprises and research institutes added to the difficulties. At that time, enterprises in the electrical engineering sector had virtually no scientific support. Small design departments at plants, with very few employees holding academic degrees, could not provide the necessary scientific guidance. All of this created unfavorable conditions for the development of the material and technical base and the implementation of new innovations. It was necessary not only to restore the sectoral science infrastructure at a new level, focused on applied research, but also to introduce innovative developments. This was taken into account when establishing new enterprises, where design bureaus and research departments were created from the outset.

By the early 1950s, more than 30 electrical engineering enterprises were operating in Ukraine, located in Kyiv, Kharkiv, Zaporizhzhia, Lviv, Donetsk, Luhansk, and Odesa (see Table 2) [10, p. 433].

In 1943, the Pervomaisk Electromechanical Plant resumed operations with a new specialization. Its product range – specialized electric motors – was intended for strategic industries. That same year, the Kremenchuk Municipal Equipment Plant was established (producing equipment for the transmission and distribution of electricity), as well as the Pivdenkabel Plant in Kharkiv (cable and conductor products).

A significant milestone for the development of the electrical industry and power engineering was the opening of the Kharkiv Locomotive Electrical Equipment Plant (later known as "Electrovazhmash"). Production of the first traction motors for electric locomotives, diesel locomotives, and trams was immediately launched, along with turbogenerators for power stations and uniquely designed hydrogenerators. A special design bureau was established within the plant, which later evolved into the Research and Design Technological Institute of Heavy Electrical Machine Building [12, p. ; 13, p. 21–22].

In 1944, reconstruction began on the Kyiv Electrical Equipment Plant (later "Tochelektroprylad"). This unique enterprise had been founded in the late 1930s based on the research workshops of the Kyiv Polytechnic Institute. One of its founders was the renowned expert in electrical instrumentation, A.D. Nesterenko, who accurately assessed the situation regarding the decline in imports of precision electrical measuring instruments.

However, during the war, all plant buildings were destroyed, and after re-evacuation, large-scale restoration efforts began. Production of control and measuring equipment for the military sector (for tanks and aircraft) was resumed. In addition to constructing new facilities, a special school was organized to train workers. In 1948, a design bureau for industrial automation and precision electrical instrumentation was established to conduct research and development [14, p. 12].

In 1947, the Dnipropetrovsk Mine Automation Plant began operations, originally established under the name Selenium Rectifier Plant. The plant's product range included electrical equipment for the coal industry. The opening of the Azovkabel Plant (later the Berdiansk Cable Plant) and the Odeskabel Plant ensured the production of cable products to meet the needs of the energy sector, industry, transport, and communications. The activities of the Kostiantynivka High-Voltage Equipment Plant were focused on developing specialized equipment for the mining industry and high-voltage explosion-proof devices. Production workshops became the foundation for the establishment of the Zaporizhzhia Electrical Apparatus Plant in 1951, whose operations were aimed at manufacturing electrical equipment for metallurgical enterprises.

Conclusions. Thus, the electrical engineering industry in the territory of Ukraine began to take shape with the establishment of the first enterprises and various workshops focused on repairing and producing basic electrical equipment. Despite the organization of large electrical engineering enterprises in Kharkiv and Kyiv, complex electrical equipment was mostly manufactured abroad. The development of the industry was hindered by the lack of scientific and technical support. An important prerequisite for the sector's growth was the expansion of research activities in laboratories of higher technical education institutions and the All-Ukrainian Academy of Sciences during the 1920s. This laid the foundation for the emergence in the 1930s of key directions in Ukraine such as electromechanics, power engineering, and electrical measuring instrumentation.

Further growth of the electrical engineering sector occurred in the early post-war years. In addition to modernizing existing enterprises, new plants were established, each with its own design bureaus and research departments, which facilitated the integration of science into production processes. To restore enterprises in the metallurgical, mining, transport, and energy sectors that had been destroyed during World War II, twelve electrical engineering enterprises resumed operations between 1943 and 1951. An analysis of the product range of these plants shows a wide assortment of items, including: electric motors of various capacities, including explosion-

Table 2

Restoration of the electrical engineering industry in Ukraine (1943–1951) *

Year	Region	Enterprise Name (Original and Current)	Products
1943	Luhansk	Pervomaisk Electromechanical Plant named after K. Marx (Pervomaisk Electromechanical Plant)	Specialized industrial electric motors
1943	Poltava	Municipal Equipment Plant ('Amper' Enterprise)	Electrical engineering equipment
1943	Kharkiv	Pivdenkabel Plant	Cable and conductor products
1943	Kharkiv	Kharkiv Electrical Apparatus Plant	Control system equipment for spacecraft
1944	Kyiv	Kyiv Electrical Equipment Plant ('Rostok Company')	Electrical measuring equipment
1946	Kharkiv	Locomotive Electrical Equipment Plant ('Electrovazhmash')	High-power hydrogenerators, turbogenerators, electric motors
1947	Dnipropetrovsk	Selenium Rectifier Plant (Mine Automation Plant)	Integrated equipment for mine transport automation
1947	Poltava	Poltava Electrical Repair Plant No. 19 (PJSC 'ZAVOD POLTAVA')	Electrical engineering components
1948	Zaporizhzhia	Azovkabel Plant (Berdiansk Cable Plant)	Mine cables
1949	Donetsk	Kostiantynivka High-Voltage Equipment Plant	Mine electrical equipment, explosion-proof equipment
1949	Odesa	Odeskabel Plant (PJSC 'Odeskabel')	Telephone and fiber-optic cable
1951	Zaporizhzhia	Zaporizhzhia Electrical Apparatus Plant	Electrical equipment for the metallurgical industry

**This and following tables were created by the author*

proof asynchronous motors; motors for driving mine ventilation systems, rolling mills, locomotives, and mine hoists; high-power hydrogenerators and turbogenerators for power stations; high-voltage and low-voltage equipment; electrical engineering devices; transformers; explosion-proof complete units and apparatus; high-voltage mining equipment; precision digital and analog devices;magnetic measurement systems; control systems for industrial and technological processes; cable and conductor products; mercury and thyristor power units for electric drives in the mining, metallurgical, and chemical industries. A key factor in intensifying industrial electrical engineering production was the establishment of research centers within industrial enterprises.

Bibliography:

1. Москалюк М. М. Загальний нарис становища та розвитку обробної промисловості українських губерній Російської імперії у другій половині XIX – на початку XX ст. *Україна-Європа-Світ. Міжнародний збірник наукових праць.. Серія: Історія, міжнародні відносини*. 2013. Вип. 11. С. 53–59.

2. Нестеренко О. О. Розвиток промисловості на Україні: [в 3 ч.]. АН УРСР, Ін-т економіки. Київ: Вид-во АН УРСР, 1959–1966.

3. Левицький В. Розвиток суконної промисловості на Наддніпрянській Україні в XIX столітті. *Наукові записки Тернопільського національного педагогічного університету ім. В. Гнатюка. Серія: історія*. 2015. Вип. 2. Ч. 1. С. 63–67.

4. Левицький В. Розвиток шкіряної промисловості у Наддніпрянській Україні у другій половині XIX – на початку XX століття. *Емінак: науковий щоквартальник*. 2018. № 1 (21) (січень–березень). Т. 1. С. 31–36.

5. Історичні нариси з розвитку техніки в Україні: кол. монографія / Л. О. Гріффен [та ін.] ; заг. ред. Л. О. Гріффен. Київ: ТОВ «Талком», 2023. 440 с.

6. Самофалова М.О. Еволюція розвитку машинобудування в Україні. *Grail of science*. 2024. № 46. https://doi.org/10.36074/grail-of-science.29.11.2024.042 368-376

7. Малярчук Олег, Остап'як Василь. Індустріальні процеси у Західному регіоні Української РСР: здобутки та прорахунки. *Український історичний журнал*. 2022. №2. С. 91–107.

8. Буторіна В.Б. Електронне виробництво в Україні: історія становлення та шляхи підвищення конкурентоспроможності підприємств. *Історія народного господарства та економічної думки України*. 2019. Вип. 52. С. 309–322.

9. Романенко В.А. Електронна промисловість України: історія, сучасність, перспективи. *Наука та наукознавство*. 2013. № 3. С. 49–54.

10. Тверитникова О. Є. Електротехнічна галузь України другої половини XX ст.: напрями розвитку і здобутки: монографія; наук. ред. В. М. Скляр. Харків: ТОВ «Тім Пабліш Груп», 2017. 500 с.

11. Милях А. Н., Чиженко И. М., Шидловский А. К. Развитие электротехнической науки на Украине. *Техническая электродинамика*. 1980. № 6. С. 13–24.

12. Электротяжмаш – флагман отечественного электро-машиностроения: страницы истории и современность / Чередник В. И. и др. Харьков: Золотые страницы, 2011. 156 с.

13. Центральний державний науково-технічний архів України. Ф. Р-49. Оп. 1. К. 1-49. Спр. 1. Харківський завод тепловозного електрообладнання. 49 арк.

14. Державний архів Києву. Ф. Р-1402. Оп. 1. Спр. 72. Київське виробниче об'єднання «Точелектроприлад». 47 арк.

Тверитникова О.Є. РОЗВИТОК ЕЛЕКТРОТЕХНІЧНОЇ ПРОМИСЛОВОСТІ НА ТЕРЕНАХ УКРАЇНИ (ПЕРША ПОЛОВИНА XX ст.)

У статті досліджено етапи становлення та розвитку електротехнічної промисловості на теренах України, яка почала формуватися на межі XIX ст. та XX ст. і поступово стала однією з провідних галузей, що відігравали ключову роль у розвитку економіки країни. Сьогодні питання відновлення і модернізації електропромислового комплексу України є актуальними. Тому вивчення досвіду розвитку галузі електротехнічної промисловості у першій половині XX ст., особливо її відновлення у перші повоєнні роки є корисним. Узагальнено інформацію щодо діяльності електропромислового комплексу і встановлено, у 1930-ті рр. вже діяло понад двадцяти електротехнічних підприємств, що забезпечували масовий випуск турбогенераторів, гідрогенераторів, трансформаторів, електродвигунів різного призначення, кабельної продукції, електровимірювальної апаратури.

Особлива увага приділяється питанням повоєнної відбудови галузі упродовж 1943–1951 рр. З метою забезпечення електрообладнанням промислових об'єктів металургійної, гірничодобувної, хімічної, транспортної та енергетичної галузей, що зазнали руйнувань у роки Другої світової війни

відбувалася модернізація існуючих підприємств та будувалися нові заводи. Велика увага приділялася підготовці фахівців та створенню науково-дослідних підрозділів. Аналіз номенклатури продукції свідчить про широкий асортимент виробів: електродвигуни різної потужності; гідрогенератори; турбогенератори; високовольтна і низьковольтна апаратура; електротехнічне обладнання; трансформатори; високовольтне шахтне та рудничне устаткування; електровимірювальна апаратура; кабельна продукція. Важливу роль у прискоренні розвитку електротехнічного виробництва відіграло створення науково-дослідних осередків у структурі промислових підприємств.

Ключові слова: *історія науки і техніки, електротехніка, промисловість, повоєнна відбудова, підприємство, виробництво, індустрія, наукове забезпечення, інновації, наукова спадщина, турбінобудування.*