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30 YEARS OF WORK OF THE BOSNIA AND HERZEGOVINA COMMITTEE
OF THE INTERNATIONAL COUNCIL ON LARGE ELECTRICAL SYSTEMS CIGRE
MONOGRAPH

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ABOUT US

The Bosnia and Herzegovina CIGRE Committee is the largest professional organization in Bosnia and Herzegovina and since 1993 it has been a regular member of the International Council on Large Electrical Systems - CIGRE Paris.

BH K CIGRE is an organization that is active both domestically and internationally and deals with professional and scientific problems in the field of production, transmission and distribution of electrical energy as well as the production of electrical equipment, and especially with issues of electrical power systems.

In achieving its goals, BH K CIGRE is particularly developing the exchange of technical information and experiences and giving initiatives for studying the problems of the electric power system of Bosnia and Herzegovina and its elements.

To achieve its goals, BH K CIGRE monitors and improves development in certain narrow areas of its work, organizes expert meetings, participates in the work of the International CIGRE, establishes cooperation with associations and individuals who are interested in the work program that BH K

CIGRE deals with, develops and improves information system and exchanges information, scientific and professional publications from its domain of work, provides financial resources necessary for its work, encourages and participates in the professional training of its members.

OPENING REMARKS FROM THE PRESIDENT

Ladies and gentlemen,
In the work and activity of any organization for 30 years represents a significant anniversary that is worth noting. This Monograph aims to record the anniversary of the existence and activity of the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE - BH K CIGRE.

BH K CIGRE was founded on August 23, 1992 in Sarajevo, in the hall of the Chamber of Commerce, in a city under siege unprecedented in the recent history of warfare, under a rain of enemy shells, without electricity and with the participation of a large number of hopeless enthusiasts and optimists, it welcomed its 30th anniversary. At the temporary Founding Assembly, the management of BH K CIGRE, the presidents of the study committees were elected and the delegation for participation on the 34th session of CIGRE Paris was determined. At the 34th session, the delegation of BH K CIGRE was welcomed by the Secretary General Mr. Yves Porcheron, who at the session of the General Assembly of CIGRE enabled the presentation of the electricity situation in Bosnia and Herzegovina, which resulted in the admission of BH K CIGRE into full membership of CIGRE Paris already at the next session of the Administrative commission in March 1993.

Thus, BH K CIGRE became the first non-governmental organization in Bosnia and Herzegovina to achieve its full membership in an international umbrella organization.

The International Council on Large Electric Systems CIGRE is an international organization dedicated to the development of the electric power sector. It was founded in 1921 in Paris as a permanent, non-governmental and non-profit association.

Through the participation of members from 115 countries from all continents, CIGRE is the world's leading organization for power system issues, which gathers power engineers and other experts working in the power sector, thereby realizing the exchange of the latest technological achievements, experiences and knowledge, with the active participation of the most famous manufacturers of electrical equipment. The work of CIGRE takes place through study committees, whose members are top world experts in their fields, and sessions, which are held every even year in Paris with the participation of the world's most prominent experts. BH K CIGRE has its representative with the right to vote in the Administrative Commission of CIGRE Paris. BH K CIGRE is one of the successors of JUKO CIGRE, which was founded in 1951 in Zagreb with the presence of 25 labour organizations of the Yugoslav electrical industry and electrical industry, and in the period up to 1991, it held 20 conferences.

This year, BH K CIGRE celebrates 30 years of successful work and activities, and during that period 15 conferences and dozens of other gatherings were held. BH K CIGRE is one of the founders and a member of the CIGRE Regional Committee for Southeast Europe (SEERC). BH K CIGRE has its members both in the Management Board and in the Technical Advisory Committee of SEERC and regularly participates in the work of this CIGRE regional committee. Within BH K CIGRE, there is an organizational structure of the Bosnia and Herzegovina Committee CIRED - BH K CIRED, which deals with professional and scientific problems in the field of electricity distribution.

Since 2019, the Women in Energy forum has been operating within BHK CIGRE, and the Next Generation Network since 2020.

BH K CIGRE is the publisher of the journal "Bosanskohercegovačka elektrotehnika" (B&H Electrical Engineering), which is published once a year. The goal of the journal is to publish high-quality professional and scientific works in the field of electrical engineering, as well as in the field of computing and informatics. After a certain period of stagnation, the journal "Bosanskohercegovačka elektrotehnika" had its original importance renewed through the quality of published works an edition in English, making it possible to continue its publication unhindered in accordance with the highest professional and scientific standards. The 15th issue of this journal was published at the end of 2021. In 2020 and 2021, a separate thematic Special issue was published, and for 2022, two regular issues plus a special issue are planned.

The issues that are dealt within the framework of BH K CIGRE are always firmly related to the current problems of the electricity sector in Bosnia and Herzegovina, which is best illustrated by the conclusions from the 15th conference held in Neum in 2021. BH K CIGRE has indeed made a significant contribution to balancing the relationship between the development of energy, economy, society and the environment. Power engineering, as a field that considers and realizes the possibilities of production, transmission, distribution and consumption of energy, is of great importance for the development and well-being of people on the entire planet.

The human population in the world continues to increase, which puts strain on planetary resources, especially food, clean water and energy. Demands for energy in the world continue to grow continuously while, at the same time, traditional coal based production, is limited by various environmental requirements, especially the negative effects of climate change due to the burning of fossil fuels. A new era has begun in the development of power engineering, which manifests itself as a transition from fossil fuels to renewable energy sources, that is, through an energy transition that leads to a major and most important change - decarbonisation.

Electricity, as the most efficient form of energy, will certainly increase its share in total energy production in the future. The traditional infrastructure of electricity production, transmission and distribution will be supplemented by distributed renewable energy sources. Digitalization, i.e. the intensive application of advanced technical solutions, leads to the development of smart grids, which is one of the most important trends in today's power industry. To this should be added the technical progress in traffic, as large energy consumers, where electric-powered vehicles are gradually replacing fossil-fuelled vehicles.

In combination with projects to increase energy efficiency and develop renewable sources, it is smart grids that guarantee the long-term sustainability of the power system while preserving the environment. The result of all this is a new model of the energy market in which the consumer of energy appears simultaneously as its producer, the so-called "prosumer." Another major change is the increased flexibility of power systems through the use of energy storage, which includes the rapid development of batteries and, more recently, green hydrogen. The power system in the future represents a new challenge for both international and domestic experts and researchers.

BH K CIGRE is an organization whose role in this process is to enable the exchange of opinions and knowledge about engineering, the energy market, as well as information about all important questions about the future of the power system, but also to be a place to find possible solutions for everyday problems and new challenges in the field of energy.

This Monograph presents a brief overview of activities and achievements in 30 years of work of our BH K CIGRE, and also a reminder of the 70 years of activity of CIGRE in Bosnia and Herzegovina and the challenges that our umbrella organization CIGRE, based in Paris, went through in its hundred-year history. In the end, I would like to thank the paper authors, expert reporters, sponsors, management of study committees, members, exhibitors, organizers, participants and all those who contributed to the successful promotion of our activities, on the basis of which this Monograph was created.

In Sarajevo, 24.08.2022.

Edhem Bičakčić
President of BH K CIGRE

1

Introduction – the First 100 Years of CIGRE

The beginning of Electrification in the World – the Period before the Establishment of CIGRE

The first awareness of the importance of electricity for wider use in society began in the year 1831, after the discovery of the phenomenon of electromagnetic induction by Michael Faraday. Based on that discovery, it was possible to generate electricity using mechanically driven generators that converted mechanical energy into electrical energy. The following year, Hyppolite Pixii (a French instrument manufacturer) used steel magnets to make the first generator using the induction effect. As generators improved over the years, they began to be used to power electric arc lamps and for other uses. The dynamo-electric principle, discovered almost simultaneously and independently by Werner Siemens, Charles Wheatstone and Alfred Varley, strongly boosted the development of. In 1860, Antonio Pacinotti invented an improved form of direct current electric generator, using a ring armature around which coils of wire were wound to produce a more ideal direct current than that produced by earlier types of dynamo. He discovered that this device could also be used as an electric motor. During 1866, Werner Siemens, inventor and industrialist, made his most important contribution to electrical engineering. Building on the work of Michael Faraday, he discovered the dynamo-electric principle and constructed the dynamo, the forerunner of modern, large electric generators, which he patented in 1867.

At the end of the 19th century, the latest knowledge in electrical engineering was mainly transmitted at world fairs or special international exhibitions on electricity. The first so-called International Exhibition on Electricity was held in Paris in 1881. This event was associated with the International Congress organized by the Government of France. It was the first comprehensive international meeting on electrical technologies, which was held under the name of *Congres International des Électriciens*, where the emergence of the science of electrical energy was discussed. The congress was attended by over 250 experts, the world's most famous scientists from 27 countries, such as: Werner Siemens, H. Helmholtz, G. R. Kirchhoff, Z. Gramme, P. Jablochoff, H. Fontaine, M. Deprez, Lord Kelvin, G. Ferraris, etc. The world population at that time was 1.5 billion. A new approach to connecting circuits introduced by Marcel Deprez opened the door to the commercial use of electricity with different customers. At the congress, scientists discussed on many interesting subjects and the first international discussion on electrical units was held. They recommended the use of the ampere, volt, and ohm as practical units for current, voltage, and resistance, which were generally adopted by electrical engineers. It was clear that the International Exhibition and Congress in Paris in 1881 showed a very advanced stage of study of the development of DC machines.

On September 4, 1882, the Pearl Street Electric Plant, the first commercial coal-fired power plant operating with six dynamos (600 kW, direct current), began operating in New York, serving 82 consumers with about 400 light bulbs. Thus, electricity started to be a business. In the same year, on September 16, the Second International Exhibition on Electricity was organized in Munich, where the transmission of electricity by direct current over long distances between Miesbach and Munich (57 km) was demonstrated. The project was designed by the French electrician Marcel Deprez and the German pioneer of electricity Oscar von Müller, who established the largest Technical Museum in the world in 1903 in Munich. The project used a voltage level of 2 kV to transmit power of 2.5 kW, which was used to run an artificial waterfall. The transmission efficiency was very low, thus confirming that direct current transmission over long distances is not economical. However, during the same year, 1882, a new idea and approach was born for working with electrical systems using polyphase AC systems. Many historians of electrical technologies considered the period from 1882 to 1892 to be the most innovative period in history that enabled the subsequent development of the use of electricity. The first information about this approach is related to the famous inventor Nikola Tesla.

Figure 1.1 Nikola Tesla (1856-1943)

Figure 1.2 Prof. Galileo Ferraris (1847-1897)

During the period when Tesla was working for Edison in Paris, just before he moved to the USA in 1884, he made a presentation in Strasbourg of a model of a two-phase synchronous generator and motor connected with 4 conductors.

However, the invention of polyphase systems was not easy and had a vivid history that some have called the “first technological war” or the “war of currents” between direct current and polyphase alternating current. During 1883, the Third International Exhibition of Electricity was held in Vienna. In parallel with it, on September 17, the Scientific Commission began its work, whose goal was to perform electrical measurements and conduct scientific research during the exhibition. The attendance of the exhibition was very high. The interest and impact of this event in Vienna on the region was enormous. Many countries in the region started their first electricity projects immediately after the International Electricity Exhibition in Vienna.

The next significant event in the history of electricity was the Electricity Exhibition held in 1884 in Turin (Italy). Based on ideas of Galileo Ferraris, the transmission of power of 20 kW at a voltage of 2000 V on a single-phase alternating network in a length of 40 km was realized, but without an engine. The efficiency of this long-distance transmission was 89%. The results of this attempt showed that the transmission of electricity through an alternating network is relatively simple and very efficient. The only open question was the AC motor which should be at least similar in performance to the DC motors. Many researchers tackled this challenge: Tesla, Bradley, Haselwander, Ferraris, Dolivo-Dobrovolsky, Wenstrom, etc...

After 1884, many world scientists dealt with polyphase systems and motors. Many of them deserve to be remembered because without them, today’s world would be different. The first published experiments with rotating magnetic fields were presented by Marcel Deprez in 1883, but, unfortunately, the famous electrician stopped his research in this field too early. The first attempt to construct a two-phase induction motor model was made by Galileo Ferraris in 1885, however, he mistakenly believed that such motors could not exceed 50% efficiency, and lost interest in their further development. Table 1.1 presents the chronology of inventions and patents in multiphase systems by different authors.

As many believe, Tesla’s lecture from May 16, 1888 was a mistake that inventors usually make. Namely, two weeks after receiving the patent, he presented all the details of his patents without first constructing those machines and conducting tests. This was followed by a veritable avalanche of patents on polyphase systems worldwide, Table 1.2.

Tesla was the first to intensively deal with the transmission of electrical energy using polyphase AC systems and was the first to describe the basics of such transmission and the first to patent the principles of the polyphase induction motor. Tesla and Ferraris were very generous people who freely opened up

Table 1.1 Chronology of inventions in polyphase AC systems

Date	Researcher	Inventions, Patents
Feb 1882	Tesla	First idea and concept of polyphase system power transmission
Mar 1884	Tesla	Model of 2-phase synchronous generator and motor presented in Strasbourg
1885	Ferraris	Construction and tests with 2-phase induction motor
6th Mar 1885	Blathy, Deri, Zipernowski	Granted patent, DRP 40414, via parallel connection of generators, transformers and consumers; **first use of the word transformer**. (Presentation at Budapest Exhibition)
8th May 1887	Bradley	First patent filed in USA (390439) of 2-phase synchronous machine with/without exciter
12th Oct 1887	Haselwander	First public operation of 3-phase model generator with self-excitation (2,8kW, 32 Hz)
12th Oct 1887	Tesla	Applies US Patents 381 968 (el. mag. motor) & 382 280 (transmission of power)
12th Oct 1887	Tesla	Applies US Patent Office for 3 new patents: polyphase motors with short-circuited rotor
23rd Dec 1887	Tesla	Applies US Patent Office for 2 new patents: application in distribution
18th Mar 1888	Ferraris	Lecture in Turin on his tests with 2-phase induction motor
1st May 1888	Tesla	Granted with all 7 patents applied in 1887
16th May 1888	Tesla	Invited lecture at Columbus University, NYC: "A new system of AC motors and transformers", before the AIEE (American Institute of Electrical Engineers)

Table 1.2 Chronology of inventions in polyphase AC systems after Tesla's patents

Date	Researcher	Inventions, Patents
21st Jul 1888	Haselwander	Filed patents on polyphase motors
Autumn 1888	Dobrowolski	Beginning of construction of the first inductive motor with rotating magnetic field
5th Oct 1888	Bradly	Filed patent 404 465; 2-phase induction motor with caged armature
20th Oct 1888	Bradly	Filed patent 409 450; 3-phase synchronous generator and motor
Feb 1889	Dobrowolski	Testing AC 3-phase motor with rotating field
8th Mar 1889	Dobrowolski	Filed patent (DRP 51083) for squirrel-cage induction motors
9th Apr 1889	Wenstrom	Filed UK patent 5423 on rotating field systems
29th Aug 1889	Dobrowolski	Filed patent DRP56359 on arrangement of the cores and yoke of 3-phase transformers
5th Dec 1889	Dobrowolski	Filed UK patent 19554 on 3-phase connection, star/wye, delta for windings
8th Jan 1890	C.L. Brown	First patent on three-phase transformer is filed in Switzerland
24th Jan 1891	C.L. Brown	HV tests in Oerlikon Fabrik for 20 kV & 30 kV transmission with bare conductors
28th Aug 1891	Dobrowolsky, Brown, Miller	First operation of 3-phase transmission system Lauffen-Frankfurt on distance 176 km, 15 kV; 42 Hz with generator 230 kVA and at exhibition side was motor 100 HP; $\eta = 75\%$

great ideas to all of mankind, which resulted in the spread of technical innovations and accelerated development of multiphase systems, but also competition. Nikola Tesla was not only a great scientist, but also a great humanist, a human.

Unfortunately, Professor Galileo Ferraris died prematurely (February 7, 1897) at the age of 50, during his greatest research potential. He left humanity with the first theoretical explanation of the operation of rotating magnetic fields. Many historians define him as the main researcher of rotating alternating fields because he constructed the first two-phase motor and explained his invention in March 1888 during an academic lecture in Turin. Significant roles were played by Tesla and Ferraris by freely providing their own ideas and spreading knowledge about multiphase systems, which in many ways accelerated important discoveries. The German engineer Dolivo-Dobrovolsky was the first to construct and apply a three-phase system that required only three conductors and is more cost-effective than a two-phase system. In August 1891, during the International Exhibition of Electricity in Frankfurt, for the first time in history, the transmission of energy by a three-phase alternating system over a long distance (175 km) between Lauffen and Frankfurt was demonstrated. This project was designed by Mikhail Dolivo-Dobrovolsky, Oskar von Miller and Charles Lancelot Brown. The project used a three-phase synchronous generator located in Lauffen (230 kVA, 42 Hz, 95V with star-connected windings). A 15 kV to 65 kV transformer and a 100 hp three-phase asynchronous motor were used at the exhibition site. The transmission network and motor, whose transmission efficiency was between 68.5% and 75.2%, were designed and constructed by Dolivo-Dobrovolsky. Thus, the first transmission of electricity by a three-phase system confirmed the victory of polyphase AC over DC transmission. This demonstration of three-phase transmission in 1891 announced the beginning of the electrification of the world. The next polyphase project was done in 1895. It was an AC power plant project at Niagara Falls, with the transmission of power over a length of 30 km to Buffalo, USA. The great popularity of the project was probably due to its large power plant capacity of 37 MW at the time.

At the beginning of the 20th century, it was clear that the future of electrification lays in three-phase systems. Electricity has played a significant role in the further development of humankind. In the technological duel between alternating current and direct current, multiphase alternating current emerged as the winner because it proved to be more suitable for wider use and more economically viable. All inventors and creators of three-phase energy systems are meritorious for the huge and accelerated development of our civilization.

Elements such as generators, transformers, conductors, insulators and systemic questions about the performance of electricity were in the focus of attention. In addition, the first electrical engineering faculties began to emerge. The first university to establish a department of electrical engineering was Darmstadt (Germany) in 1882. That is why, at the turn of the 19th to 20th century, there was a growing interest in the commercialization of the newest type of energy – electric energy. For that reason, the need for standardization became crucial.

In 1904 in St. Louis (USA), an important international exhibition was organized where the first meeting of scientists was held with the aim of forming the International Electrotechnical Commission (IEC). In order to meet the growing need for standardization of electrical machines and household appliances worldwide, the IEC was formed in 1906. The first president of the IEC was Lord Kelvin (William Thomson). IEC started its work in 1910. However, at the beginning it became obvious that the further development and operation of growing electrical systems, elements and services, requires a more significant international discussion on specific technical problems, harmonization of certain approaches, solutions for frequency issues, exchange of experiences, research, etc. All these issues led to the organization of new international conferences. Thus, CIGRE was founded in Paris in 1921 as a permanent international congress to support the development of electrical energy technologies, the standardization of new equipment for electrical systems and the exchange of technical information on electrical power systems.

The first acronym CIGRE originated from the French *Conférence Internationale des Grands Réseaux Électriques*, while after 2000 it was changed to *Conseil International des Grands Réseaux Électriques*, and after 2016 CIGRE only means the brand of a global organization that deals with the entire electricity sector.

Prof. Dr. Milan Vidmar, the leading Slovenian expert in power systems, after meeting Nikola Tesla in New York in 1936, described him in the following words: "*As an artist, a poet, who suffers when he creates, who is withdraws from the world, who despises money, does not care for foolish titles and awards, who lives for his ideas and does not need comfort or luxury; he is exactly that.*"

Prof. Dr. Tomo Bosanac, editor, Nikola Tesla Symposium, in 1976, wrote:

Many things were used, and were not even mentioned as Tesla's work. Radiotelegraphy began to develop in the world after 1910, and radiotelephony only from 1923. Elements invented by Tesla and patented by others as their invention were *used. These were high-frequency generators, spark gaps, switches, coupled circuits, modulation, cables and transformers. Apart from that, there are Tesla's solutions that are still waiting to be tested with the help of modern technology. Tesla laid the foundations of modern electrical engineering with his inventions. With his works, he helped physics take a big step towards further understanding the nature of matter. He is one of the rare giants, whose works have not yet been made public, and this is perhaps the reason why his role in some fields of science is still not entirely clear. Tesla wrote in the magazine "The Sun" on December 20, 1914, while the world war was underway, where he gave the best presentation of his work, so let this presentation be concluded with a quote:*

(...) As long as there are different nationalities, there will be patriotism. That feeling must be eradicated from our hearts before lasting peace can be established. Its place must be filled with love for nature and the scientific ideal. Science and discovery are the great forces that will bring about its end. I have just disclosed an invention that will show electricians how to produce large electrical voltages and effects. With their help, miraculous results can be achieved. The human voice and the like will be sent around the globe without wires, energy directed through space, the wastes of the oceans made safe to navigate, transportation facilitated, rain caused at will, and perhaps an inexhaustible supply of atomic energy released.

Nikola Tesla was born in Lika, in the town of Smiljan in 1856. He studied in Prague and Graz. He started his career in a telephone company in Budapest. After that, he worked at the Continental Edison Company in Paris, where he was employed on designing dynamos. Tesla discovered a rotating magnetic field in 1882 and then invented and built a prototype of an induction alternating current machine, but he failed to find anyone interested in his machine in Europe. That is why he went to work for Thomas Edison in his laboratory in New York in 1884. Tesla developed over 40 patents for alternating generators, motors and transformers that George Westinghouse bought in 1885. He invented the Tesla transformer used in radio and television sets. Among the many inventions, fluorescent lighting, lasers, wireless communication, wireless energy transmission, remote control, robotics, the Tesla turbine and vertical take-off of airplanes should be singled out. Tesla is the father of modern multiphase power systems. He patented over 700 inventions. He experimented with X-rays. Tesla patented the basic radio system in 1896 and described all the basic parts of the radio with which Marconi made the first radio transmission across the Atlantic Ocean in 1901, for which he received the Nobel Prize in 1909. The US Supreme Court later recognized Tesla's greater contribution to the invention of the radio. He died in New York on January 7, 1943. In his honour, the unit for magnetic induction is named after him, the tesla (T).

Significant years in the development of power systems before the establishment of CIGRE are given in Table 1.3

Table 1.3 Significant years in the development of power systems before the establishment of CIGRE

1800, Alessandro Volta credited as the inventor of the electric battery, the first source of continuous electric (galvanic) current. Today we can say that it is an invention that has completely changed humanity.
1831, Michael Faraday discovered the principles of electromagnetic induction, enabling various applications of electricity, such as transformers, electric motors and generators.
1865, James Clerk Maxwell published "A Dynamical Theory of the Electromagnetic Field" which summarized the knowledge of electromagnetism with 20 fundamental equations. Around 1882 Oliver Heaviside, using vector calculus, reduced this to 4 equations with 4 variables. Those equations fully describe the theory of electrical engineering.
1866, Werner Siemens develops a dynamo-electric machine based on a double T-armature. Later, Zenobe Gramme (1871) and Friedrich von Hefner-Alteneck (1873) improved the dynamo so that it generated an ideal DC voltage. In 1879, the light bulb (Edison, Swan) was invented, which opened new possibilities for the use of electricity.
1881, The First International Congress and Exhibition of Electrical Engineering in Paris led to significant improvements in thinking about electricity, principles of electrical circuits, agreement on the first units of measurement, etc.
1882, beginning of commercial use of electricity (Edison's Pearl Street Power Plant in New York)
1882-1892, a historic decade of innovation, Nikola Tesla, Galileo Ferraris, Charles Bradley, Fredrich August Haselwander, Michael Dolivo-Dobrovolsky, Charles L. Brown created a polyphase AC system that opened the door wide to global electrification.
1891, the first demonstration of long-distance transmission of electricity via a three-phase system between Lauffen and Frankfurt, Germany
1900-1920, plenty of innovations in insulation, suspension insulators (1907), ACSR (Al/Fe) conductors (1907), electric generators (bar windings invented by Ludwig Roebel, 1912), beginning of standardization (terminology, rotating machines, graphical symbols , overhead conductors, etc.), the need for international cooperation in the development of technology opened the door to a permanent international conference for the exchange of knowledge and experience in the field of energy.
In 1921, CIGRE was founded in Paris, France

History of CIGRE

Figure 1.3 Delegates of the First CIGRE Conference, Paris, 1921

ICE - The International Electrotechnical Commission was responsible for the standardization of equipment, the nomenclature of electrical quantities and units, as well as the definitions of terms. Her work required research support from international experts. Conferences were a possible solution. The Union of Syndicates of Electricity (Union des Syndicats de l'Electricité USE) from Paris offered its staff and premises so that the idea of establishing an International Conference was close to being realized. USE represented French electrical experts. Thus, in 1921, the CIGRE International Organization was founded (the acronym CIGRE was derived from the French *Conférence Internationale des Grands Réseaux Électriques*) as a result of the need for international cooperation of experts who would solve common problems in creating an increasingly interconnected electrical system.

In the period after the First World War, Europe was quite devastated and in need for rapid reconstruction. In addition, in 1920, a great drought hit Europe. Large investments in new infrastructure are linked to the start of electrification. There were ideas about connecting small isolated electrical systems of that time and mutual support of hydro and thermo systems, especially between Switzerland, France and Italy. Discussions began about interconnected electrical networks, which required new equipment standards. At the same time the international equipment market was opening and this was an opportunity to convene an International Conference. On March 21, 1921, in Paris, the Secretary General of the French Association of Electrotechnical Professions, Jean Tribot Laspiere, concluded an agreement with IEC President Dr. Cyprien O'Dillon Mailloux and IEC Secretary General Charles Delacour Le Maistre, with the aim of convening an international conference for large electrical systems.

According to the recommendation of the IEC, the conference was supposed to deal with high voltage transmission issues and to have a scientific and technical character. At that time, the highest voltage in the world was 120 kV, while the 220 kV voltage was only used experimentally. After a six-month period of preparation, the first conference was convened and held in Paris from November 21 to 26, 1921. The first conference was attended by 231 delegates from 12 countries. The losing countries of the First World War were not invited and were not allowed to participate in the conference. The Frenchman René Legouez was elected as the first president of CIGRE, who remained in that position until 1928. At the first conference, 64 reports were submitted and discussed in 3 sections. No permanent organizational form was adopted at the First Conference. The establishment of CIGRE must be considered in the context of the search for new economic and technological directions on a wider international basis. The difference between CIGRE and IEC was still in the fact that CIGRE presents individual opinions on a specific technical issue, while IEC implements nationally agreed positions. This gives CIGRE participants the necessary freedom of opinion in professional debates, and adds value to the results of discussions on certain issues.

The second session of CIGRE was held in 1923 in Paris. Three important decisions were made:

- that conferences are convened every 2 years,
- that a National Committee will be established in each country and
- that the Study Committee *Rational Use of Energy* will be established.

From this CIGRE Study Committee for the rational use of energy, the World Energy Conference was born, which was founded in 1924 in London by Daniel Nicol Dunlop, and today is known as the World Energy Council (WEC). The second session was attended by 375 delegates from 19 countries.

The third session of CIGRE, attended by 530 delegates from 27 countries, was held in Paris in 1925, and then an important decision was made to establish the second Study Committee *Statistics*, *Production*, *Transmission*. This

Study Committee functioned for a very short time and in 1925, the association UNIPEDE was born from it, with headquarters in Paris.

UNIPEDE is the International Union of Electricity Producers and Distributors. The acronym UNIPEDE is derived from the French "Union Internationale des Producteurs Et Distributors d'Energie electrique." During 1999, the UNIPEDE organization was merged with EUROELECTRIC (European Grouping of the Electricity Supply Industry).

The next, fourth session of CIGRE was held in 1927 and was particularly important in the history of CIGRE because decisions were made on the establishment of several study committees (SC) that will represent the focus of the activities:

SC1 – *Insulating oils and materials*,
SC2 – *HV cables*,
SC3 – *Interrupters (later named Circuit breakers)*
SCx – *Reactive power compensation* and
SCxx – *Parallel operation*.

The last two study committees were without numbers. In 1928, Marcel Urlich from France was elected the second president of CIGRE. The next, fifth session of CIGRE was held in 1929.

The sixth session was held in 1931 and is very important in CIGRE history because the first CIGRE Statute was adopted, and CIGRE was registered as a non-governmental organization in accordance with French law. The first Statute defined CIGRE as a permanent international organization called the Conférence Internationale des Grands Réseaux Électriques, with headquarters in Paris. In the Statute, the field of activity was defined as a two-year conference activity under the auspices of the IEC. International cooperation between the conferences is shown in the following areas:

- construction and operation of power plants and substations,
- design, construction, insulation and operation of transmission lines,
- operation, protection and integration of power systems.

In addition, the basis for the formation of CIGRE national committees was defined. It can be said that the main framework of CIGRE as an independent organization was established in 1931.

In 1931, the Study Committee SK6 for overhead lines was founded. In 1933, the Frenchman Ernest Mercier, a very talented engineer and builder of

Figure 1.4 Sixth session of CIGRE, Paris, 1931

numerous power facilities, innovator and main protagonist in the framework of the World Energy Conference (WEC) and the World Trade Organization (WTO), became the president of CIGRE. He gave new momentum to the Organization in this crucial period. His presidential term was the longest so far and lasted 15 years. The tenth session was held in 1939, just 3 months before the start of World War II. By 1939, the CIGRE organization had consolidated its position as the leading technical organization for the field of electricity supply - ESI (Electrical Supply Industry).

The first three national committees (Great Britain, the Netherlands and Italy) were founded in 1923. After the establishment of the independent organization, 9 national committees were formed: Belgium, France, Denmark, Japan, USA, Norway, Spain, Sweden, and Switzerland. In 1932, the National Committee of Germany was founded, which attended the session for the first time in 1933. He was admitted to CIGRE membership in 1935, but was expelled in 1939, only to be accepted again in 1952. Today, the National Committee of Germany is one of the most active committees.

The participation of delegates and the number of reports at the first ten sessions of CIGRE is given in Table 1.4.

Table 1.4 The participation of delegates and the number of reports at the first ten sessions

Session	Year	No. of countries	No. of delegates	No. of reports
1.	1921.	12	231	64
2.	1923.	19	375	49
3.	1925.	27	530	99
4.	1927.	28	545	77
5.	1929.	29	703	75
6.	1931.	36	731	100
7.	1933.	31	751	131
8.	1935.	46	834	176
9.	1937.	41	870	119
10.	1939.	41	814	116

After World War II, CIGRE organized the eleventh session in Paris in June 1946, which was attended by 877 delegates from 30 countries. Europe was in ruins, so all the levers of the profession had to be quickly activated in order to establish a new era of electrification. The twelfth session in Paris in 1948 was attended by 1144 delegates from 40 countries. For the first time, over 1,000 CIGRE delegates attended the session. Then, for the first time in history, a 400 kV cable was presented, which was put into operation in Sweden in 1952. Generally, the development of overhead line voltage grew similarly to interconnecting networks. The nominal voltage of 400 kV was designed in the 1930s as the basic voltage of the pan-European network, but was realized only in the 1950s. At that time, a number of new study committees were formed: for pillars and foundations; for alternating transmission with very high voltages; for DC transmission with very high voltages; for telephone and radio disturbances; for stability and frequency regulation. From the names of the new study committees, it is evident that the electric power system began to expand, and new problems began to arise that required solutions. Due to the great interest of experts who wanted to participate in international study committees, the number was limited to 12 members. Today this number is limited to 30 members. It is interesting

Figure 1.5 Eleventh session of CIGRE, Paris, 1946

Figure 1.6 Jean Tribot-Laspière, founder of CIGRE, Secretary General (1921–1963)

that the membership fee at that time depended on the production of electricity in the member state. The payment method was later changed. Thus, in the period of 10 years after the Second World War, the number of participating countries reached 50, and the number of delegates exceeded 1,500 (Table 1.5).

Table 1.5 Participation of delegates from 1946 to 1954

Session	Year	No. of countries	No. of delegates
11.	1946.	30	877
12.	1948.	40	1144
13.	1950.	42	1252
14.	1952.	45	1351
15.	1954.	50	1525

Electra journal was first published in 1931. This version of the journal was used for study committee minutes and other administrative information. During the second organizational reform, in 1967, the journal *Electra* was completely changed with a new design and since then the new *Electra* started with issue number 1.

The general secretary or, at that time, the general delegate from its foundation until 1963 was Jean Tribot Laspiere. He was posthumously declared the founder of CIGRE. Jean Tribot Laspiere was the organizer of all CIGRE events from 1921 to 1963.

After him, the role of general secretary was taken over by Francois Cahen, who at that critical moment implemented extremely successful reforms of the organization. At the same time, this was the period of the fastest growth of power systems in Europe. Thus, in 1966, a new structure of study committees began to work, which lasted until 2002 (Table 1.6).

Figure 1.8 Yves Porcheron, Secretary General (1991–1995)

At the 34th session in 1992, discussions were started for the first time on methods of continuous monitoring and diagnostics for evaluating the condition of equipment in order to plan the replacement of the devices, the extension of the life span or the improvement of the reliability of the devices. At the 34th session, the delegation of BH K CIGRE participated for the first time, and was welcomed by the then General Secretary Mr. Yves Porcheron, who facilitated the presentation of the electricity situation in Bosnia and Herzegovina at the session of the General Assembly of CIGRE, which resulted in the admission of BH K CIGRE into full membership of CIGRE Paris already at the next session of the Administrative Council, which was held in Paris in 1993.

The notice of recognition is given in Figure 1.10.

Table 1.6 Study committees structure in the period 1966-2002

Study committee number	Study committee name
11	Rotating machines
12	Transformers
13	Switching equipment
14	HVDC links and AC power electronic equipment
15	Materials for electrotechnology
21	High voltage insulated cables
23	Substations
31	System planning
32	System stability
33	Power systems insulation coordination
34	Power systems protection and local control
35	Power systems communications and telecontrol
36	Power systems electromagnetic compatibility

* Study committee SC 12 – Transformers, was established in 1948 and lasted continuously until 2002.

** Study committees SC 31 and SC 32 were changed in 1982 into three new committees: SC 37 – Power systems planning and development; SC 38 – Power systems analysis and techniques ; SC 39 –Power system operation and control.

The increase in interest in CIGRE activities is probably the result of the new reform implemented in the period from 1998 to 2002. Thus, countries

Figure 1.7 Twenty-first session of CIGRE, Paris, 1966

Figure 1.9 Michel Chamia, President of CIGRE (1996–2000)

such as Brazil, China and India became among the largest in terms of the number of equivalent members. Michel Chamia, president of CIGRE in the period from 1996 to 2000, initiated the creation of the Masterplan for the development of the organization, revised the Statute and prepared CIGRE for the 21st century. The latest structure of groups and study committees, established since 2002, with an update from 2018, is given in Table 1.7.

Table 1.7 The current structure of study committees established in 2002, with the 2018 upgrade

Study committee number	Study committee name
Group: Equipment	
A1	Rotating electrical machines
A2	Power transformers and reactors
A3	Transmission and distribution equipment
Group: Technologies	
B1	Insulated cables
B2	Overhead lines
B3	Substations and electrical installations
B4	DC systems and power electronics
B5	Protection and automation
Group: Systems	
C1	Power system development and economics
C2	Power system operation and control
C3	Power system environmental performance
C4	Power system technical performance
C5	Electricity markets and regulation
C6	Active distribution systems and distributed energy resources
Group: New materials and IT	
D1	Materials and emerging test techniques
D2	Information systems and telecommunication

CONFÉRENCE INTERNATIONALE DES GRANDS RÉSEAUX ELECTRIQUES À HAUTE TENSION
INTERNATIONAL CONFERENCE ON LARGE HIGH VOLTAGE ELECTRIC SYSTEMS

Le Secrétaire Général
The Secretary General

11th April, 1994

<u>Subject:</u> Recognition of the National Committee of Bosnia-Herzegovina
Consultation by correspondence

Dear Sir,

In answer to our circular letter of 15th February 1994 concerning recognition of the National Committee of Bosnia-Herzegovina, we wish to inform you that the majority of Administrative Council members voted in favour of this recognition. We received no negative answers.

Consequently, we are pleased to inform you that the National Committee of Bosnia-Herzegovina is thus officially recognised.

I remain,

Yours sincerely,

Y. PORCHERON

<u>Addressees:</u> Members of the Administrative Council

Figure 1.10 Notice of admission of the National Committee of Bosnia and Herzegovina to CIGRE

Management of CIGRE

During the last 100 years, CIGRE's work has contributed to many key technical foundations of the modern power system. CIGRE's renowned publications, developed through the joint exchange of experiences from the real world, are in many cases an authoritative source of reference information. When experts in the power sector are looking for unbiased, fact-based answers, they turn to CIGRE, as the world's premier source for power system analysis. CIGRE promotes the development of skills and knowledge through: alignment with the most relevant and current topics in the field of power engineering; publication of technical reports prepared by working groups (brochures and articles in Electra) and preparation and organization of technical events such as sessions in Paris, conferences, symposia, colloquia, tutorials and workshops. CIGRE represents a global forum for the development and open exchange of knowledge and information that is technically relevant and practically applicable for future power systems.

In the history of CIGRE, certain turning points can be recognized - turning points when the organization implemented key organizational changes or improvements. We distinguish 6 periods:

- 1921, establishment and organization of the First Conference when the acronym CIGRE was given;
- 1931-1932, CIGRE was established as an independent international organization;
- 1946–1950, after the Second World War, the period of intensive electrification and connection of the power system began;
- 1963–1970, the period after the death of CIGRE founder Jean Tribot-Laspière;
- 1998–2002, reorganization of CIGRE and new structure of study committees for the 21st century;
- 2015–2018, CIGRE's opening to the entire power sector as a reaction to global changes in the energy sector that are moving in the direction of decarbonization and clean energy for all.

In the hundred-year history of CIGRE, its administrative bodies were certainly very important, but especially presidents and general secretaries. Tables 1.8 and 1.9 present the presidents and general secretaries of CIGRE chronologically, and below are photos of some of them.

Many presidents of CIGRE will be remembered as persons with excellent professional and organizational skills who have shown personal responsibility for the global development of the electric power sector. However, general secretaries, as heads of professional staff, have always been key persons who thought about everything in the organization, and we should thank them for the quality, continuous work and exceptional progress of CIGRE in the previous 100 years.

Table 1.8 Presidents of CIGRE from 1921

Presidents of CIGRE from 1921		
Period	**Name and Surname**	**Country**
1921–1928.	Rene Legouez	France
1928–1933.	Marcel Urlich	France
1933–1948.	Ernest Mercier	France
1948–1957.	M. Schmidt	Switzerland
1957–1966.	G. Silva	Italy
1966–1972.	A. R. Cooper	Great Britain
1972–1978.	G. Jancke	Sweden
1978–1984.	R. Guck	Germany
1984–1990.	W. S. White Jr.	USA
1990–1996.	Jerzy Z. L. Lepecki	Brazil
1996–2000.	Michael Chamia	Sweden
2000–2004.	David G. Croft	Australia
2004–2008.	Yves Filion	Canada
2008–2012.	Andre Merlin	France
2012–2016.	Klaus Fröhlich	Switzerland
2016–2020.	Rob Stephen	South Africa
2020–	Michel Augonnet	France

Table 1.9 Vice-Presidents and Council Delegates (as they were called from 1921 to 1970), renamed to general secretaries since 1970

General secretaries of Paris CIGRE from 1921		
Period	Name and Surname	Country
1921–1963	Jean Tribot-Laspière	France
1963–1970	Francois Cahen	France
1970–1976	M. Rene Pelissier	France
1976–1991	Gerard Leroy	France
1991–1995	Yves Porcheron	France
1995–1998	Yves Thomas	France
1998–2000	Marc Herouard	France
2001–2010	Jean Kowal	France
2010–2014	Francois Meslier	France
2014–	Philippe Adam	France

Figure 1.11 Marcel Urlich, president of CIGRE (1927–1933)

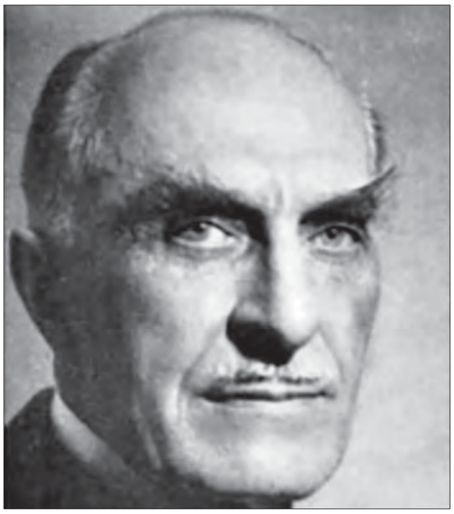


Figure 1.12 Ernest Mercier, president of CIGRE (1933–1948)

Figure 1.13 M. Schmidt, president of CIGRE (1948–1957)

Figure 1.14 G. Silva, president of CIGRE (1957–1966)

Figure 1.15 Presidents of CIGRE from 1966 to 1990: A. R. Cooper (1966–1972), W. S. White (1984– 1990), R. Guck (1978–1984), G. Jancke (1972–1978)

Figure 1.16 Jerzy Lepecki, president of CIGRE (1990–1996)

Figure 1.17 Jean Tribot-Laspière, founder and general secretary of CIGRE (1921–1963

Figure 1.18 Presidents of CIGRE from 2000 to 2012: D. Croft (2000-2004), Y. Filion (2004-2008), A. Merlin (2008-2012)


Figure 1.19 CIGRE Presidents from 2012 to 2020: Klaus Fröhlich (2012–2016) and Rob Stephen (2016–2020)


Figure 1.20 Current CIGRE President Michel Augonnet (2020–) and General Secretary Philippe Adam (2014–)

Organizational structure of CIGRE

Figure 1.21 Opening ceremony, 47th session of CIGRE, Paris, 2018

For more than 100 years, CIGRE has been the leading global community for large electrical systems. Many other energy communities were formed from CIGRE, such as: WEC, EURELECTRIC and CIRED. CIGRE gathers power engineers and other experts working in the power sector, where the latest technological achievements, experiences and knowledge are exchanged, with the active participation of the most famous manufacturers of electrical equipment. The challenges facing CIGRE are related to: renewable energy sources, increasing environmental requirements, restrictions on the construction of new transmission facilities, network architecture, maintenance of existing power systems, large power transmission over long distances, cyber security, intermittent production from renewable energy sources and energy transition. The knowledge exchange offered by CIGRE includes a wide range of local and international events culminating every two years in the Paris Session in France – the single leading congress and number one event in the global electricity sector. The result of all this is the knowledge needed by professionals, as well as power system solutions in the global framework. This is achieved through a number of bodies within the organization.

The main governing bodies of CIGRE are: General Assembly, Administrative Council, Steering Committee, Technical Council, Study Committees and National Committees. Central office – Secretariat, with administrative staff, is led by the general secretary. The governing bodies of CIGRE Paris are linked in a hierarchical structure, which enables CIGRE to operate efficiently and with high quality (Figure 1.22).

- The General Assembly consists of all individual representatives and representatives of collective members. The General Assembly: considers and approves financial reports, approves the composition of the members of the Administrative Council, approves changes to the Statute and makes other acts and decisions.
- The Administrative Council consists of representatives of all recognized national committees approved by the General Assembly and the CIGRE President. The non-voting members of the Administrative Council are: the president of the Technical committee, the head of the Treasury, former presidents of CIGRE, the president of IEC and the general secretary.
- The Steering committee consists of representatives of the countries with the largest number of members, the chairman of the Technical committee and the head of the Treasury. General secretary and representatives of the Women in Energy Forum and Next Generation Network are non-voting members.
- The Technical committee represents the highest technical management body of the Organization. The Technical committee consists of the presidents of the study committees and two representatives of the Steering committee.
- Central Office - The Secretariat consists of general administrative staff who take care of daily processes (manages finances in accordance with the approved budget; prepares plans and budgets; liaises with national committees; organizes sessions and conferences; collects and distributes reports for proceedings; assists in activities of study committees; preparing meetings of the Technical Council, the Steering committee, the Administrative Council and the General Assembly).

CIGRE regional councils are a novelty in the organization of CIGRE and are designed for the purpose of improving the exchange of knowledge and technical cooperation of experts from the same region who face similar challenges in power systems. The organization of CIGRE regional councils has no influence on CIGRE's management structure nor does it introduce any hierarchical relationship to national or study committees.

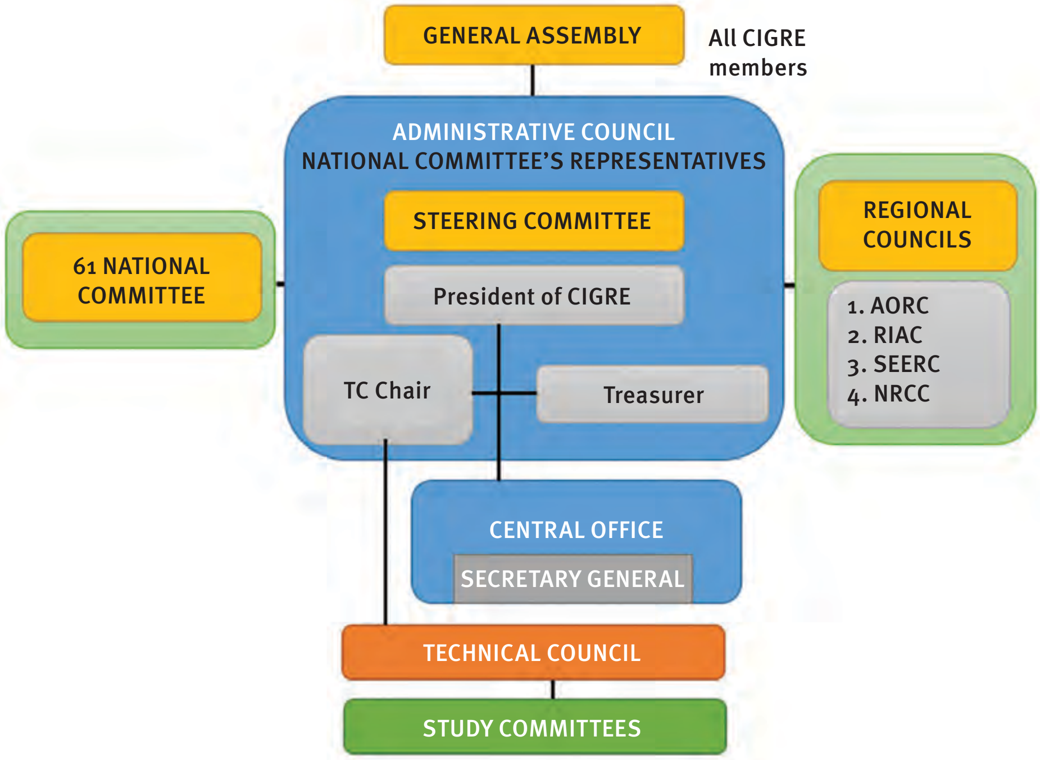


Figure 1.22 Current organizational structure of CIGRE

Figure 1.23 Participants of the Administrative Council meeting, 47th session, Paris, 2018.

The following CIGRE regional councils have been formed so far (Figure 1.24):

AORC (Asia-Oceania Regional Council of CIGRE) – Regional Council CIGRE for Asia and Oceania was formed in 2000 and consists of 12 national CIGRE committees and three observer members;

NRCC (Nordic Regional Council of CIGRE) – Regional Nordic the council was formed in 2001;

RIAC (Regional Ibero-American of CIGRE) – Regional Ibero-American Council was formed in 2006;

SEERC (South-East European Region of CIGRE) – Regional Council of Southeast Europe was formed in 2013.

Figure 1.24 Regional councils of CIGRE

Figure 1.25 Participants of the SEERC Steering committee and Technical advisory committee

2

Electrification of Bosnia and Herzegovina

The electrification of Bosnia and Herzegovina began in the late 80s of the 19th. Along with electric lighting, on May 1, 1895, the first electric tram began to circulate in Sarajevo, which replaced the previous horse-drawn tram, which had been in operation for 10 years. The electrification of Bosnia and Herzegovina had several distinct periods: the period of initial or local electrification; the period of electrification between the two world wars or the period of regional electrification; period of general electrification and capital construction; the period of war devastation and post-war reconstruction and construction, and the period of energy transition, which is one of the biggest challenges of today.

Beginning of electrification (1888–1918)

The first power plant in Bosnia and Herzegovina was built at Zenica coal mine in 1888, and the first public power station in Sarajevo in 1895. Then followed the construction of HPP Delibašino selo near Banja Luka in 1899 (with expansion in 1910), HPP Carbide factory near Jajce 1899, HPP Travnik in 1904, TPP Kreka coal mine in 1906, TPP Brčko in 1908, HPP Una in Bihać 1911, TPP Mostar in 1912, HPP Bileća in 1912, TPP Prijedor in 1917, HPP Hrid near Sarajevo in 1917 and others. All of them were not interconnected electrical power stations, of small installed capacity, short supply range and of local importance.

Along with the construction of electrical power stations, in the surrounding areas, networks for the distribution of electricity to consumers were built. In this period of local electrification, there was no network for the transmission of electricity over longer distances. In this period, the voltage level of distribution networks ranged from 3 to 5 kV, and in the local distribution networks from 100 to 220 V.

The voltage level of electrical networks was mainly adapted to the generator voltage of electrical power stations. The lines were built on wooden poles, with copper conductors and modest protective and metering equipment, with

Figure 2.1 Horse-drawn tram from 1885, manufactured in Vienna

Figure 2.2 Sarajevo's first electric trams

the rare installation of transformer stations. The carriers of the construction of electrical power stations and networks were city municipalities, commercial companies, foreign and domestic concessionaires.

In all areas where power stations were built, electric lighting developed and spread rapidly. Due to economic underdevelopment and low level of technical equipment, the consumption of electricity in electric drives and technological processes developed much more slowly. The largest consumers of electricity at the time of local electrification in Bosnia and Herzegovina were: public lighting in cities, coal mines, carbide producers, sawmills, mills, breweries and tobacconists, larger craft and trade shops and public institutes. Considering that the use - consumption of electricity was dominantly for lighting, power stations worked more intensively at night. They mostly had a low level of capacity utilization and high production costs. The staff of public power stations, in addition to production work and maintaining the operational readiness of power plants and electrical networks, sold electricity, light bulbs, electrical devices and appliances, and electrical materials. The development of local electrification in Bosnia and Herzegovina was slowed down by the Balkan wars, and then by the First World War, during which major damage was done to


Figure 2.3 Electric power station in Sarajevo, 1895

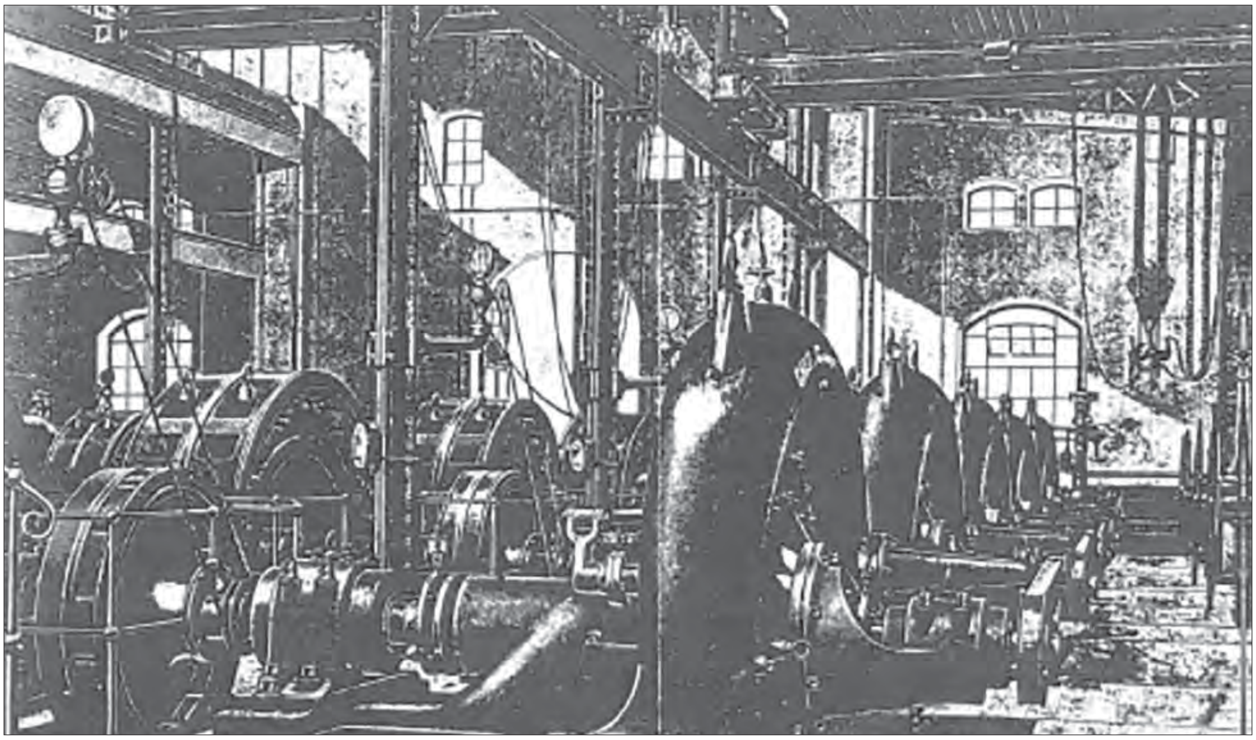


Figure 2.4 HPP Jajce Carbide Factory (1899–1957)

Figure 2.5 HPP Delibašino selo near Banja Luka, 1899

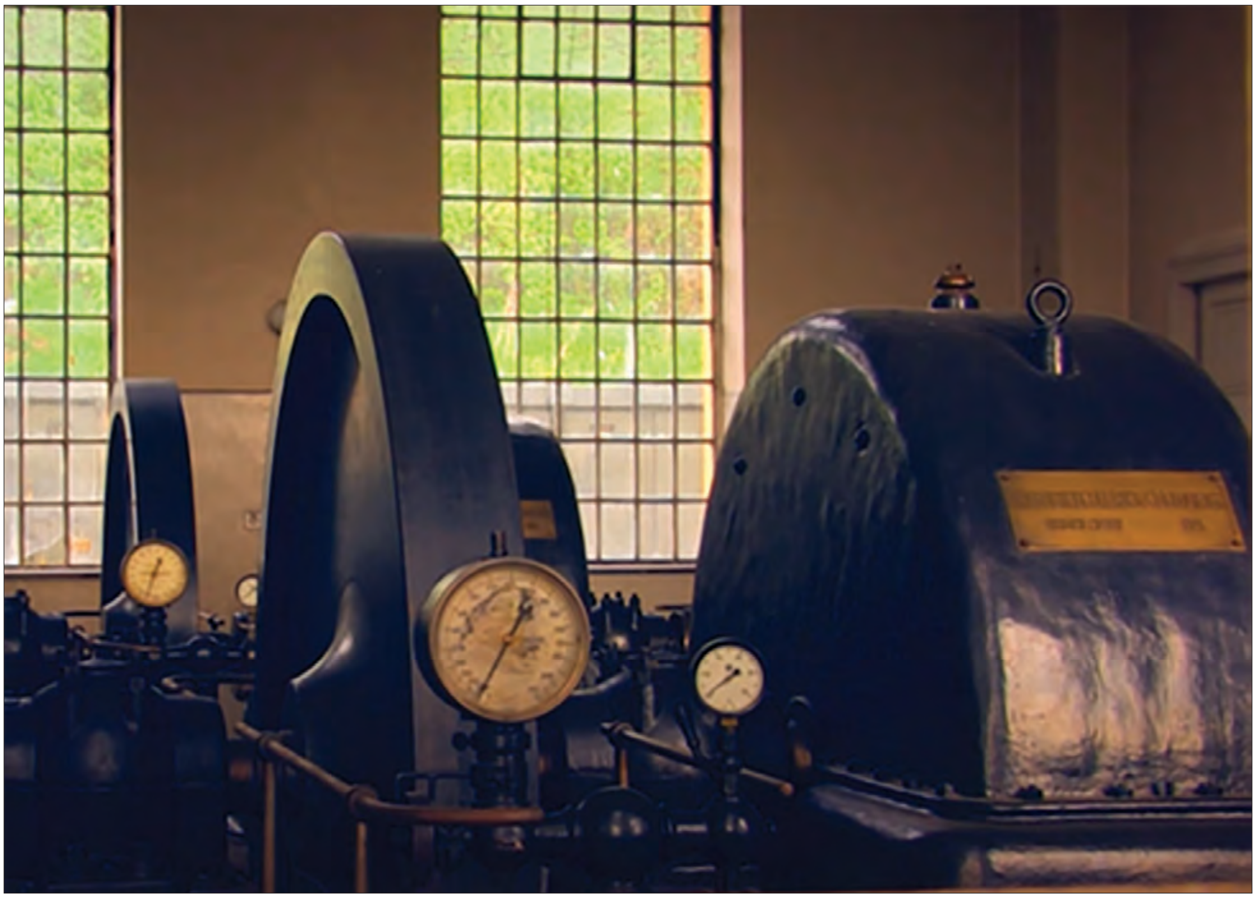


Figure 2.6 HPP Hrid, Sarajevo, 1917

electrical power stations and electrical networks. At the end of the First World War, there were 5 hydroelectric and 44 small thermal power plants in operation in Bosnia and Herzegovina, with a total installed capacity of 22 MW. Only 1.1% of the settlement was electrified.

Regional electrification (1919–1945)

The dynamic flow of electrification in European countries and the growing need for electricity at the end of the First World War, gave new impulses to the electrification of Bosnia and Herzegovina. Initiatives were being launched to enact a law on electrification, adopt unique technical regulations on the construction, maintenance and protection of electrical installations, connection and better use of electrical power stations. Requests are being made for the granting of concessions for the use of water heads on the rivers Neretva near Jablanica (31,000 hp), Rama near Prozor (30,000 hp), Vrbas near Jajce and Banja Luka, Željeznica near Sarajevo, and for the construction of thermal power plants at coal mines. These professional initiatives were being realized slowly due to the general lack of money, the inertness of the state administration, the disunity of the interests of the owners of electrical power plants and the lack of professional staff - especially the electrical engineering profession. Thus, after the reconstruction of the more important electrical power stations and networks destroyed in the war, the process of spontaneous electrification of settlements and companies continued. Review of the progress of construction of electrical power stations in Bosnia and Herzegovina from 1920 to 1945 is given in Table 2.1.

Table 2.1 Construction of power stations in Bosnia and Herzegovina from 1920 to 1945

Year	Total		Hydroelectric		Thermal	
	Number	Power (MW)	Number	Power (MW)	Number	Power (MW)
1920.	49	32,1	5	10,2	44	21,9
1930.	71	44,3	7	10,3	64	34,0
1939.	90	69,3	16	10,7	74	58,6
1945.	48	48,7	13	7,1	35	41,6

Significant capacity expansions were carried out in TPP Sarajevo, HPP Elektrobosna Jajce and TPP Kreka. Thermal power plant in Zenica with an installed capacity of 21.3 MW and HPP Elektrobosna Jajce with 8.1 MW were among the largest power plants in southern Europe. Along with the construction of new, larger power plants, numerous small, technically outdated and unprofitable power plants stopped operating. During the Second World War, due to the destruction, 42 power plants stopped working. Thus, at the end of 1945, there were 48 electric power plants in operation in Bosnia and Herzegovina (13 HPP and 35 TPP), with a total installed capacity of 48.7 MW.

Public power plants were located near large cities, and business power plants were located in coal mines, wood, chemical and mill industries. Coal, river hydro potential, diesel fuel, wood and wood waste were used in the production of electricity. The construction of new and expansion of existing power plants was based on the installation of technically diverse and expensive imported equipment. This caused differences in the production of electricity: direct and alternating current and very different voltages and frequencies. All this made it difficult to interconnect and synchronize the use of electrical power plants.

The growth in the electricity needs and the expansion and connection of electrification zones around the built electrical power stations required more intensive construction and better quality of the transmission and distribution networks at the time. Thus, at the beginning of the 20s, the construction of the 10 kV voltage network began. The first transmission lines of this network were being built on the stretches Sarajevo - Ilidža and Kreka - Tuzla. In 1927, the construction of the first 30 kV transmission line Mostar - Metković began, and in 1929 the construction of the first 35 kV transmission line Kreka - Tuzla - Salt works Simin Han.

Technical and financial difficulties affected the continuation of the construction of various electrical networks both in terms of technical structure and voltage levels. Transmission networks were built at voltage levels of 35 kV, 30 kV, 10 kV, 6 kV, 5 kV, 3 kV, and the electricity distribution network at voltages from 100 V to 400 V, with a tendency to adopt 400 V (0,4 kV) voltage as the standard voltage of this network. An increase in the unit power of generators in power plants, a higher voltage level of transmission and distribution lines, and changes in the structure of electricity consumption have influenced the more intensive construction of distribution facilities in power plants and transformer stations in centres of electricity consumption. In Bosnia and Herzegovina, in the period from 1930 to 1940, there was a more intensive construction of 35 kV and 30 kV transmission lines and transformer stations.

The transmission lines of these voltage levels were built on steel and wooden poles with the installation of copper conductors with a section of 35, 50, 75 and 95 mm2. Total length of 30 kV and 35 kV transmission lines built in Bosnia and Herzegovina before the Second World War, was around 305 km. Only 110 km of these transmission lines worked under voltage of 30 and 35 kV, and 195 km were used under 10 kV voltage.

By the construction of transmission lines and transformer stations of 35 kV, 30 kV and 10 kV voltages in Bosnia and Herzegovina at the end of the 1930s, significant zones of regional electrification were formed. Regional electrification zones around Sarajevo and Zenica in central Bosnia, around Banja Luka, Prijedor and Bihać in the Bosnian Krajina, around Tuzla, Doboj, Brčko and Bijeljina in the area of north-eastern Bosnia and around Mostar and Trebinje in Herzegovina. The spatial distribution of regional electrification zones in Bosnia and Herzegovina before the Second World War is clearly illustrated by the graphic representation in Figure 2.8.

Figure 2.7 Transmission line 35 kV Banja Luka 1 – Petrićevac

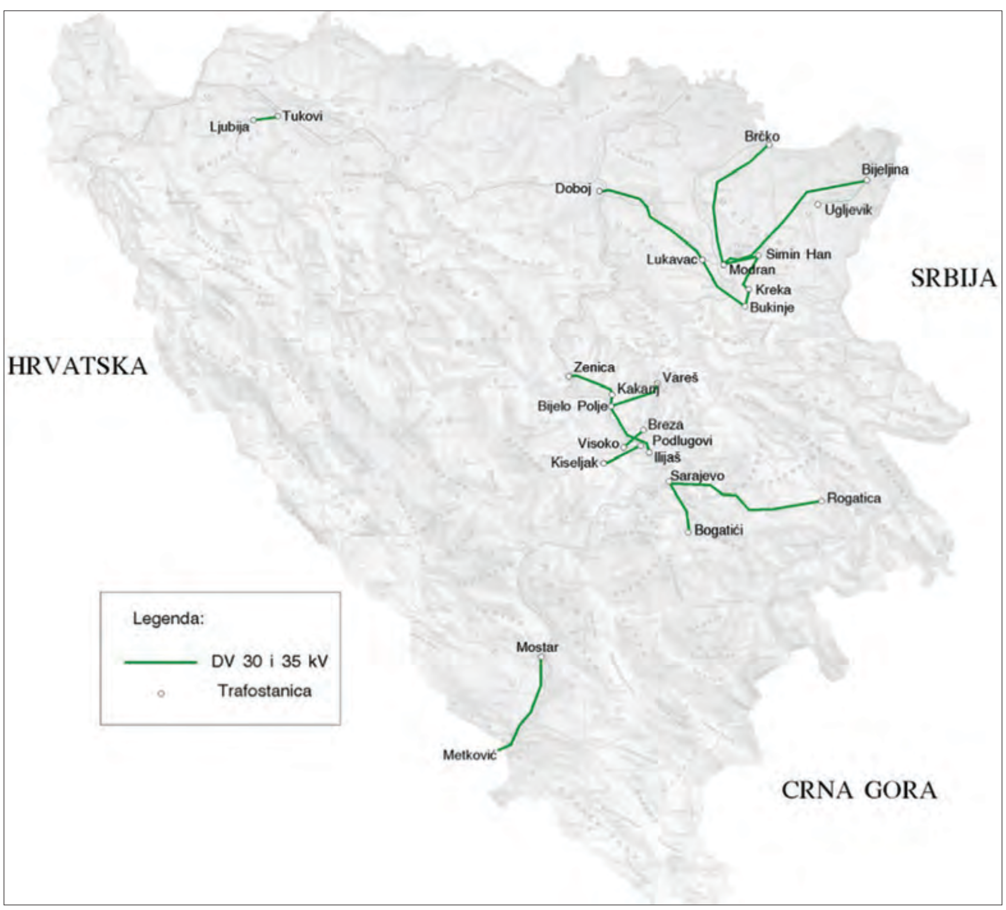


Figure 2.8 Transmission network 30 and 35 kV built by 1940

Figure 2.9 Switching of gas lamps for electric lights, Konjic, 1936

In addition to all that, the process of electrification in Bosnia and Herzegovina between the two world wars was slow and spontaneous. In 1940, only 6.2% of settlements were electrified. The process of electrification remained in parts of the cities and industrial zones with individual "penetrations" into suburban settlements and did not include the villages. The expansion of regional electrification in Bosnia and Herzegovina between the two world wars was slowed down by the unsettled economic and political conditions, the absence of a unified energy policy and legal regulations, the diverse technical equipment of power stations and networks, and the disjointed interests of the owners of power stations and networks. Currency instability and high state taxes and excises had a disincentive effect on the investment of foreign and domestic capital in the construction of electrical power stations and electrical networks.

During the Second World War, the power plants and electrical grids in Bosnia and Herzegovina were badly damaged and destroyed. Of the 90 power plants built by 1939, after the end of the war, electricity could only be partially produced in 48 power plants. The electrical grid was torn out and damaged in all electrified areas. Thus, at the end of 1945, there were 48 electrical power plants in Bosnia and Herzegovina with a total installed power of 48.7 MW, 305 km of 30 and 35 kV transmission networks and about 700km of distribution networks. In 1945, total electricity production was 62 GWh and electricity consumption was 55 GWh. The specific consumption of electricity per capita was only 23 kWh. In total, around 16.2% of the settlements were electrified.

General Electrification and Capital Construction (1946–1991)

In the period from 1946 to 1990, the production and consumption of electricity in Bosnia and Herzegovina developed intensively. The increase in industrial consumption is particularly evident, and despite this, Bosnia and Herzegovina had a surplus in electricity production for most of this period. Along with the growth of production, the transmission network on the territory of Bosnia and Herzegovina at the voltage levels of 110, 220 and 400 kV was developed with interconnections to the neighbouring systems of Serbia, Croatia and Montenegro, and together with the system of SFRY, interconnection with the member countries of the European electric power system was realized.

The strategic decisions at the beginning of this period of electrification are:

- Electrification is carried out in a planned and integral manner throughout the country;
- Development in the production of electricity is based on domestic energy sources, primarily through the construction of hydroelectric power plants and the use of state-of-the-art technology;
- Thermal power plants are built on coal that cannot withstand long transport;
- For consumers who use large quantities of heat and electricity, power plants for combined heat and power generation are built and used;
- The development of the transmission network is based on the construction and use of transmission lines and substations on 110 kV and higher voltages, and only exceptionally on 35 kV voltage;
- Facilities and installations of the distribution network are used and built on voltages of 35, 10 and 0.4 kV;
- In the processes of production, transmission and distribution of electricity, dispatch management is introduced for better load distribution and capacity utilization of power plants and electrical networks;
- The most modern technical achievements are applied in the construction of the power base.

Such an orientation called for rapid work on the formation of schools and faculties for the education of the necessary electrical industry staff, the creation of institutions for studies, projects and other preparatory work, the orientation of the domestic industry to conquer the production of electrical power equipment and materials, and the rapid formation of the necessary construction operative and operative for installation work in the construction of power plants and electrical networks. At the time of the accession to general electrification, Bosnia and Herzegovina belonged to the territories of the Federal Republic of Yugoslavia with the lowest level of development of electric power capacities and electrification of settlements and households, and with the distinct consequences of the war's destruction of the modest power base. On the other hand, very significant hydropower potentials and deposits of lignite and black coal are concentrated in its area. These all were the circumstances that led to the intensive electrification of Bosnia and Herzegovina after the Second

World War. The most intensive construction of power plants in Bosnia and Herzegovina took place from 1950 to 1960, when the following power plants were commissioned: HPP Jablanica, HPP Jajce I and HPP Jajce II, first and second stages of TPP Kakanj, HPP Mesići, HPP Slapovi na Uni, TPP Banovići, expansion of TPP Zenica and construction of eight industrial power plants (Prijedor, Blažuj, Lukavac, Bosanski Brod, Maglaj, Foča, Banja Luka).

Figure 2.10 HPP Mesići, 1950/51

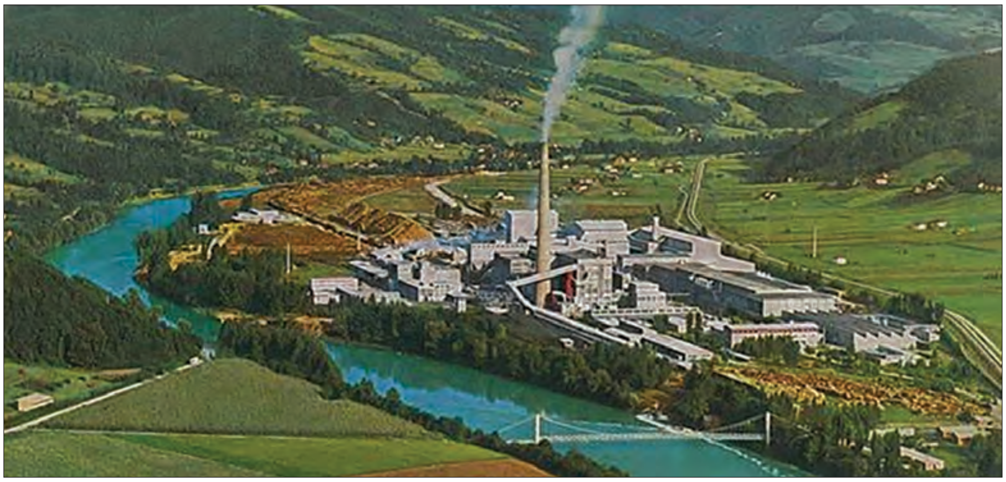


Figure 2.11 TPP – Natron paper mill, Maglaj, 1955

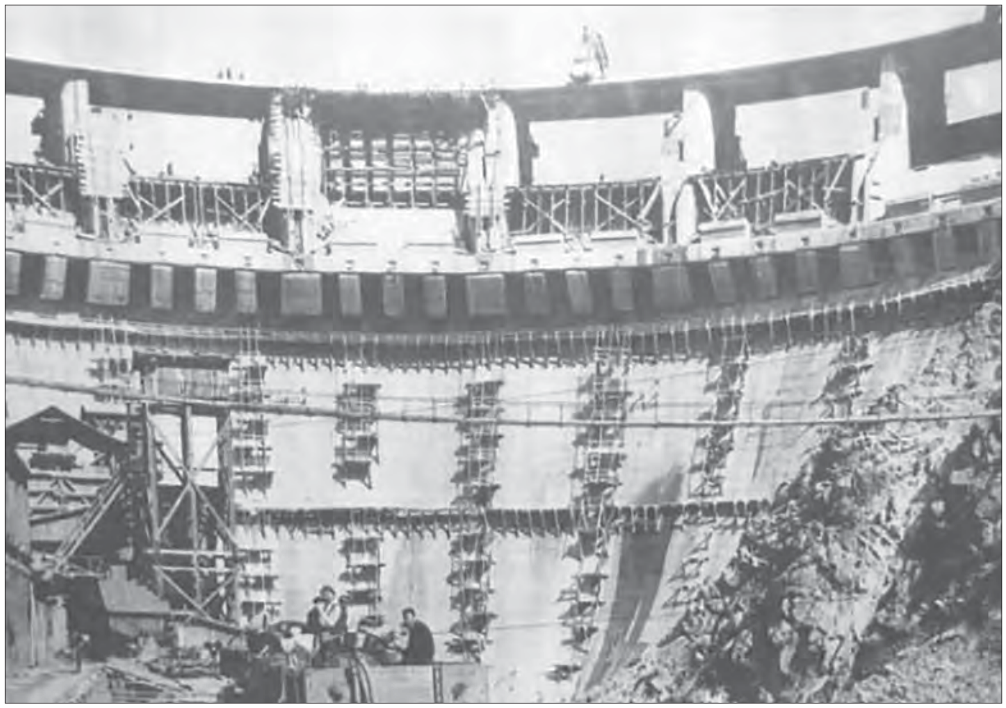


Figure 2.12 Construction of HPP Jablanica, 1954

Figure 2.13 HPP Jablanica, 1955/58

All public power plants were built and equipped as generating units of a singular power system. They were all interconnected by a transmission network and prepared for unified dispatch management. All industrial power plants were connected to the public power grid. Thus, they fed the surplus electricity produced into the electric power system of Bosnia and Herzegovina, and compensated for the shortfalls of their own production by taking electricity from the system.

Spatial distribution of power plants and consumption centres in Bosnia and Herzegovina was not balanced. The location of the power plants was determined by the natural distribution of hydropower potentials and coal reserves. On the other hand, industrial and other electricity consumption is concentrated in cities and larger settlements. This required increased investments in the development of the electricity transmission and distribution network and design of a reliable electric power system in Bosnia and Herzegovina.

During the period of general electrification, the construction and use of transmission network facilities took place in three characteristic phases. In the first phase, from 1946 to 1957, 35 kV and 110 kV voltage facilities were built and used. Thus, in the period from 1946 to 1953, 32 35 kV transmission lines with a total length of 805 km and 38 35/x kV substations with a total installed capacity of 65 MVA were built. The basic function of these 35 kV transmission lines was the expansion and connection of regional electrification zones, inclusion in the network of newly built public power plants HPP Bogatići, HPP Mesići and HPP Vlasenica and HPP Banovići, as well as industrial power plants built in Prijedor, Blažuj and Lukavac.

Construction of the first 110 kV transmission lines in Bosnia and Herzegovina began in 1948. These transmission lines were built on concrete and wooden pillars with the installation of copper conductors with a section of 3×95 mm2, 3×120 mm2 or 3×150 mm2 and a steel protective rope with a section of 1×50 mm2. All 110 kV transmission lines built until 1954 were used at 35 kV due to the slower construction of 110/35 kV substations compared to transmission lines. In 1953, Elektroprijenos was formed, which took over all 110 kV transmission lines that had been built, transmission lines that were under construction and several 35 kV transmission lines, which by their function and location were an integral part of the transmission network.

The spatial layout of the built 110 kV and 35 kV transmission network until 1954 is given in Figure 2.16.

The construction of significant production facilities continued, namely:

HPP Trebinje 1 – 162 MW, 1968/75; HPP Rama – 160 MW, 1968; PHPP Čapljina – 420 MW, 1979/80; TPP Tuzla – I stage, 64 MW, 1964, II stage, 100 MW, 1966, III stage, 200 MW, 1971, IV stage, 200 MW, 1974 and V stage, 215 MW, 1978; TPP Kakanj – III stage, 110 MW, 1969, IV stage, 110 MW, 1977, V stage, 230 MW, 1988; TPP Gacko – 300 MW, 1983; TPP Ugljevik – 300 MW, 1985; HPP Višegrad – 315 MW, 1989; HPP Bočac – 110 MW, 1981; HPP Grabovica – 114 MW, 1982; HPP Salakovac – 210 MW, 1981; HPP Mostar – 72 MW, 1987.

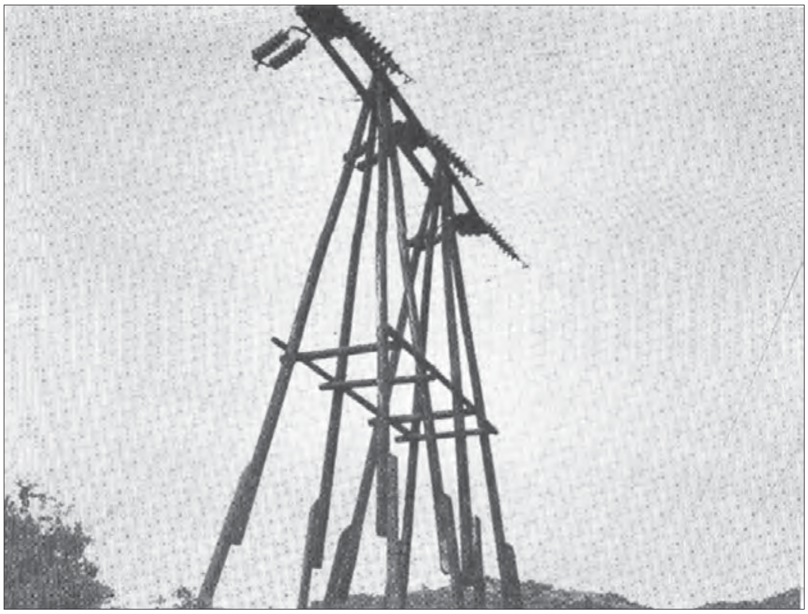


Figure 2.14 The first 110 kV transmission lines

Figure 2.15 110 kV transmission line with concrete pillars

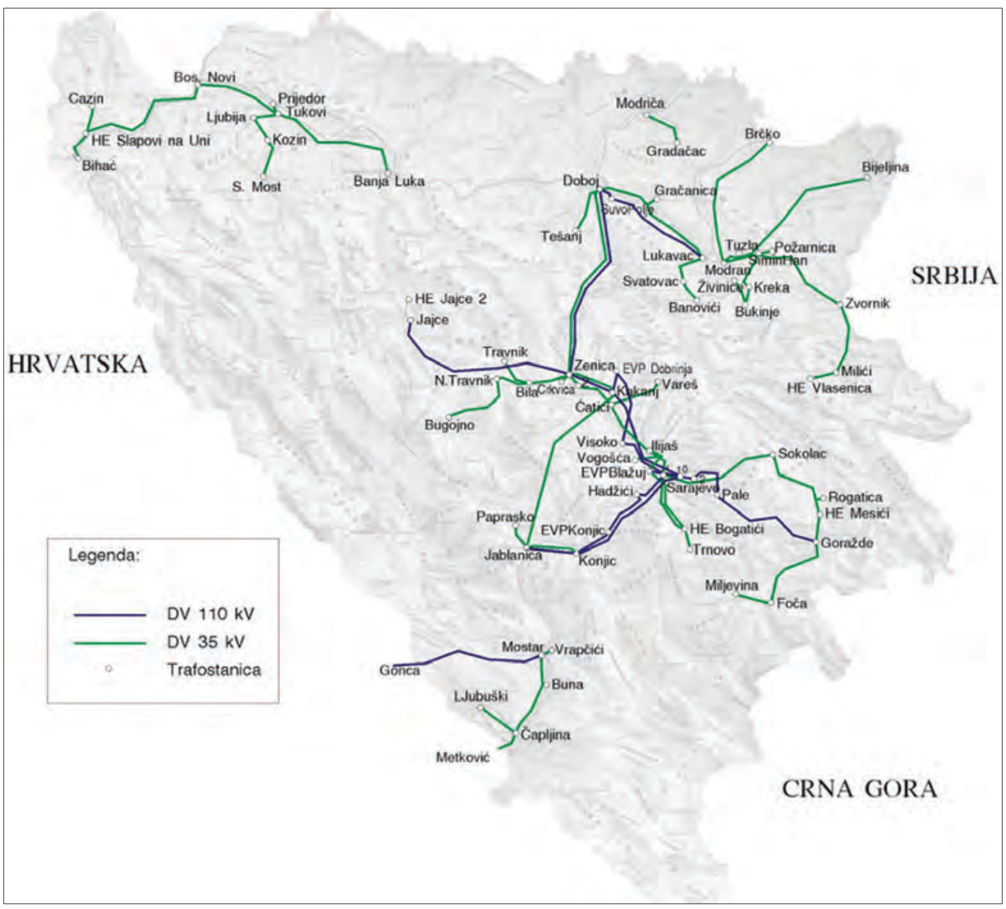


Figure 2.16 110 kV and 35 kV transmission network built by 1954

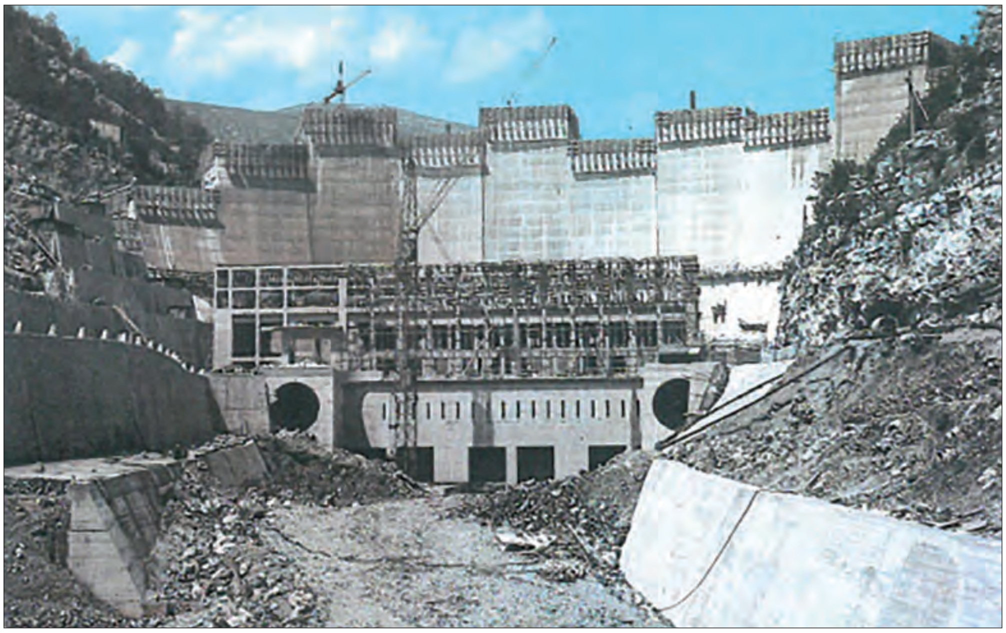


Figure 2.17 HPP Trebinje 1 (Grančarevo) - works on the dam

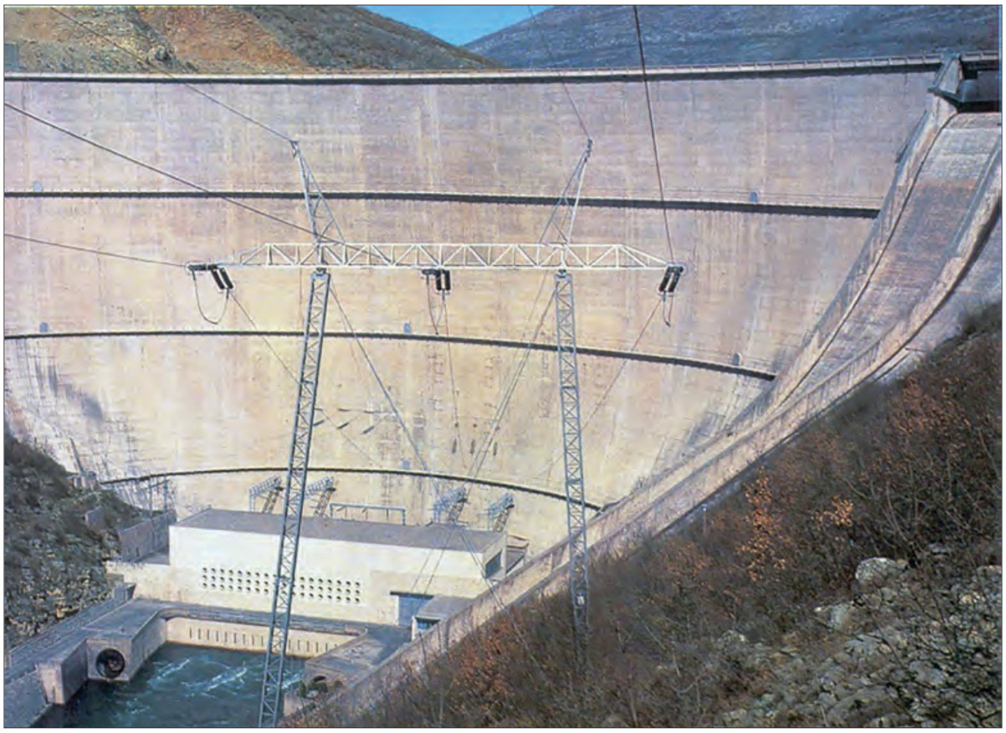


Figure 2.18 Grančarevo Dam (Bileća Lake, the largest reservoir in the Balkans), 1968/75

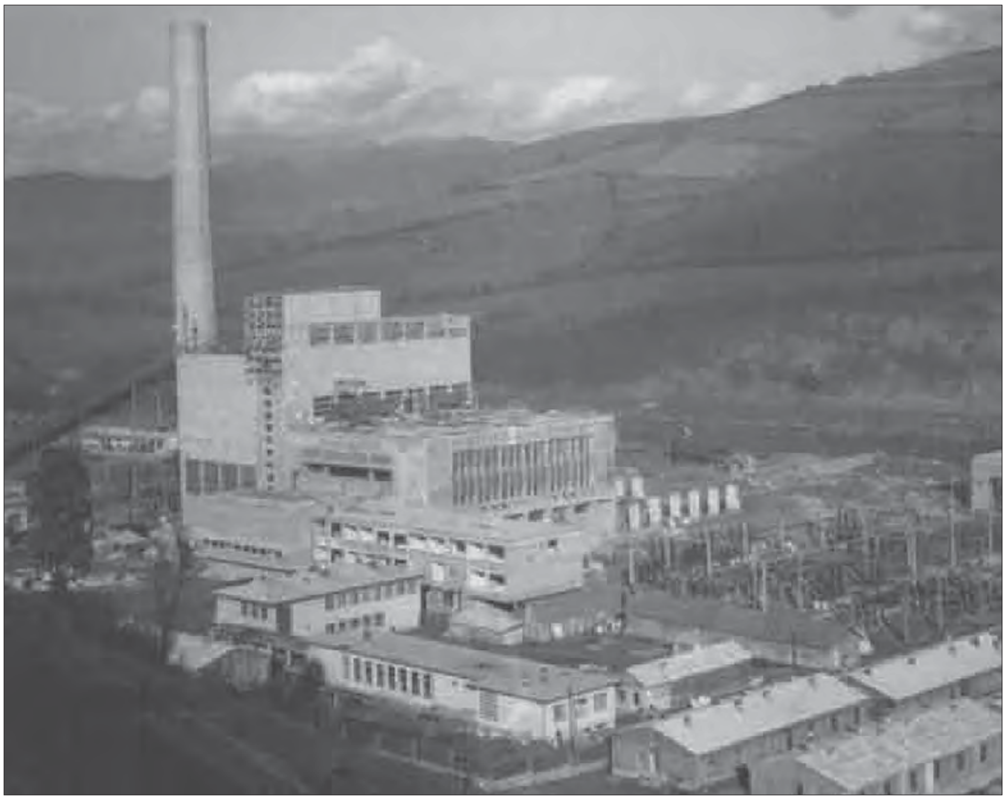


Figure 2.19 TPP Kakanj, Construction of Stage I (blocks 1 and 2), each 32 MW (1954–1956)

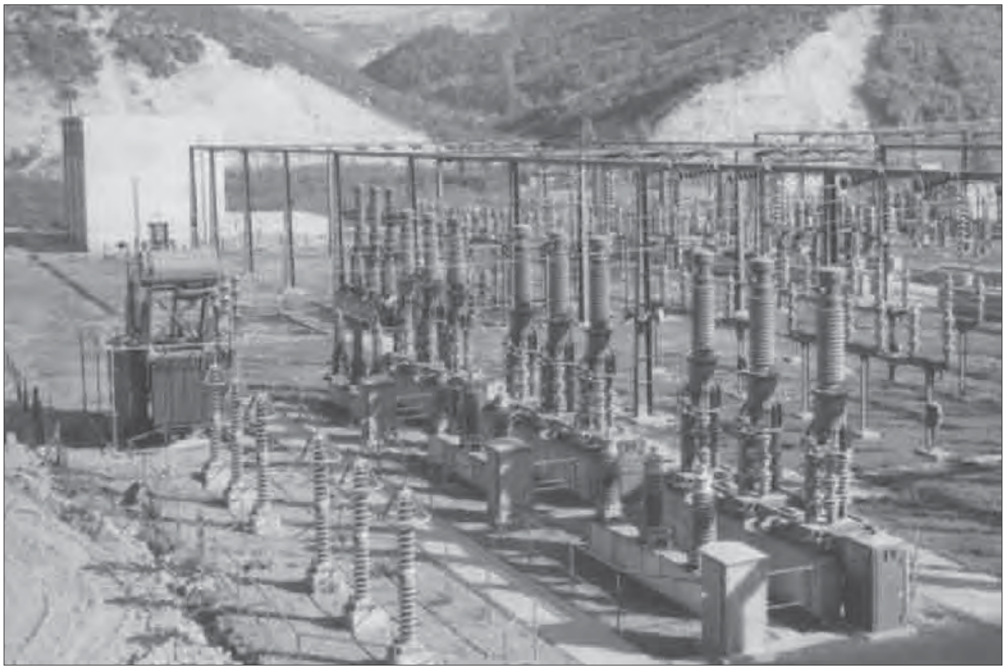
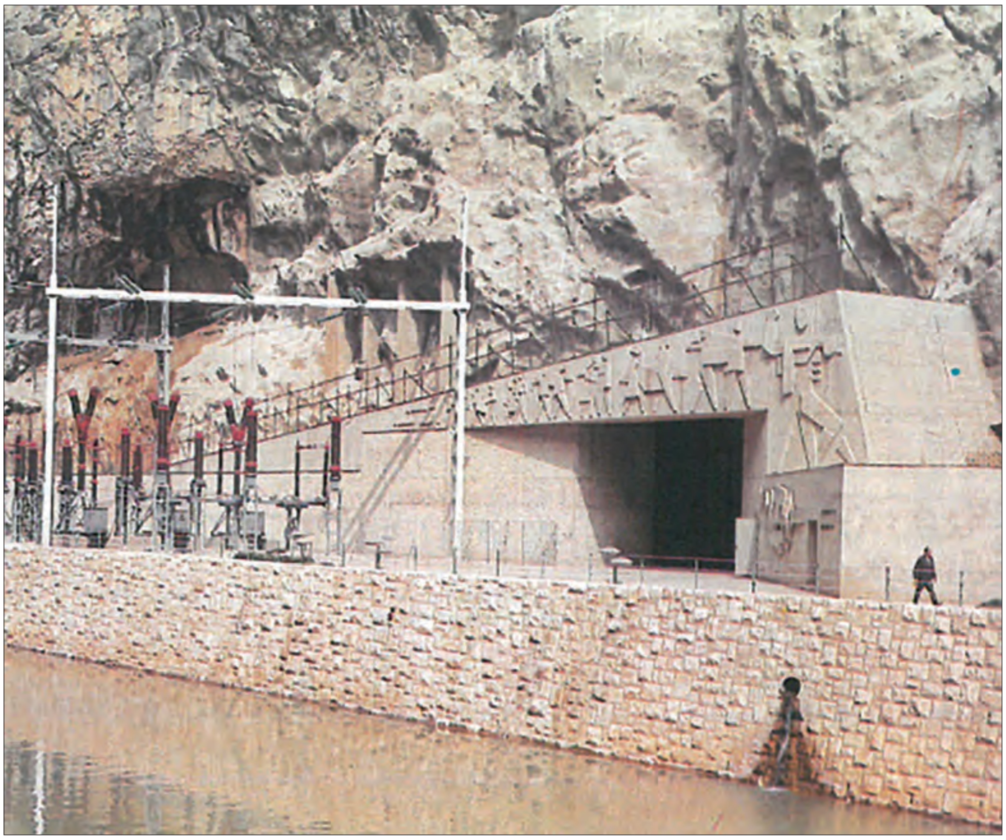


Figure 2.20 TPP Kakanj, External plant 110 kV, 1956



Picture 2.21 HPP Rama in operation since 1968, entrance to the machine room

Figure 2.22 TPP Ugljevik in 1985

Figure 2.23 TPP Tuzla, Construction of the II stage, 1966

Figure 2.24 TPP Tuzla, III stage, 1971

During the period of general electrification of Bosnia and Herzegovina, a modern transmission network system was formed. Until 1957, 110 kV transmission lines and substations formed the basis of the transmission network in Bosnia and Herzegovina. From 1957 to 1976, the structure of the transmission network consisted of 110 kV and 220 kV transmission lines and substations and 35 kV transmission lines that were part of the transmission network facilities. From 1976 to 1990, the transmission network in Bosnia and Herzegovina consisted of 110 kV, 220 kV and 400 kV facilities. The electric power system, that is, the transmission network of Bosnia and Herzegovina, is connected to the power systems of Croatia, Serbia and Montenegro. The construction of the 400 kV transmission network in Bosnia and Herzegovina began in the mid-1970s. The first transmission lines of this voltage level were put into operation in 1976, on the routes Tuzla - Ugljevik - Ernestinovo and Mostar - Konjsko. The first 400/220/110 kV substations were built in Tuzla

Figure 2.25 PS HPP Čapljina, turbine plant, in operation since 1979/80

(Ljubače) and Mostar (Čule) in 1977. From 1976 to 1992, 14 400 kV transmission lines, with a total length of 824 km, and 6 400/x kV substations with an installed power of 4,500 MVA were built and put into operation in Bosnia and Herzegovina. Until the war events of the 1990s, the transmission system consisted of 5,400 km of high-voltage transmission lines and 95 substations with an installed capacity of over 10,000 MVA.

Figure 2.26 TS 400/110 kV Banja Luka 6

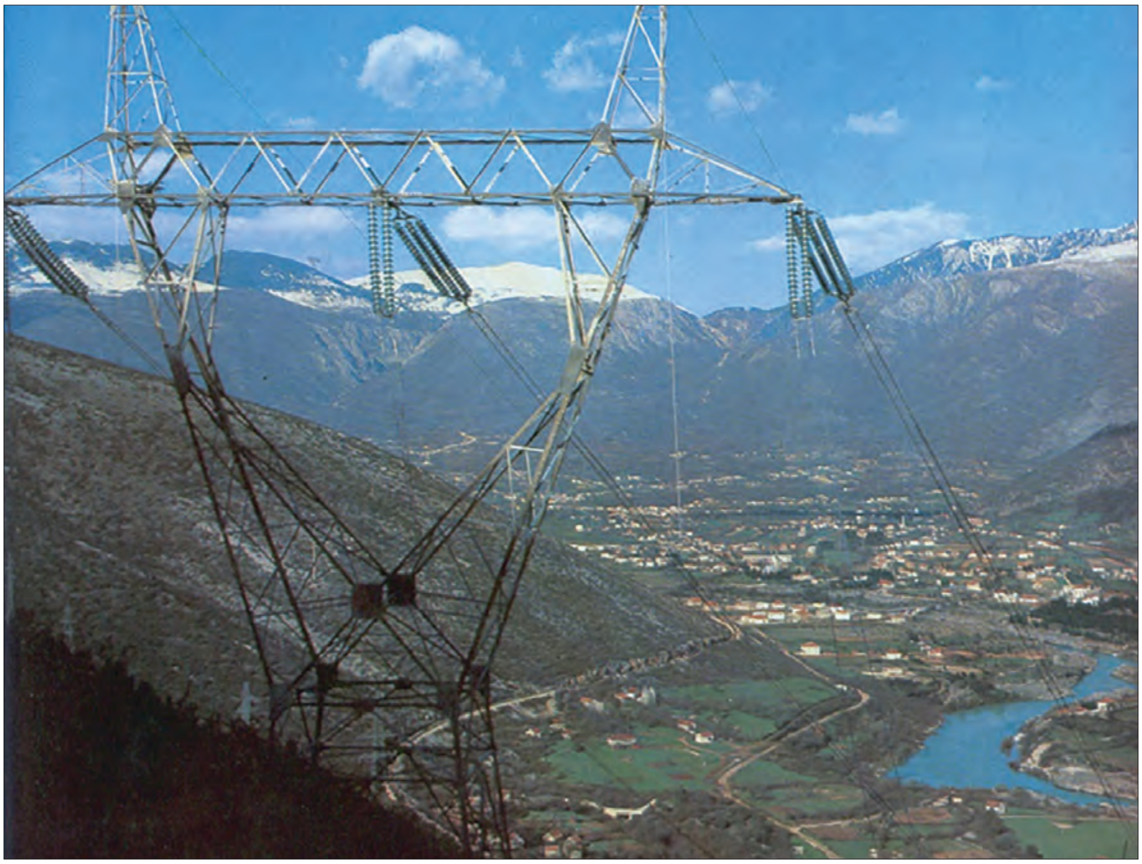


Figure 2.27 Transmission line 400 kV Sarajevo 10 - Mostar 4

Figure 2.28 Metal-shielded SF6 plant 110 kV, Sarajevo 11

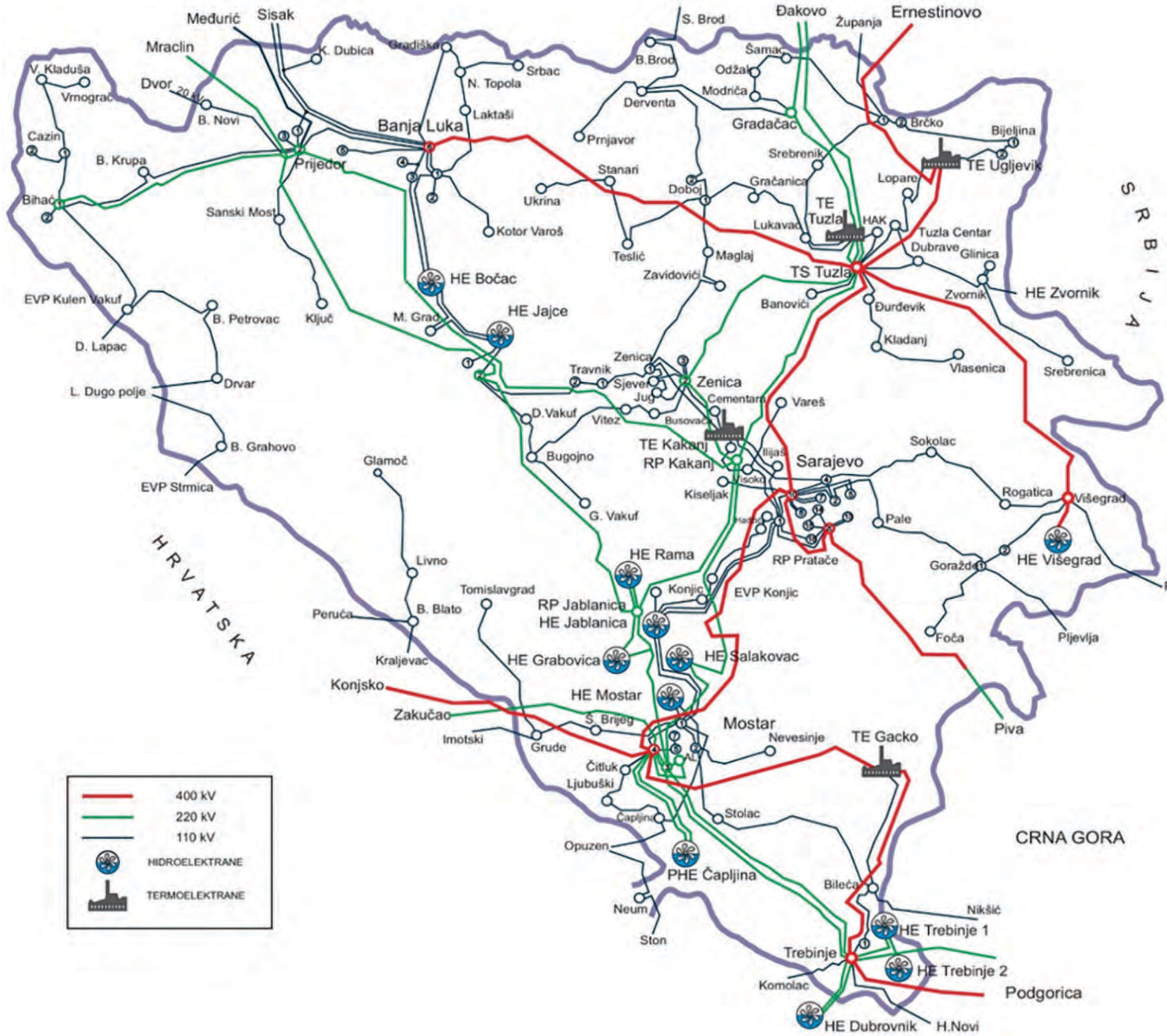


Figure 2.29 Production facilities and transmission network 110 kV, 220 kV and 400 kV, 1992

The Period of War Devastation, Post-War Reconstruction and Construction

Until the beginning of the first war events in the territory of the former Yugoslavia, the electric power system of Bosnia and Herzegovina functioned within the framework of networks of most of the European countries UCPTE (UCPTE - Union for the Coordination of the Production and Transmission of Electricity), the name was changed in 1999 to UCTE, the word *Production* was omitted, which enabled it stable operation. In the middle of 1991, as a result of the war in Croatia, the high-voltage transmission lines that connected EPS of BiH with Croatian EPS, and thus with the network of UCPTE, were increasingly damaged. Due to the impossibility of damage repair, the power lines were mostly left standing permanently out of order, which resulted in the termination of parallel work with the UCPTE network in September 1991. Thus, the UCPTE interconnection split into two zones, and the EPS of Bosnia and Herzegovina was the central point of the breakdown, so that part of the system was in synchronous operation with one UCPTE zone, and the other part with another UCPTE zone.

In addition, the war events in Bosnia and Herzegovina led to a new reorganization of Elektroprivreda in 1992. In the period from April to June 1992, three public power companies were founded, which today exist as:

- JP Elektroprivreda BiH d.d. - Sarajevo,
- JP Elektroprivreda HZ HB d. d. Mostar,
- Mixed- Holding "Elektroprivreda" of Republika Srpska, a. d. Trebinje.

Major disruptions in supply began in April 1992 when, as a result of the war, a large number of transmission and production facilities in Bosnia and Herzegovina remain in disrepair. The total available power and the number of generating units in the electric power system of Bosnia and Herzegovina decreased more and more, which, in addition to damaged networks, permanently left an increasing number of consumers without electricity supply. Transmission lines that connect EPS BiH with neighbouring countries also remain out of service, so that the system has broken up into several isolated islands of low power and unstable operation, which is why system breakdowns often occurred.

The system still survived, split and reconnected, but it always functioned at least on a minimal scale. And in the following years, the system worked in very difficult conditions on a larger or smaller scale and in several islands. Although a significant part of consumers remained without electricity for longer periods, production was still reflected on a smaller scale thanks to a large number of innovations and original solutions by workers in all segments of the electrical industry.

In the war period from 1992 to 1995, the 400 kV network experienced significant destruction and devastation. Heavy damage particularly affected the TL 400 kV Tuzla 4 – Ugljevik – Ernestinovo, TL 400 kV Tuzla 4 – Banja Luka 6, TL 400 kV Tuzla 4 – Sarajevo 10, TL 400 kV Tuzla 4 – Višegrad, TL 400 kV Sarajevo 10 – Mostar 4 and TL 400 kV Mostar 4 – Konjsko, as well as TS 400/220/110 kV Mostar 4 (Čule). A large number of pillars on the mentioned transmission lines were blown up and dismantled, conductors were torn and taken, suspension and connecting equipment was damaged.

In the 400/x kV substations, the most prominent damages were on transformers, switchyards and other expensive protective, metering and communication equipment. During the war period, no serious repairs were made to the damaged facilities of the 400 kV network, given that it was the largest in terms of dimensions and most expensive equipment, and there was a lack of equipment, spare parts and special vehicles necessary for work on this type of facilities. Salakovac and Mostar hydroelectric plants were flooded.

In that war period, new facilities such as the 35 kV cable connection were built which enabled the delivery of electricity to Sarajevo via Igman, and after that a 25 km long 110 kV cable connection was built from Pazarić to Sarajevo.

In addition, the following transmission lines were built: TL 220 kV Višegrad – Vardište; TL 110 kV Rudo – Zamršten, TL 110 kV Kozarska Dubica – Prijedor 3; TL 110 kV Ugljevik – Zvornik; TL 110 kV Janja – Lešnica; TL 110 kV Maglaj – Tešanj; TL 110 kV Salakovac – Opine; TL 110 Bosanski Petrovac – Ključ; transformation of 400/220 kV in TS Višegrad; two substations (TS Pazarić and TS Posušje).

Since 1995, electricity conditions in Bosnia and Herzegovina have gradually become increasingly favourable compared to previous years. The volume of production was increased, which, along with the simultaneous rehabilitation of networks, enabled a greater volume and quality of supply to end consumers. The number of consumers without electricity was constantly decreasing and was reduced to a minimum by the end of the year. After 1995, rehabilitation and reconstruction of production facilities, transmission and distribution networks in BiH was intensified. A new transmission line TL 400 kV

Figure 2.30 Rescue tunnel (35 kV cable installed)

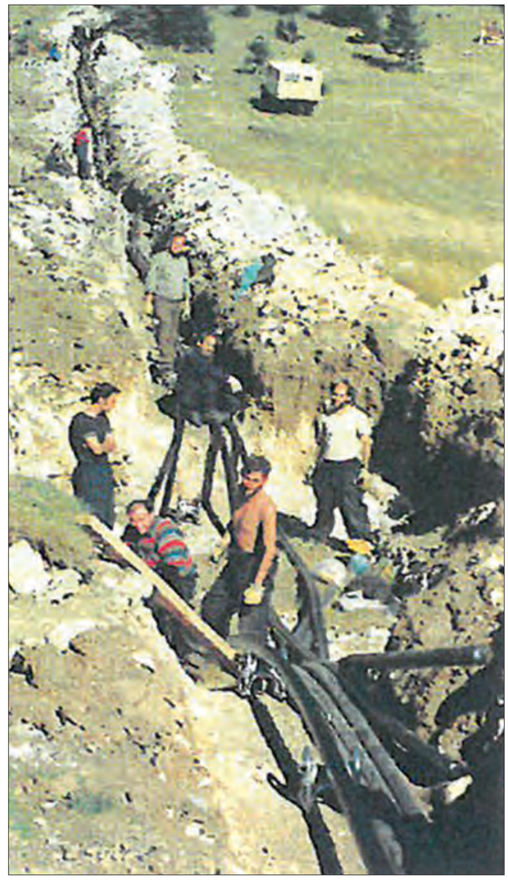


Figure 2.31 Laying of 110 kV cable. 1995

Ugljevik - Sremska Mitrovica was built. At the same time, the rehabilitation of the high-voltage network in the countries of the former Yugoslavia is being carried out, and finally, after 13 years, the conditions are being created for the reconnection of the South-East European network with the main part of the European high-voltage network. After extensive technical calculations and organizational preparations, with the coordination of the UCTE Control Centre with the national dispatch centres, on Sunday, October 10, 2004, the successful reconnection of I and II UCTE zones was carried out. The reconnection increased the stability and safety of the power system. This is crucial for Bosnia and Herzegovina, both because of the placement of surplus electricity, and because of the chances of electricity transit, which will bring additional income for the new transport company.

In addition to the rehabilitation and reconstruction of damaged facilities, modernization, life span extension and capacity increase was carried out, as well as the construction of new plants. In the last 20 years or so, several new hydroelectric power plants (Mostarsko blato, Peć Mlini, Ustiprača), a large number of small hydroelectric power plants and photovoltaic plants, one thermal power plant (Stanari) and 3 wind farms (Mesihovina, Jelovača and Podveležje) have been built.

The transition from fossil fuels to renewable energy sources occurs through energy transition. This is a gradual change in the structure of electricity production facilities, which is taking place with an increase in the share from renewable sources, primarily from the sun and wind. To this should be added the technical progress in traffic, as a major consumer of energy, where electric vehicles, which continue to be perfected and developed, are gradually replacing fossil fuel vehicles. The energy transition is one of the biggest challenges today and is actualized by the negative effects of climate change. The goal of the energy transition is the rapid and drastic reduction of greenhouse gas emissions as the most dangerous threat to humans and the rest of the living world. Bosnia and Herzegovina decided to implement the transition to complete decarbonization in 2050. A successfully implemented energy transition gives Bosnia and Herzegovina real chances to sustain energy independence and security and reliable supply of customers with electricity, which means that activities on the preparation, adoption and implementation of new legislation should be accelerated, an organized market should be established as soon as possible and energy efficiency should be increased.

Figure 2.32 HPP Peć Mlini, 30.6 MW, in operation since 2004

Figure 2.33 HPP Mostarsko blato, 60 MW, in operation since 2010

Figure 2.34 TPP Stanari, 300 MW, in operation since 2016

Figure 2.35 WF Mesihovina, 50.6 MW, in operation since 2018

Figure 2.36 WF Jelovača, 36 MW, in operation since the beginning of 2019

Figure 2.37 WF Podveležje, 48 MW in operation since 2021

Current Organization of the Power Sector

Regulated by legal decisions at the state level from 2002 is the establishment and operation of the State Regulatory Commission for Electricity, of the independent system operator and the electricity transmission company, and the functions and mandates of each individual body are defined. The State Electricity Regulatory Commission (DERK) is an independent and non-profit institution of Bosnia and Herzegovina, which operates in accordance with the principles of objectivity, transparency and equality, and has competences and responsibilities over electricity transmission, transmission system operations and international trade of electricity, as well as over the production, distribution and supply of electricity customers in the Brčko District of Bosnia and Herzegovina.

Key participants in the electric power sector of Bosnia and Herzegovina are: the Independent System Operator in BiH (NOS BiH), Elektroprijenos BiH, three power utility companies as public enterprises, the Distribution and Supply Company in Brčko District and independent electricity producers and traders. Transmission of electricity and management of the transmission network are separated from other electricity industry activities, which is particularly significant from the point of view of market opening and enables access to the network for all participants in the sector, regardless of ownership.

Independent System Operator in BiH (NOSBiH)

It was established by the Law on the Establishment of the Independent System Operator for the Transmission System in Bosnia and Herzegovina in 2004, and registered in July 2005. The primary responsibilities of NOS are:

– transmission system management in order to ensure reliability;

– management of the balance market and provision of auxiliary services, development and application of reliability standards;

– development and management of rules governing the use of the transmission system.

Elektroprijenos of Bosnia and Herzegovina a.d. Banja Luka

Electricity transmission company in Bosnia and Herzegovina, Elektroprijenos BiH is a joint-stock company owned by FBiH (58.90%) and RS (41.10%). The shares correspond to the ratio of the initially entered assets. The main task of the company is to transmit the electricity produced in the power plants to the electricity distribution areas and large industrial consumers, and to connect the electricity system of Bosnia and Herzegovina with the electricity systems of neighbouring countries and beyond, thereby enabling the export, import and transit of electricity. This includes activities related to maintenance, construction and development of the BiH transmission system.

Power utility companies

In addition to Elektroprijenos and NOS, there are three public power utility companies in Bosnia and Herzegovina (two in the Federation of Bosnia and Herzegovina, one in the RS) with majority state capital:

– JP Elektroprivreda BiH d. d. – Sarajevo,
– JP Elektroprivreda HZ HB d. d. Mostar,
– Mixed Holding “Elektroprivreda” of Republika Srpska, a. d. Trebinje

These companies have permits (licenses) for production, distribution, first-order supply (tariff customers), second-order supply (non-tariff customers and internal trade) and international trade in electricity. The two power companies in the Federation are organized as vertically integrated companies, and in the RS, 10 companies are connected through the Holding - five production and five distribution companies, which at the same time supply tariff customers. In addition to the majority of state-owned power companies, several legal entities that hold a permit (license) for the production of electricity (independent producers, TPP Stanari, WF Jelovača, most of the SHPP's and photovoltaic power plants) are registered, as well as legal entities that hold a license for supply activities of the II order (internal trade) or a license for international trade (export and import).

The wholesale market operates through bilateral trade, which is based on tender buying and selling mainly for periods of one month to a year, short-term day-ahead contracts or hourly intraday contracts related to internal trade and export or import. The retail part of the market is under the jurisdiction of entity bodies and regulators. Although entity regulators issued 23 licenses that enable the supply of end customers and passed regulations that enable qualified customers to change suppliers, the three power utility companies continue to predominantly supply end customers.

The electricity market in Bosnia and Herzegovina has been formally open for all customers, including households, since January 1, 2015. This means that all customers are qualified and have the right to choose a supplier, i.e. to buy electricity on the market and conclude a supply contract with the supplier they choose.

The market has practically been open since January 1, 2016, when the application of the Market Rules began, which is a document adopted by the Independent System Operator (NOS) and approved by SERC in May 2015. This document, among other things, regulates issues such as provision of system/auxiliary services, determination and calculation of imbalances and procurement of energy to cover losses on the transmission network. This created the prerequisites for the market to practically open up to competition, so that already at the beginning of 2016, new suppliers appeared with offers to supply customers in Bosnia and Herzegovina.

Customers from the household category and small customers (other consumption at 0.4 kV), who do not choose a supplier on the market, have the right to buy electricity from a public supplier, i.e. to supply themselves with electricity based on universal service.

The production of electricity takes place for the most part in hydroelectric power plants and thermal power plants. In addition to hydropower plants and thermal power plants, there are 3 wind farms in operation, namely: WF Mesihovina, 50.6 MW, in operation since 2018; WF Jelovača, 36 MW, in operation since 2019 and WF Podveležje, 48 MW, in operation since 2021.

Table 2.2. Main production capacities in BiH

Hydroelectric power plants	Generators power (MW)	Total installed power (MW)
Trebinje I	2x54+63	171
Trebinje II	8	8
Dubrovnik	126+108	234
Čapljina	2x210	420
Rama	80+90	170
Jablanica	6x30	180
Grabovica	2x57	114
Salakovac	3x70	210
Mostar	3x24	72
Mostarsko blato	2x30	60
Peć Mlini	2x15,3	30,6
Jajce I	2x30	60
Jajce II	3x10	30
Bočac	2x55	110
Višegrad	3x105	315
Thermal power plants	**Installed power (MW)**	**Available power (MW)**
TUZLA	715	635
Tuzla G3	100	85
Tuzla G4	200	182
Tuzla G5	200	180
Tuzla G6	215	188
KAKANJ	450	398
Kakanj G5	110	100
Kakanj G6	110	90
Kakanj G7	230	208
GACKO	300	276
UGLJEVIK	300	279
STANARI	300	283
Wind farms	**Generators power (MW)**	**Total installed power (MW)**
Mesihovina	22x2,3	50,6
Jelovača	18x2	36
Podveležje	15x3,2	48

Basic Information about the EPS of BiH

Table 2.3 Basic information

Area of Bosnia and Herzegovina	51.209 km²
Population	3.5 million
Number of TSO's	1 (NOS BiH)
Number of DSO's	8
Total installed power of production facilities: – Installed power of larger hydroelectric power plants – Installed power of thermal power plants – Installed power of larger wind farms – Installed power in other facilities	4.608 MW 2.077 MW 2.065 MW 135 MW 331 MW
Annual electricity production (average for the period 2017–2021)	16.4 TWh
Total annual electricity consumption (average for the period 2017–2021)	12.5 TWh
Maximum load (average for the period 2017–2021)	1.968 MW
SAIDI for the transmission network (average for the period 2017–2021)	119.54 min/buyer
SAIFI for the transmission network (average for the period 2017–2021)	1.39 interruption/buyer

Table 2.4 Electrical indicators of the EPS of BiH for the period 2017-2021

Year	2017.	2018.	2019.	2020.	2021.
Production in TWh	15.15	17.87	16.07	15.39	17.06
Total consumption in TWh	13.37	13.29	12.33	11.33	12.17
Maximum load in MW	2.189	1.994	1.945	1.804	1.909
SAIDI min/buyer	163.21	147.99	136.95	71.38	78.17
SAIFI interruption/buyer	1.73	1.45	1.63	0.95	1.21

Table 2.5 Balance quantities in EPS of BiH

Year	2017.	2018.	2019.	2020.	2021.
Production / Consumption EP BiH, TWh	7.01 / 5.96	7.24 / 5.09	6.03 / 5.23	6.24 / 5.24	6.68 / 5.41
Production / Consumption ERS, TWh	4.49 / 4.12	6.03 / 4.14	4.67 / 4.11	5.00 /3.92	5.65 /4.33
Production / Consumption EP HZ HB, TWh	1.29 / 1.67	2.09 / 1.65	2.70 / 2.07	1.68 / 1.48	2.25 /1.58
Production / Consumption Komunalno Brčko, TWh	0 / 0.28	0 / 0.27	0 / 0.27	0/ 0.27	0 / 0.29
Production / Consumption other subjects, TWh	2.37 / 1.34	2.50 / 2.05	2.67 / 0.64	2.47 / 0.42	2.48 / 0.56
Production / Consumption Total, TWh	15.16 / 13.37	17.86/13.2	16.07/12.32	15.39/11.33	17.06/12.17

Table 2.6 Number of electricity buyers in BiH

Supplier	110 kV	35 kV	10 kV	Other consumption	Households	Public lighting	Total
Elektroprivreda BiH	8	64	947	65.292	716.118	4.852	787.281
Elektroprivreda RS	5	30	996	31.065	515.370	212	547.678
Elektroprivreda HZ HB	1		266	15.893	180.955	2.006	199.121
Komunalno Brčko		1	67	3.732	32.077	446	36323
Other suppliers			7	3			12
Total	14	97	2.283	115.985	1.444.520	7.516	1.570.415

Table 2.7 Number of interconnections

	400 kV	220 kV	110 kV
Croatia	2	6	12
Serbia	1	1	2
Montenegro	1	2	2

Table 2.8 Number of high voltage facilities 400 / 220 / 110 kV

Voltage	Facilities	Transformers	Power (MVA)
400/x kV	10	14	4.900
220/x kV	8	13	1.950
110/x kV	135	251	6.216
Total	153	278	13.066

Table 2.9 High voltage transmission lines

Voltage	HV lines	Length (km)
400 kV	15	866
220 kV	42	1.520
110 kV	243	4.037
110 kV (Kabl)	11	35
Total	311	6.458

Significant Years in the History of Electricity in Bosnia and Herzegovina

Table 2.10 provides an overview of significant years in the history of electricity of Bosna and Herzegovina

Table 2.10 Significant years in the history of electricity of Bosnia and Herzegovina

Year	Event
1888.	First power plant in Bosnia and Herzegovina - Zenica Coal Mine
1895.	First public power plant in BiH in Sarajevo
1895.	First electric tram in Sarajevo
1945.	Founding of Elektroprivreda BiH – Decision of the National government of BiH
1951.	Founding of Elektroprojekt Sarajevo (later Energoinvest)
1953.	Founding of Elektroprijenos BiH
1955.	Commissioning of HPP Jablanica, the largest yet HPP in SFRY
1961.	Founding of The Faculty of Electrical Engineering in Sarajevo
1979/80.	Commissioning of the PHPP Čapljina, the largest pumped storage hydroelectric plant in the Balkans
1991.	UCPTE interconnection split into two zones – EPS of Bosnia and Herzegovina, was the central breaking point
1992.	Three power utility companies were formed as a result of the war in Bosnia and Herzegovina
1992.	Founding of the Council on Large Electrical Systems of Bosnia and Herzegovina CIGRE – BH K CIGRE
1994.	The capital of BiH, Sarajevo, received an independent power supply via a 35 kV cable through the Sarajevo Tunnel
1995.	The capital of BiH, Sarajevo, received an independent power supply via a 110 kV cable (a 110 kV cable was used for the transmission of electricity for the first time in BiH)
2002.	Founding of the State Electricity Regulatory Commission – DERK
2004.	Reconnection in BiH, the two UCTE zones were reconnected in Bosnia and Herzegovina
2005.	Founding of the Independent System Operator in BiH
2006.	The Treaty on the Establishment of the Energy Community entered into force, to which Bosnia and Herzegovina is also a signatory state
2006.	Founding of Elektroprijenos BiH

3

40 Years of Activity of JUKO CIGRE (1951–1991)

Founding of JUKO CIGRE

Professor Dr. Milan Vidmar, a world expert in transformers and transmission networks and a leading Yugoslav engineer, attended the 12th session of CIGRE in Paris in 1948 and thus made the first contacts with this international association. At the end of the same year, he received a letter from the then vice-president of CIGRE, Jean Tribot-Laspière, proposing the establishment of a CIGRE National Committee in Yugoslavia. Until then, 28 countries had national committees. In January 1949, Prof. Milan Vidmar introduces the proposal to the Minister of Electrical Industry in FNRY, Nikola Petrović. As a result of these activities, in October 1949, the Board of Directors of the Association of Engineers and Technicians of Yugoslavia accepted the proposal to form an Initiative Committee for the establishment of the Yugoslav CIGRE Committee. A few days later, the Provisional Administration of the Yugoslav Section of CIGRE was formed, with the following composition:

1) President: Dr. Milan Vidmar, Faculty of Engineering, Ljubljana;
2) Vice-presidents: Dr. Pavle Miljanić, Faculty of Engineering, Belgrade and Vladimir Žepić, Faculty of Engineering, Zagreb;
3) Secretary: Herman Mattes, Ministry of Electrical Industry, Belgrade;
4) Members: Milivoje Rakić, Faculty of Engineering, Belgrade; Anton Dolenc, Faculty of Engineering, Zagreb; Henrik Čopić, Faculty of Engineering, Ljubljana; Dr. Ilija Obradović, Ministry of Electrical Industry, Belgrade.

The first meeting of the Management Board was held on December 21, 1949 in Zagreb, under the name Interim Committee of the International Conference for Large Power Grids. In accordance with the Statute of CIGRE Paris, preparations were immediately started for the establishment of the Yugoslav National Committee (JUNAKO CIGRE) and the participation of the first Yugoslav representatives at the 13th session of CIGRE in Paris in 1950.

The founding assembly of the Yugoslav National Committee (JUNAKO) CIGRE was held on December 3, 1951 in the premises of the Society of Engineers and Technicians of Croatia in Zagreb, attended by representatives of 25 labour organizations of the Yugoslav electrical industry. On that occasion, the Management and Supervisory Boards were elected, the Statute was adopted and the Work Program was accepted (copies provided below).

The management board consisted of:

1) President:	Dr. Milan Vidmar (Ljubljana)
2) Vice president:	Milivoje Rakić (Belgrade)
3) Secretary:	Herman Mattes (Zagreb)
4) Members:	Bogomir Berdajs (Ljubljana)
	Čedomir Miličević (Sarajevo)
	Dr. Ilija Obradović (Belgrade)
	Vladimir Žepić (Zagreb)

According to records from 1952, one of the 13 collective members of JUNAKO CIGRE was Elektroprojekt Sarajevo (later changed its name to Energoinvest Sarajevo).

Herman Mattes registered the temporary headquarters of JUNAKO CIGRE in in Zagreb at his private address, Jakićeva 39. Mattes was persistent and looked for ways to legalize legal acts and establish JUNAKO CIGRE. After a series of activities, during 1954, approval was finally obtained for the headquarters of JUNAKO CIGRE to be in Zagreb.

Below is the Statute and Work Program of the Yugoslav National CIGRE committee.

STATUT JUGOSLAVENSKOG NACIONALNOG KOMITETA CIGRE

Član 1.

Cilj i naziv . U cilju unapređenja stručne djelatnosti na području elektrotehnike i elektrifikacije osniva se pri Savezu Društva Inžinjera i tehničara Jugoslavije, jugoslavenska sekcija Međunarodne stručne organizacije za velike električne mreže (Conference Internationale des Grands Reseaux Electriques - C.I.G.R.E) pod nazivom "Jugoslavenski Nacionalni Komitet CIGRE") - u tekstu skraćeno "Komitet".

Član 2.

Zadaci Komiteta su slijedeći:

1) da vrši sve potrebne pripremne radove za učestvovanje Jugoslavije na zasjedanjima "Međunarodne konferencije za velike električne mreže", koje se održavaju svake druge (parne) godine u Parizu;
2) da daje inicijativu za studij problema koji se odnose na:
   a/ projektiranje, gradnju i pogon elektrana, razvodnih postrojenja i transformatorskih stanica;
   b/ konstrukciju, izolaciju, održavanje i pogon električnih dalekovoda;
   c/ pogon, zaštitu i povezivanje električnih mreža
   kao i na sva pitanja koja su u vezi sa gornje 3 točke.
3) da stvara i održava veze između stručnih udruženja, ustanova, industrije i stručnjaka iz privrede i naučnih institutcija, koje su zainteresirane na problematici - navedenoj u toč.2.ovog člana, i da na taj način poradi na unapređenju elektrotehnike;
4) da potpomaže stručne veze svojih članova sa ostalim članovima CIGRE,
5) da organizira u dogovoru sa privrednim i naučnim ustanovama i sekcijama električara DIT-ova stručna savjetovanja, konferencije, konkurse, posjete i razmjenu iskustava u vezi aktuelnih i perspektivnih problema navedenih u toč.2.
6) da objavljuje materijal sa konferencija CIGRE kao i sa stručnih konferencija i savjetovanja održanih u našoj zemlji;
7) da pridobije pojedine stručnjake i organizacije kao stalne - individualne ili kolektivne - članove i propagira ciljeve i rad CIGRE.

Član 3.

Forme rada - Komitet ostvaruje svoje zadatke putem:

a/ učestvovanjem članova na međunarodnim zasjedanjima predviđenim statutom CIGRE;

b/ saradnje članova u Međunarodnim studijskim komitetima predviđenim statutom CIGRE;

c/ stručnih savjetovanja, izmjene stručnih podataka, organiziranjem ili učestvovanjem u stručnim anketama, kao i putem stručne štampe.

Član 4

Članovi i članarine. CIGRE ima dvije kategorije članstva:

a/ Kolektivni članovi, koji mogu biti državne ustanove, privredne organizacije, tehničke ili naučne organizacije, stručna udruženja, tehničke škole i fakulteti, industrijska i elektroenergetska popoduzeća i t.d.

b/ Individualni članovi, koji mogu biti svi oni stručnjaci koji imadu kvalifikacije (diplomirani inženjeri i elektro-tehničarim ili odgovarajuće kvalifikacije) i koji se interesiraju za problematiku koju raspravlja CIGRE.

Visina godišnje članarine za kolektivne i individualne članove kao i time stečena prava i prednosti određeni su statutom CIGRE.

Osim ove članarine koja se uplaćuje u devizama dužni su redovni članovi CIGRE da uplaćuju Komitetu slijedeće godišnje iznose:

Kolektivni članovi godišnje 12.000 din
individualni " " 120 "

Komitet će Upravnom odboru CIGRE preporučiti samo one kolektive i lica za učlanjenje, koja ispune svoje obaveze prema komitetu.

Visinu godišnje članarine u dinarima može izmijeniti Upravni odbor Komiteta s time da ga glavna skupština odobri.

Sve kolektive i lica koja ne uplaćuju članarinu u devizama predviđenim Statutom CIGRE, a redovno uplaćuju svoj godišnji iznos u dinarima, priznat će Komitet kao svoje izvanredne kolektivne ili individualne članove sa svim pravima i dužnostima predviđenim ovim statutom.

Svaki novi član imade da uplati svoju članarinu u roku od tri mjeseca po prijemu, a svaki stari član treba da plati svoju članarinu u toku prva tri mjeseca one godine na koju se članarina odnosi.

Član 5.

Dužnosti i prava članova - Članovi imadu pravo odnosno dužni su:

1/ da učestvuju odnosno pošalju svoje delegate na glavne skupštine, stručna savjetovanja, konferencije kao i da učestvuju u svim akcijama koje organizira Komitet;

-3-

2/ da biraju odnosno da budu birani u upravu i stručne komisije Komiteta;

3/ da daju ili da primaju besplatno ili uz znatan popust sve stručne informacije putem referata, diskusije ili korespondencije;

4/ da im se preko Komiteta uspostavi međunarodne stručne veze ili da im se kod toga pomogne.

Svi redovni članovi koji su ispunili članske obaveze prema CIGRE-i uživaju i one prednosti koje im daje statut CIGRE.

Član 6.

Glavna skupština- Glavna skupština održava se svake parne godine poslije zasjedanja Međunarodne konferencije CIGRE. Mjesto i vrijeme održavanja određuje predhodna glavna skupština.

Saziv gl. skupštine uz prijedlog dnevnog reda izvršit će upravni odbor dva mjeseca prije određenog roka.

Primjedbe na dnevni red imadu se dostavljati pismeno Upravnom odboru mjesec dana prije održavanja glavne skupštine.

Radu glavne skupštine predsjeda predsjednik uz pomoć članova Upravnog odbora.

Pravo prisustvovanja i glasanja imadu svi članovi. Svaki kolektivni član ima pravo na jednog delegata i četiri glasa; individualni član ima pravo na jedan glas. Svakog člana može na skupštini zastupati preko punomoći član koji imade pravo učestvovanja na glavnoj skupštini i koji će glasati u njegovo ime. Članovi koji nisu uplatili članarinu nemaju pravo glasa.

Glavna skupština donosi zaključke apsolutnom većinom prisutnih glasova, osim za promjene u ovom statutu za koje je potrebno više od polovine glasova svih upisanih članova. Skupština može donositi punovažne zaključke ako su prisutni članovi sa najmanje polovinom pravovaljanih glasova. Zaključci glavne skupštine dostavljaju se Upravnom odboru Saveza DITJ na znanje.

Član 7

Uprava - Svaka glavna skupština bira Upravni odbor i nadzorni odbor koji sprovodi u život zaključke skupštine i vodi cjelokupno poslovanje između dvije glavne skupštine. Broj članova Upravnog odbora treba da bude najmanje 5, a najviše 7. Od toga mora po mogućnosti biti najmanje polovina redovitih članova CIGRE.

Članovi upravnog odbora biraju iz svoje sredine predsjednika, podpredsjednika i sekretara.

Upravni odbor održava sjednice prema potrebi, a najmanje jed... godišnje. Cjelokupno poslovanje i korespondenciju između dvije sjednice vodi sekretar u okviru zaključaka glavne skupštine i Upravnog odbora. On je za svoj rad odgovoran Upravnom odboru, a ovaj ga može za taj rad nagraditi.

Za svoj rad Upravni odbor polaže račun glavnoj skupštini.

Član 8.

Financije - Financijama upravlja Upravni odbor odnosno po njemu ovlašteni sekretar. Financijsko poslovanje nadzire odbor od dva člana koji bira glavna skupština.

Budžet komiteta, podnosi Uprava na odobrenje Glavnoj slupštini.

Član 9.

Stručna savjetovanja. Dnevni red, vrijeme i mjesto održavanja stručnih savjetovanja daje Upravni odbor na osnovu plana rada kojeg je odobrila Glavna skupština. Za pojedina pitanja mogu se formirati stručne komisije koje rade između dva zasjedanja stručnih savjetovanja. Stručna savjetovanja održavaju se prema potrebi u dogovoru sa privrednim i naučnim ustanovama, a najmanje svake druge godine.

Član 10.

Učestvovanje članova kao i upućivanje referata na međunarodna zasjedanja i međunarodne studijske komitete predlaže Upravni odbor Generalnom delegatu CIGRE. Kod većih delegacija Upravni odbor određuje šefa delegacije (prvog delegata).

Član 11.

Opće odredbe. Ovaj statut stupa na snagu kad ga prihvati konstituirajuća skupština, a odobri Upravni odbor Saveza DITJ i Uprava CIGRE.

Za detaljna tumačenja ovog statuta, Upravni odbor po potrebi ustanovljuje pravilnike.

Član 12.

Ovaj komitet prestaje sa radom:

a) kad to odluči 2/3 upisanih članova
b) ako svi redovni članovi CIGRE ne ispune svoje obaveze u članarini. U tom slučaju će o imovini Komiteta odlučiti Glavna skupština.

Ovaj statut jednoglasno je prihvaćen na Konstitutirajućoj skupštini Jugoslavenskog nacionalnog Komiteta CIGRE u Zagrebu, 3. decembra 1951. g.

Sekretar: Ing. Mattes v.r.

Predsjednik: Prof. dr. Vidmar Milan v.r.

PROGRAM RADA
JUGOSLAVENSKOG NACIONALNOG KOMITETA CIGRE

1/ sudjelovanje na zasjedanjima Međunarodne konferencije za velike električne mreže.

2/ Studij problema koji se odnose na projektiranje, gradnju i pogon elektrana, razvodnih postrojenja i transformatorskih stanica, električnih dalekovoda i električnih mreža.

3/ Održavanje veze između stručnih udruženja, ustanova industrije i stručnjaka iz privrede i naučnih institucija na unapređenju elektrotehnike.

4/ Stručna pomoć kao i održavanje veze između svojih članova i ostalih članova CIGRE.

5/ Organiziranje stručnih savjetovanja, konferencija i konkursa u vezi aktuelnih i perspektivnih problema elektrana, transformatorskih stanica, električnih dalekovoda i električnih mreža.

6/ Objavljeivanje materijala sa konferencija CIGREi sa stručnih konferencija i savjetovanja održanih u na-šoj zemlji.

T A J N I K :
/Ing.Matte H./
Ing Matte

Conferences JUKO CIGRE

The first meeting of JUNAKO CIGRE was not held in 1952, but from 25 to 27 May 1953 in Ljubljana. This gathering was attended by 100 Yugoslavian power engineers from the electrical industry, colleges, scientific research institutes and other interested organizations.

21 papers were put up for discussion. The papers were divided into 5 sections:

Section 1 Construction of power facilities (led by: **Salom Šuica, Sarajevo**),

Section 2 Constructions and operating characteristics of machines and devices (led by: Anton Dolenc, Zagreb),

Section 3 Electrical networks and interconnected power systems (led by: Milivoje Rakić, Belgrade),

Section 4 Typification, standardization and regulations for power facilities, machines and devices (led by: Božidar Ribić, Zagreb),

Section 5 Technical and economic issues of power engineering – Dispatch system (led by: Dr. Milan Vidmar, Ljubljana).

At the First conference in 1953, discussions were held about the standardization of 30 or 35 kV voltages and the method of grounding the star point of 110 kV transformers. In continuation of the work of the first conference, on May 28, 1953, the annual Assembly of JUNAKO CIGRE was held. The assembly was led by Prof. Dr. Milan Vidmar. The Board of Directors was then elected, consisting of:

1) President: Dr. Milan Vidmar (Ljubljana)

2) Vice-presidents: Milivoje Rakić (Belgrade), Božidar Ribić (Zagreb), **Salom Šuica (Sarajevo)**

3) General secretary: Herman Mattes (Zagreb)

4) Members: **Emerik Blum (Sarajevo)**, Vekoslav Korošec (Ljubljana), Vojo Kundić (Zagreb), Vladimir Ljubojević (Belgrade), Mihail Manev (Skopje), Milorad Velašević (Podgorica)

5) Supervisory Board composed of: Anton Dolenc (Zagreb), **Čedomir Miličević (Sarajevo)** and Dušan Kornicer (Belgrade).

That's how the JUNAKO CIGRE came to life. After the first conference, others followed so that by 1991 a total of 20 conferences were held. At particular specialized conferences-symposia, power cables and management and informatics were discussed. Round tables and colloquiums were organized as special gatherings.

At the following conferences, the number of sections was increased, in accordance with the then organizational structure of the international CIGRE. Based on the discussions and conclusions in the sections, for some current issues, expert commissions were formed that worked in between conferences. The commissions were the following:

Figure 3.1 Engineer Emerik Blum, founder and first director of Energoinvest, appointed as a member of the Steering committee of JUNAKO CIGRE at the end of May 1953

1. Commission for Transmission Lines (Dr. M. Vidmar),
2. Commission for grounding the neutral point (V. Ljubojević),
3. Commission for Electrification of Agriculture (M. Rakić),
4. Commission for overspeeds, reactances and generator excitation speeds (O. Gros), and
5. Commission for cooperation in the adoption of regulations for power facilties (B. Ribić).

The commissions initiated constant work on current topics, so in that sense they were the forerunners of future study committees. The establishment of study committees began in 1957, that is, after the 3rd conference in Niška Banja. On June 29, 1957, the founding meeting of the Study Committee for Protection and Relays was held. V. Beđanić was elected president, and E. Höfler was elected secretary. At the conference in 1958 in Opatija, problems related to the transition to 220 kV dominated, at which voltage the first plants in Yugoslavia went into operation two years later. In subsequent years, constructions of large generators were discussed; especially modern solutions, their excitation and regulation, and the experiences of the first 220 kV devices were presented. In those years, before the wider campaign of electrification of the railways, issues of single-phase traction also found their place in the discussions at the conferences. On September 12, 1959, the formation of the Study Committee for the 220 kV network of Yugoslavia with president Dr. B. Stefanini and secretary B. Markovčić and the Study Committee for perturbations and disturbances, with president Dr. V. Matković and secretary M.

Savić was completed. Both of these study committees had their first constituent meetings in mid-1960.

At the Seventh Consultation in Bled in 1964, it was concluded that the following study committees will be established:

- For generators (Dr. R. Wolf, Dr. B. Frančić),
- For economic and technical bases for designing (Dr. H. Požar) and
- For the standardization of distribution systems (E. Hadžihalilović, O. Mešić)

In addition, it was concluded that the study committees that had been established until then should be activated. After the Tenth Consultation in Dubrovnik in 1970, the organizational scheme of professional work was changed. According to the model of the organizational scheme of the International CIGRE, 4 sections were established with a total of 13 expert groups and 6 subgroups. A noticeable leap in the quality and scope of activities was made by the reorganization of study committees, which followed the aforementioned reorganization of sections and groups in 1970. Within the framework of the problems of each group established is a study committee that bears the same name and designation as the corresponding group

Views on the 400 kV voltage of the Yugoslav network were discussed at the conference in Vrnjačka Banja in 1968, and in Dubrovnik in 1970 the plan for the construction of the basic 400 kV network of Yugoslavia was presented. Short-circuit problems, system stability, optimal construction of the electrical network of all high voltage levels, optimal construction of hydro and thermal power plants, problems of optimal operation and reduction of losses were a constant topic of consultation. In pipe and reversible hydro generators, SF6 plants, vacuum switches and higher voltage cables were discussed. In addition, the problems of connecting power systems, as well as the reliability of the system as a whole and its individual elements, were discussed. Much has been done, especially through the work of study committees, to improve the construction of transmission lines, relay protection, telecommunications and automation in the electrical industry. The problems of cable technology and IT were discussed at specialized symposia and conferences.

In contrast to CIGRE Paris, JUKO CIGRE, since its foundation, also covered high-voltage distribution issues, which were dealt with by the special Study Committee - Distribution Networks. Until the reorganization of the Distribution Network Study Committee in 1979, it was numbered 41 and then changed to 39, and then from 1989 to 31 because the former study committees 31 and 32 divided their topics into study committees 37, 38 and 39, modeled after CIGRE Paris. This study committee, especially on the international level, was interested in the work of CIRED (Congres International des Reseaux Electriques de Distribution), which deals with distribution issues.

Study committees consider narrow issues and current issues of their field, exchanging professional experiences and opinions, and draw conclusions about technical solutions. Opinions may differ, and conclusions are optional. Other interested parties can also attend the study committee meetings. Due to the coordination of the work of the study committees and the resolution of common issues related to appearances at conferences in the country and abroad during 1972, the Presidency of the Study Committees was established. The first president of the Presidency of Study Committees was Prof. Mihajlo Golubović, then from 1979 academician Prof. Dr. Hrvoje Požar, from 1985 to 1989. Dejan Mandić, and then Mirko Majić.

The issues considered by JUKO CIGRE, at the end of the eighties of the 20th century, were divided into 3 sections and 15 study committees (Stk):

Section I - PLANT ELEMENTS
Stk 11 – Rotating machines
Stk 12 – Transformers
Stk 13 – Switching equipment
Stk 15 – Materials for electrotechnology

Section II - POWERLINES AND PLANTS
Stk 21 – High voltage insulated cables
Stk 22 – Overhead lines
Stk 23 – Substations

Section III - NETWORKS
Stk 31 – Power system distribution
Stk 33 – Power systems insulation coordination
Stk 34 – Power systems protection and local control
Stk 35 – Power systems communications and telecontrol
Stk 36 – Power systems electromagnetic compatibility
Stk 37 – Power systems planning and development
Stk 38 – Power systems analysis and techniques
Stk 39 – Power system operation and control

In order to give recognition and gratitude to its deserving members, the Assembly of JUKO CIGRE establishes a Plaque, which it ceremoniously awards at regular biennial meetings. In order to stimulate the quality of the papers and to give recognition to the authors, the awarding of diplomas was introduced in each group for a particularly noteworthy paper presented at the regular consultation. The first plaques and diplomas were awarded in 1977 at the 13th JUKO CIGRE conference in Bled.

In the period from 1951 to 1991, 20 regular JUKO CIGRE conferences were held, four of which were held in Bosnia and Herzegovina, namely:

– II conference, Sarajevo, 1954,
– VIII conference, Mostar, 1966,

Table 3.1 Overview of JUKO CIGRE conferences for the period 1951-1991

Conference	Location	Year	No. of participants	No. of reports	No. of reports from BiH
I	Ljubljana	1953.	100	19	-
II	Sarajevo	1954.	135	23	2
III	Niška Banja	1956.	205	35	3
IV	Opatija	1958.	253	30	7
V	Ohrid	1960.	291	46	4
VI	Budva	1962.	350	77	5
VII	Bled	1964.	550	93	16
VIII	Mostar	1966.	650	102	21
IX	Vrnjačka Banja	1968.	713	99	16
X	Dubrovnik	1970.	830	163	33
XI	Ohrid	1972.	860	152	12
XII	Budva	1975.	1091	193	32
XIII	Bled	1977.	1170	180	29
XIV	Sarajevo	1979.	1058	185	22
XV	Belgrade	1981.	1016	215	35
XVI	Opatija	1983.	1023	255	46
XVII	Struga	1985.	1110	262	50
XVIII	Bečići	1987.	1330	271	55
XIX	Bled	1989.	1210	283	71
XX	Neum	1991.	-	216	47
	Total			2899	506

– XIV conference, Sarajevo, 1979 and

– XX conference, Neum, 1991.

Experts from Bosnia and Herzegovina in the period of activity of JUKO CIGRE, from 1951 to 1991, published 506 reports, which is 17.5% of the total published reports at all 20 JUKO CIGRE conferences. The last JUKO CIGRE conference was held in Bosnia and Herzegovina, in Neum, in 1991.

Considering the great interest of the cable industry, the Study Committee 21 Power Cables, in the period from 1967 to 1990, organized 12 specialized symposia on the subject of cables. Due to the increasing importance of information technology in the electrical industry, in the period from 1975 to 1990, all eight expert consultations on management and IT were held in Cavtat. In Sarajevo, on October 22 and 23, 1987, a round table on the supply of cities with electricity was organized by the JUKO CIGRE study committees (*High voltage insulated cables, Overhead lines, Substations, Planning of transmission networks and Distribution networks*). The second colloquium (educational) of Study Committee 34 *Power systems protection and local control* (JUKO CIGRE), entitled *Digital protection in the power system*, was held in Sarajevo from May 21 to 26, 1990. Study committee 33 *Power systems insulation coordination* (JUKO CIGRE) and JUGEL organized a *Colloquium on metal-oxide surge arresters and their application* in Sarajevo on October 18 and 19, 1990.

Figure 3.2 8th JUKO CIGRE conference, Mostar, 1966, Sabaher, Wolf, Frančić, Sirotić, Jurković

Figure 3.3 9th conference, Vrnjačka Banja, 1968, Belin, Bosanac, Dolenc, Cihlar, Bek

Figure 3.4 11th conference, Ohrid, 1972, speaker Drago Mijić

Figure 3.5 12th conference, Budva, 1975

Presidents and General Secretaries of JUKO CIGRE

JUKO CIGRE was headed by the following presidents from its founding in 1951 to 1991:

1951–1960.	Prof. Dr. Milan Vidmar, professor at the Faculty of Electrical Engineering and director of Elektroinštitut, Ljubljana
1960–1964.	Vladimir Ljubojević, technical director of ZEPS, Belgrade
1964–1968.	Vekoslav Korošec, director of *Milan Vidmar* institute, Ljubljana
1968–1972.	Prof. Dr. Hrvoje Požar, professor at the Faculty of Electrical Engineering, Zagreb

1972–1975. **Čedomir Miličević, representative in the Federal Assembly, Sarajevo, BiH**

1975–1979. Prof. Milorad Velašević, professor at the Faculty of Electrical Engineering, Titograd

1979–1985. Prof. Dr. Stanimir Jovanovski, professor at the Faculty of Electrical Engineering, Skopje

1985–1989. Prof. Dr. Božidar Frančić, president of SOUR *Rade Končar*, Zagreb

1989–1991. **Dr. Jovo Mandić, vice president of the Management Board, Power sector, Energoinvest, Sarajevo**

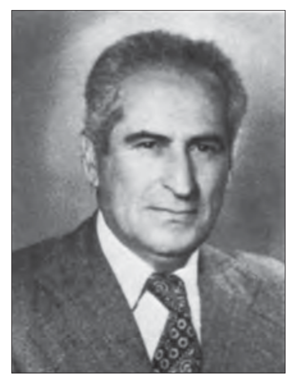
Prof. Dr. Milan Vidmar
1951–1960

Vladimir Ljubojević
1960–1964

Vekoslav Korošec
1964–1968

Prof. Dr. Hrvoje Požar
1968–1972

Čedomir Miličević
1972–1975



Prof. Milorad Velašević
1975–1979

Prof. Dr. Stanimir Jovanovski
1979–1985

Prof. Dr. Božidar Frančić
1985–1989

Prof. Dr. Jovo Mandić
1989–1991

Figure 3.6 Presidents of JUKO CIGRE

From the founding of JUKO CIGRE until his death in 1976, the General Secretary was Herman Mattes. Then Boris Markovčić was elected general secretary, who remained in that position until 1989, when he was replaced by Dr. Zorko Cvetković.

General Secretaries of JUKO CIGRE in the period from 1951 to 1991 were:

Herman MATTES, B.Sc. Eng. (1951–1976)
Boris MARKOVČIĆ, B.Sc. Eng. (1976–1989)
Zorko CVETKOVIĆ, Ph.D. Eng. (1989–1991)

Figure 3.7 General secretaries of JUKO CIGRE

Activities in the Umbrella Organization CIGRE in Paris

In addition to the described extensive activity at conferences, symposia and in study committees in Yugoslavia, JUKO CIGRE maintained constant ties with the parent International organization CIGRE in Paris and was constantly internationally active. The international activity of JUKO CIGRE was especially strengthened in the eighties of the last century thanks to the dedicated work of the activists of the study committees. JUKO CIGRE, considering the sufficient number of individual and collective members from Yugoslavia who joined CIGRE Paris, managed to maintain the status of a national committee, with all the positive consequences. The members themselves directly benefited from this membership, because at that time they received the highly technical *Electra* journal, as well as discounts on the purchase of CIGRE editions and discounts on registration fees for meetings.

About thirty members of JUKO CIGRE regularly came to the biennial CIGRE conferences in Paris. By staying at the meeting in Paris, Yugoslav power engineers were able to get acquainted with top technical achievements in the field of power systems and to make valuable acquaintances with leading international experts. At symposia around the world, organized by individual study committees of CIGRE Paris, with a narrower theme, the number of JUKO CIGRE members was much smaller.

After the first appearance of the JUKO CIGRE delegation at the 13th CIGRE Paris conference in 1950, cooperation in international study committees (SC) began. Until the reorganization of SC in 1966, Yugoslavia had only one official member (Dr. J. Obradović) in SC *Design and grid operation*, but Yugoslavian experts, also collaborated in other SC. Special mention should be made of participation in the SC *Protection and relays* gatherings. After the reorganization of SC CIGRE Paris, JUKO CIGRE has a representative in SC 15 *Materials for electrotechnology* (S. Muren), and since 1974 also in SC 22 *Overhead lines* (R. Škarica).

In the following years, members of JUKO CIGRE participated in three SC, namely no. 22 – *Overhead lines*, no. 23. – *Substations* and no. 34. – *Protection*, that at the end of the eighties, JUKO CIGRE would have 7 representatives in the study committees of CIGRE Paris.

When, in the early eighties, more intensive cooperation of Yugoslavian experts with SC began, an idea emerged of JUKO CIGRE also hosting some SC conferences. The first to achieve this was Stk No. 34 – *Power systems protection and local control*, which organized a meeting of the same SC (Meeting CIGRE SC 34 – *Protection*) in Ljubljana from 16 to 18 September 1985 with the participation of 64 experts from 21 countries.

In the following years, in the former Yugoslavia, two international working groups (Working Group CIGRE) met. In Sarajevo, from March 10 to 11, 1987, a meeting of the Working Group SC no. 22 – *Overhead lines* (WG 29.09) and in Dubrovnik from May 17 to 18, 1988 Working group SC no. 34 – *Protection* (WG 24.02).

In 1989, two SC meetings were held in Sarajevo:

– JUKO CIGRE organized the Stk 13 meeting from May 22 to 27;

– *Switching equipment* of the SC of the same name (Colloquium CIGRE SC – 13 *Switching Equipment*) attended by 101 participants from 25 countries;
– In the fall of the same year, from October 8 to 13, SC no. 22 – *Overhead lines* met (Meeting CIGRE SC 22 – *Overhead lines and Transmission line open Conference*) organized by Stk no. 22 JUKO CIGRE. On that occasion, a special Proceedings of Yugoslav experts was published in English. The meeting was attended by 150 experts from 30 countries.

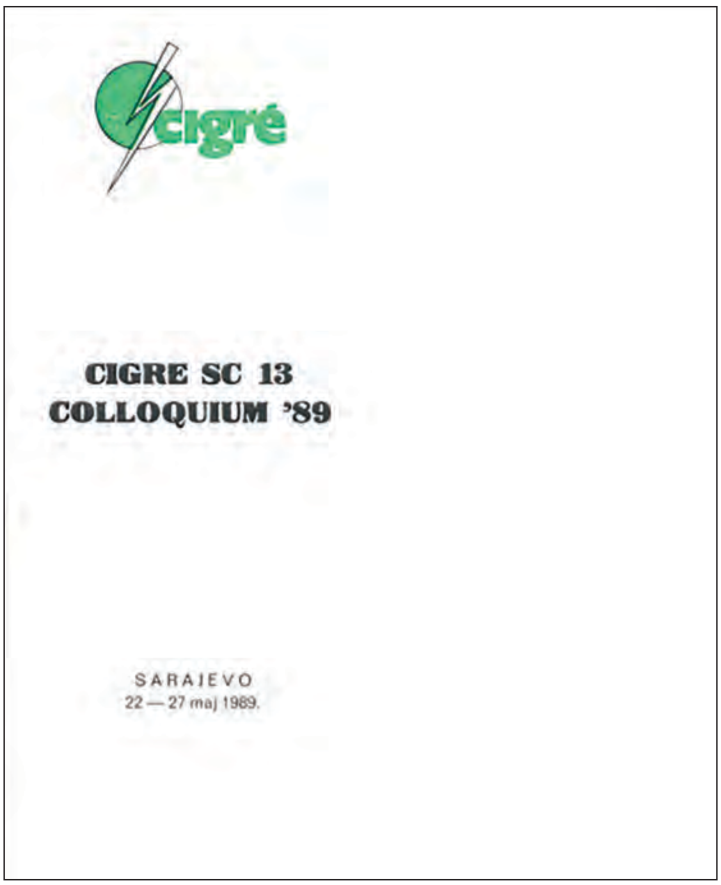


Figure 3.8 Colloquium of Study Committee 13, SWITCHING EQUIPMENT CIGRE Paris, Sarajevo, 1989

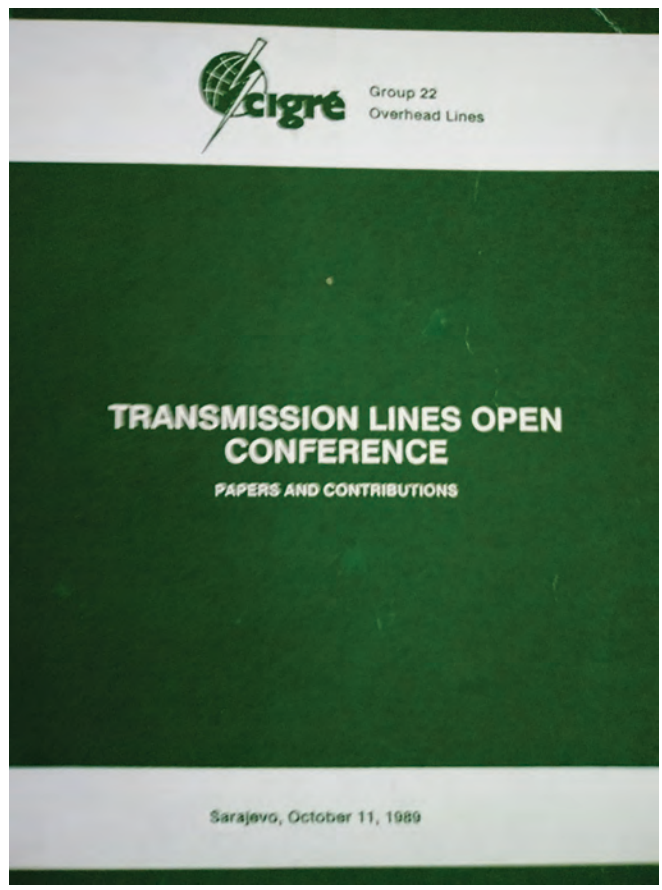


Figure 3.9 Proceedings "Overhead Lines and Transmission Line Open Conference", Sarajevo, 1989

Out of a total of 25 papers published on behalf of JUKO CIGRE at CIGRE Paris, in the period from 1950 to 1990, experts from Bosnia and Herzegovina published 4 reports at the sessions of CIGRE Paris, namely:

29th session of the International CIGRÉ, 1982.

M. Veledar, Ž. Timić, S. Skok, Z. Firšt, *Improvement of grounding properties by using bentonite*

30th session of the International CIGRÉ, 1984.

S. Sadović, M. Heleta, M. Abadžić, S. Djulić, *Computer and experimental investigations of switching overvoltages on HV transmission lines*

31st session of the International CIGRÉ, 1986.

M. Kezunović, S. Kreso, P. Vujović, B. Peruničić, S. Sadović, *Application of digital computer technology to the implementation and testing of an integrated substation protection and control system*

32nd session of the International CIGRÉ, 1988.

S. Nuić, Ž. Timić, M. Veledar, N. Vučinić, S. Sadović, *Reduction of sizes for 400kV transmission line tower*

Contribution of Experts and Companies from Bosnia and Herzegovina to the Development of Yugoslav Power Engineering

The issues that were dealt with in the framework of the work of JUKO CIGRE were always related to the current problems of the Yugoslav power industry. The main preoccupation of JUKO CIGRE is the planning and operation of the Yugoslav electric power system. The study committees are structured in such a way that technical problems of the elements of the power transmission system as well as the system as a whole can be studied within the framework of one organization, from the point of view of the power utility company and the electrical industry. This gives the experts the opportunity to, among other things; coordinate the technical parameters of the equipment needed by the power utility company, opening up the possibility of domestic production. It should be emphasized that JUKO CIGRE dealt with technical issues of the electric power system by exchanging experiences and making recommendations, while the policy of development and operation was the subject of the power utility companies. A special contribution to the development of JUKO CIGRE was made by prominent experts, companies and organizations from Bosnia and Herzegovina.

Affirmed and experienced engineers from Bosnia and Herzegovina, in addition to writing papers and presenting their expert standpoints, working in special study committees, got acquainted with the current problems of the electric power industry, exchanged experiences and made valuable contributions to the development of the electric industry. Contributions were made by companies and organizations from Bosnia and Herzegovina that facilitated and/or conducted appropriate research. Our experts from Bosnia and Herzegovina deepened their knowledge and helped to coordinate the technical parameters of the equipment needed by the electrical industry, in order to start domestic production. Interested experts from Bosnia and Herzegovina, from the electrical industry, electrical industry and faculties, participating in the work of JUKO CIGRE, had wide opportunities for their professional training and raising their technical culture. Energoinvest Sarajevo, Elektroprivreda BiH and faculties, as well as other Bosnian and Herzegovinian organizations and their experts, made an immeasurable contribution to the development of the Yugoslav power industry. To point out especially here the institutes and laboratories that operated within the Energoinvest Sarajevo. On the way of its development, Energoinvest left its mark through exceptional solutions in the field of energy. From its humble beginnings to an economic giant and a driver of development, Energoinvest has based its success on knowledge and incredible persistence. The founder and long-time director of Energoinvest was engineer Emerik Blum, a great visionary and manager who, at its beginnings, back in 1951, with 138 employees, began to write the history of this company, first under the name Elektroprojekt (since January 1, 1959, Energoinvest) with the intention of designing hydro and thermal power plants. According to records from 1952, Elektroprojekt was one of 13 collective members of JUKO CIGRE.

Engineer Emerik Blum was an extraordinary human and managerial greatness with incredible work energy. His vision of Energoinvest was a global company capable of independently designing, producing investment equipment and building power and industrial plants. From the beginning, he was aware that without people, knowledge and communication with the world, it is difficult to achieve something great. This is confirmed by his statements: *People are the foundation of everything... without them, nothing works, not even computers* or *the Faculty is our most important factory*. His spirit and innate energy were not satisfied with small successes. Emerik Blum is the creator of the idea of founding and developing many technical faculties and institutes that produced the potential personnel needed by Energoinvest. Already two years after its establishment, Energoinvest's engineers were able to design large power plants. Under the leadership of Emerik Blum and thanks to his vision, the company Energoinvest crosses the borders of the country and achieves incredible success on its development path.

However, it should be noted that the hydroelectric plants Jablanica, Rama, Jajce I and II and Dubrovnik, and later many others, were designed in the offices of this company. The Thermal bureau designed and carried out works and supervision on the largest thermal power plants in BiH, TPP Kakanj and TPP Tuzla, but also abroad. The Bureau for Transmission Lines has designed and built tens of thousands of kilometres of transmission lines, ranging from

10 kV to 400 kV. Energoinvest's test station for transmission poles successfully tested the mechanical characteristics of many types of transmission poles and foundations. To this should be added electrical equipment and hundreds of substations of all voltages. Energoinvest's Energy Research and Development Center should be highlighted in particular (IRCE).

The establishment of IRCE marked the beginning of a new period in the independent development and production of power equipment within Energoinvest. IRCE experienced its peak in the period from 1980 to 1992, during which decades of experience in research and development of electric power equipment, as well as numerous theoretical and experimental researches in the field of electric power, were interwoven. From the aforementioned research activities, a significant number of development projects resulted, which are reflected in the production of new generations of switching equipment intended for Energoinvest's production facilities: SF6 high-voltage circuit breakers of voltage level 72.5–420 kV; SF6 high-voltage metal-shielded plants 72.5–420 kV; SF6 current and voltage metering transformers 123–420 kV; SF6 medium voltage switches 12–36 kV; development of different types of high-voltage disconnectors for voltage levels 12–420 kV.

Through its work and achieved results, IRCE has affirmed and established itself as a leading organization in the field of electric power, so that some experts of this Institute were leading members of all significant professional organizations in the former Yugoslavia. Energoinvest's laboratory complex should be highlighted in particular, which was involved in the research of phenomena in the power industry, but also in the development, typical and special testing of electrical equipment. The High Voltage Laboratory in Lukavica performed dielectric tests with impulse and drive frequency voltages, while the High Power Laboratory in Visoko performed short-circuit tests of the interrupting power of power equipment. Research in these laboratories has resulted in the development of new electrical equipment, while the results have been published in journals and at conferences, a significant number of which have been published within CIGRE. These laboratories, especially in the eighties of the last century, significantly contributed to the promotion of experts from Bosnia and Herzegovina. The high voltage laboratory in Lukavica is still in operation today and is owned by the mixed holding Elektroprivreda RS Trebinje, but it only performs a limited number of tests due to lack of work. The Visoko High Power Laboratory has been dismantled and no longer exists. The development of the transmission line sector at Energoinvest was also contributed by the Testing Station for Transmission Line Poles at Alipašin Most, which is in operation, but performs a limited number of tests due to lack of work.

Figure 3.10 Teachers and associates of the Faculty of Electrical Engineering in Sarajevo, Lukavica, 1986

Figure 3.11 High voltage laboratory in Lukavica

Figure 3.12 Associates from Energoinvest's high voltage laboratory, Sarajevo, 1982.
Top row: Živojin Timić, Meludin Veledar, Goran Bogdanović, Mladen Tajšanović, Nedžad Bajraktarević, Nenad Gogić, Zoran Rimac, Muhamed Šišić and Munib Gadžo
Bottom row: Alija Smaka, Tomislav Halilović, Goran Haler, Nihad Dilberović, Miroslav Ljevak, Alojz Buntić, Hajra Borovina, Salko Bajrović and Dragan Novaković

Figure 3.13 Associates from Energoinvest's high voltage laboratory, Sarajevo, 1984

Figure 3.14 Energoinvest's high-power laboratory, a) protection breaker, 1985

Figure 3.15 Energoinvest's high power laboratory, b) test transformers, 1985

Figure 3.16 Energoinvest's high power laboratory, c) medium voltage plant, 1985

Figure 3.117 Energoinvest's high-power laboratory, d) ballasts for adjustment of short-circuit currents, 1985

Figure 3.18 Energoinvest's high-power laboratory, e) control room, 1985

Figure 3.19 Energoinvest's test station for transmission poles, Alipašin Most
a) Preparation for the test (left), b) Testing the bearing capacity of the power line pole (right)

4

Development Path of BH K CIGRE (1992–2022)

Founding of BH K CIGRE

BH K CIGRE was founded on August 23, 1992 in Sarajevo at the Provisional Founding Assembly. At the Provisional Founding Assembly, the management of the Bosnia and Herzegovina Committee of the CIGRE International Council – BH K CIGRE, the presidents of the study committees and the delegation to participate in the 34th session of CIGRE Paris were elected. At the 34th session, the delegation of BH K CIGRE, led by Edhem Bičakić, was welcomed by the Secretary General, Mr. Yves Porcheron. General Secretary Porcheron gave strong support to BH K CIGRE and enabled our delegation to present the electricity situation in Bosnia and Herzegovina at the CIGRE General Assembly session. This resulted in the acceptance of BH K CIGRE into full membership of CIGRE at the next session of the Administrative Council in March 1993. Thus, BH K CIGRE became the first non-governmental organization in Bosnia and Herzegovina to achieve its full membership in an international umbrella organization.

Since 1993, the Bosnia and Herzegovina Committee of the International Council has been a regular member of CIGRE and its members participate in its work through administrative bodies, participate in working groups and through papers at sessions and colloquiums. CIGRE President Michel Chamia visited BH K CIGRE during 1998. General Secretary Jean Kowal attended the sixth conference of BH K CIGRE in 2003, and President André Merlin attended the Ninth Conference of BH K CIGRE in 2009. The current president of BH K CIGRE, Edhem Bičakčić, was admitted to the Administrative Council of CIGRE at the General Assembly of CIGRE Paris, held on August 22, 2016 in Paris.

Study committees are the basic form of organizing and connecting members of BH K CIGRE. As a rule, the number of study committees and the content of their work corresponds to the study committees of CIGRE Paris. The scope of work of each study committee is defined in accordance with the areas of activity of CIGRE Paris study committees. So far, BH K CIGRE has successfully organized six crucial international gatherings in Bosnia and Herzegovina. Authors from Bosnia and Herzegovina have published 10 papers at CIGRE sessions in Paris since 2000. A significant number of our members participated in the work of CIGRE working groups.

With the breakup of Yugoslavia, the work of the Yugoslav Committee of CIGRE (JUKO CIGRE) ceased, and seven national committees were formed, which continued their work and achieved continuity of membership in the CIGRE International Council and are included in the group of older national committees of the International CIGRE, legal successors of JUKO CIGRE. They are: BH K CIGRE (Bosnia and Herzegovina), CG KO CIGRE (Montenegro), HO CIGRE (Croatia), Kosovo CIGRE (Kosovo), MAKO CIGRE (Macedonia), Slovenian Forum of Electricians CIGRE – CIRED (Slovenia) and CIGRE Serbia (Serbia).

Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE – BH K CIGRE is the largest professional, non-governmental, independent and voluntary organization in Bosnia and Herzegovina. It was founded on August 23, 1992, and since August 1993 it has been a full member of the International Council on Large Electrical Systems – CIGRE.

At the First Founding Assembly of the Bosnia and Herzegovina CIGRE Committee, held on August 23, 1992, the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems – BH K CIGRE was founded, whose founders are:

Dr. Rusmir Mahutćehajić
Dr. Salih Čaršimamović
Dr. Alija Muharemović
Dr. Rasim Gačanović
Edhem Bičakčić
Sabaheta Sadiković
Zoran Dragnić
Mr. Luka Deak
Zaim Karamehmedović
Mirsad Fazlinović
Prof. Franjo Božuta
Prof. Avdo Džumrukčić
Mr. Miroslav Vuković
Malik Kulender
Mirsad Brajlović
Afan Mešić
Branislav Erić
Enver Kreso
Alija Isaković
Mr. Nedžad Rašidbegović
Mustafa Jašić
Ekrem Demirović
Mr. Mensur Lačević
Jusuf Krvavac
Sejfo Taljić
Nedžad Smailbegović
Drago Kecman
Slobodan Primorac
Mr. Sedina Erić
Amira Puzić
Veseljko Dragnić
Dubravka Nikolić
Mr. Nikola Rusanov

VIŠI SUD U SARAJEVU
BROJ: R-IV-2/92
Sarajevo, ol.12.1992. godine

VIŠI SUD U SARAJEVU u vijeću sastavljenom od sudije Babić Sulje kao predsjednika vijeća, sudija Eterović Zdenke i Debevec Dušana kao članovavijeća, odlučujući i vanparničnom postupku po zahtjevu BOSANSKOHERCEGOVAČKOG KOMITETA MEDJUNARODNE KONFERENCIJE ZA VELIKE VISOKONAPONSKE ELEKTRIČNE SISTEME-CIGRE za upis u registar kod ovoga suda, dana ol.12.1992. godine, donio je slijedeće

R J E Š E NJ E

1. UPISUJE SE u registar kod ovoga suda BOSANSKOHERCEGOVAČKI KOMITET MEDJUNARODNE KONFERENCIJE ZA VELIKE VISOKONAPONSKE ELEKTRIČNE SISTEME - CIGRE sa sjedištem u Sarajevu ulica Kralja Tomislava 3.

   Upis je izvršen pod reg.broj R-IV-2/92, knjiga četvrta registra, dana ol.12.1992. godine.

2. Ciljevi i zadaci BOSANSKOHERCEGOVAČKOG KOMITETA MEDJUNARODNE KONFERENCIJE ZA VELIKE VISOKONAPONSKE ELEKTRIČNE SISTEME - CIGRE su:

- prati i unapredjuje razvoj u pojedinim užim područjima svog rada. U tom cilju formira Studijske komitete i Radne grupe,
- organizira stručne skupove - savjetovanja, simpozije, kolokvije, seminare i dr.,
- sudjeluje u radu CIGRE-Paris, njenih organa i radnih tijela, u svojstvu redovnog člana sa svim pravima u upravljanju, a rezultate koje u tom radu dobije stavlja na raspolaganje svojim članovima,
- uspostavlja saradnju s asocijacijama i pojedincima koji su zainteresirani za program rada kojim se bavi BiH K CIGRE,
- razvija i unapredjuje sistem informisanja i vrši razmjenu informacija objavljivanjem materijala i preporuka sa svojih stručnih manifestacija,
- izdaje i pomaže izdavati znanstvene i stručne publikacije iz svog domena rada,
- osigurava finansijska sredstva potrebna za svoj rad,
- podstiče i sudjeluje u stručnom osposobljavanju svojih članova.

3. BOSANSKOHERCEGOVAČKI KOMITET MEDJUNARODNE KONFERENCIJE ZA VELIKE VISOKONAPONSKE ELEKTRIČNE SISTEME - CIGRE u cilju sticanja sredstava za vršenje svoje aktivnosti obavljaće djelatnost predvidjenu svojim Statutom a u skladu sa Zakonom.

4. BOSANSKOHERCEGOVAČKI KOMITET MEDJUNARODNE KONFERENCIJE ZA VELIKE VISOKONAPONSKE ELEKTRIČNE SISTEME - CIGRE djeluje na teritoriji Republike Bosne i Hercegovine, a danom upisa u registar kod ovoga suda stiče svojstvo društvenog pravnog lica.

- 2 -

5. BOSANSKOHERCEGOVAČKI KOMITET MEDJUNARODNE KONFERENCIJE ZA VELIKE VISOKONAPONSKE ELEKTRIČNE SISTEME - CIGRE dužan je u roku od 15 dana prijaviti ovome sudu svaku promjenu Statuta i Programa rada koje nastanu nakon donošenja ovoga rješenja, odnosno dužan je postupiti u skladu sa članom 15 stav 3 Zakona o udruženju gradjana.

6. Lice ovlašteno za zastupanje i predstavljanje BOSANSKOHERCEGOVAČKOG KOMITETA MEDJUNARODNE KONFERENCIJE ZA VELIKE VISOKONAPONSKE ELEKTRIČNE SISTEME - CIGRE je

   - prof.dr. Rusmir Mahmutčehajić, dipl.el.ing.

O B R A Z L O Ž E NJ E

BOSANSKOHERCEGOVAČKI KOMITET MEDJUNARODNE KONFERENCIJE ZA VELIKE VISOKONAPONSKE ELEKTRIČNE SISTEME - CIGRE podnio je ovome sudu ol.12.1992. godine zahtjev za registraciju i upis u registar udruženja kod ovog suda. Uz zahtjev je priložena dokumentacija predvidjena Zakonom o udruživanju gradjana i Pravilnikom o jedinstvenom registru udruženja.

U provedenom postupku sud je utvrdio da su ispunjene sve zakonske pretpostavke za registraciju napred navedenog udruženja pa je primjenom odredaba člana 12 i 13 Zakona o udruživanju gradjana odlučio kao u izreci ovoga rješenja.

PREDSJEDNIK VIJEĆA
S u d i j a
Babić Suljo

POUKA: Podnosilac zahtjeva i Više javno tužilaštvo mogu izjaviti žalbu Vrhovnom sudu R BiH u roku od 15 dana, a ista se podnosi ovome sudu u tri primjerka.

Figure 4.1 Decision of the High Court in Sarajevo on the entry of the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE into the Register

Managements of BH K CIGRE

Presidents

BH K CIGRE was headed by Prof. Dr. Rusmir Mahmutćehajić from its foundation until 2015, and since 2015, by Edhem Bičakčić.

Figure 4.2 Prof. Dr. Rusmir Mahmutćehajić

Figure 4.3 Edhem Bičakčić

Temporary bodies of the Executive Board of BH K CIGRE (1992–1995)

President: Prof. Dr. Rusmir Mahmutćehajić, B.Sc. Electrical Engineering
Vice President: Dr. Salih Sadović, B.Sc. Electrical Engineering

Study committees – presidents

STK 11 *Rotating machines* – Prof. Dr. Milan Zečević, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo;
STK 12 *Transformers* – Ninoslav Vidović, B.Sc. Electrical Engineering, JP EP BiH Elektroprijenos, Sarajevo;
STK 13 *Switching equipment* – Dr. Zoran Gajić, B.Sc. Electrical Engineering, Energoinvest IRCE, Sarajevo;

STK 15 *Materials for electrotechnology* – Dr. Kemo Sokolija, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo;

STK 21 *High voltage insulated cables* – Malik Kulender, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo;

STK 22 *Overhead lines* – Nikola Vučinić, B.Sc. Electrical Engineering, Energoinvest, Sarajevo;

STK 23 *Substations* – M.Sc. Mensur Lačević, B.Sc. Electrical Engineering, Electroforce, Sarajevo;

STK 31 *Power system distribution* – Milivoje Tomić, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo;

STK 33 *Power systems insulation coordination* – Dr. Mirsad Raščić, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo;

STK 34 *Power systems protection and local control* – Prof. Dr. Franjo Božuta, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo;

STK 35 *Power systems communications and telecontrol* – M.Sc. Luka Deak, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo;

STK 36 *Power systems electromagnetic compatibility* – Dr. Rasim Gačanović, B.Sc. Electrical Engineering, Ministry of Energy, Mining and Industry of the Republic Bosnia and Herzegovina;

STK 37 *Power systems planning and development* – M.Sc. Sedina Erić, B.Sc. electrical engineering, JP EP BiH, Sarajevo;

STK 38 *Power systems analysis and techniques* – Dr. Salih Sadović, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo;

STK 39 *Power system operation and control* – Dr. Mensur Hajro, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo.

Members of the Supervisory Board

Boro Bjelobrk, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo;

Dr. Alija Muharemović, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo;

Veseljko Đurđević, B.Sc. Electrical Engineering;

Dr. Salih Čaršimamović, B.Sc. Electrical Engineering, Ministry of Energy, Mining and industry of the Republic of BiH;

Slobodan Primorac, B.Sc. Electrical Engineering, JP EP BiH.

Bodies of the Bosnia and Herzegovina CIGRE Committee (1995–2015)

Bodies of the Bosnia and Herzegovina CIGRE Committee are:

Assembly – all members of BH K CIGRE;
Presidency (after 2011 Council);
Management Board (prior to 1999, the Executive Board consisted of vice-presidents, presidents of STK and members of the Executive Board from the ranks of scientific and professional workers);
Supervisory Board.

President of the Bosnia and Herzegovina CIGRE Committee

Prof. Dr. Rusmir Mahmutćehajić, B.Sc. Electrical Engineering 1992–2015

Presidency/Council of the Bosnia and Herzegovina CIGRE Committee

Prof. Dr. Rusmir Mahmutćehajić, B.Sc. electrical engineering, president 1995–2015
Academician Prof. Dr. Božidar Matić, B.Sc. Electrical Engineering, Academy of Sciences and Arts of BiH 1995–2007
Academician Prof. Dr. Zijo Pašić, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo 1995–2015
Doc. Dr. Mirza Kušljugić, B.Sc. Electrical Engineering, Faculty of Electrical and Mechanical Engineering, Tuzla 1995–2007
Mr. Josip Jerković, B.Sc. Electrical Engineering, JP Elektroprivreda HZ HB, Mostar 2003–2007
Mr. Ognjen Marković, B.Sc. Electrical Engineering, JP EP BiH, Elektroprijenos, Sarajevo 2007–2011
Jakub Viteškić, B.Sc. Electrical Engineering, Energoinvest IDV, Sarajevo 2007–2011
Dr. Nediljko Bilić, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo 2007–2011
Branko Antunović, B.Sc. Electrical Engineering, JP Elektroprivreda HZ HB, Mostar 2007–2015
Zdenko Vukić, executive director for system operation and maintenance, Elektroprijenos a. d. BiH 2007–2015

Enver Kreso, B.Sc. Electrical Engineering, general manager,
JP Elektroprivreda BiH, Sarajevo 2007–2009
Edhem Bičakčić, B.Sc. Electrical Engineering,
JP Elektroprivreda BiH, Sarajevo 2009–2010
Amer Jerlagić, B.Sc. Electrical Engineering, general manager,
JP Elektroprivreda BiH, Sarajevo 2009–2011
Hilmo Šehović, B.Sc. Electrical Engineering,
JP Elektroprivreda BiH, Sarajevo 2010–2011
Zahrudin Sikira, B.Sc. Electrical Engineering,
JP Elektroprivreda BiH, Sarajevo 2011–2011
Dr. Elvedin Grabovica, general manager,
JP Elektroprivreda BiH, d. d. Sarajevo 2011–2015
Mr. Enver Agić, President of the Supervisory Board,
JP Elektroprivreda BiH, d. d. Sarajevo 2011–2015
Mr. Vinko Bošnjak, JP Elektroprivreda BiH, d.d. Sarajevo,
Elektrodistribucija, Zenica 2011–2015
Mr. Enes Čengić, B.Sc. Electrical Engineering, chief director,
Energoinvest, d. d. Sarajevo 2011–2011
Mr. Džemail Vlahovljak, B.Sc. Electrical Engineering, chief director,
Energoinvest, d. d. Sarajevo 2011–2015
Mato Žarić, general manager,
JP Elektroprivreda HZ HB, d. d. Mostar 2011–2011
Nikola Krešić, general manager,
JP Elektroprivreda HZ HB, d. d. Mostar 2011–2015
Dr. Nasuf Hadžiahmetović,
JP BH Telecom, d. d. Sarajevo 2011–2015
Mr. Azra Hajro, executive director for planning
and engineering, Elektroprijenos, a. d. BiH 2011–2015
Dr. Mensur Hajro, professor,
Faculty of Electrical Engineering, University of Sarajevo
2011–2015
Dr. Tatjana Konjić, professor, University of Tuzla,
Faculty of Electrical Engineering 2011–2015
Dr. Sulejman Mešalić, JP Elektroprivreda BiH, d.d.
Sarajevo, Thermal Power Plant Tuzla 2011–2015
Dubravka Nikolić, Inghydro d. o. o. 2011–2015
Ervin Vrdoljak, member of the Supervisory Board,
JP Elektroprivreda HZ HB, d. d. Mostar 2011–2015
Srećko Vučina, JP Elektroprivreda HZHB, d. d. Mostar 2011–2015

Executive Board of the Bosnia and Herzegovina CIGRE Committee

The Executive Board consists of the president, vice-presidents, STK presidents and members of the Executive Board from the ranks of scientific and professional workers.

Vice Presidents of the Executive Board of BH K CIGRE

Slobodan Primorac B.Sc. Electrical Engineering,
JP Elektroprivreda BiH, d. d. Sarajevo 1992–1993
Prof. Dr. Božidar Krstajić, B.Sc. Electrical Engineering,
Faculty of Electrical Engineering, Sarajevo 1992–1993
Dr. Kemo Sokolija, B.Sc. Electrical Engineering,
Faculty of Electrical Engineering, Sarajevo 1992–2011
Mr. Ognjen Marković, B.Sc. Electrical Engineering,
JP EP BiH, Elektroprijenos, Sarajevo 1993–2007
Mr. Miroslav Ljevak, B.Sc. Electrical Engineering,
Energoinvest, Sarajevo 1993–1995
Sabaheta Sadiković, B.Sc. Electrical Engineering,
JP EP BiH, Sarajevo 1995–2011
Krunoslav Putica, B.Sc. Electrical Engineering,
Energoinvest, IEE, Sarajevo 1995–2007
Dr. Mirza Kušljugić, B.Sc. Electrical Engineering,
Faculty of Electrical and Mechanical Engineering, Tuzla
1995–2011
Josip Kreh, B.Sc. Electrical Engineering, JP EP BiH,
Elektrodistribucija, Zenica 1995–2015
Savo Nikolić, B.Sc. Electrical Engineering,
JP EP BiH Elektroprijenos, Sarajevo 1995–2012
Himzo Ćosić, B.Sc. Electrical Engineering,
JP EP BiH, Hydropower plants on Neretva 1995–1999
Dr. Mensur Hajro, B.Sc. Electrical Engineering,
Faculty of Electrical Engineering, Sarajevo 2007–2011
Dr. Rasim Gačanović, B.Sc. Electrical Engineering,
Faculty of Electrical Engineering, Sarajevo 2007–2011
Duško Vicković, B.Sc. Electrical Engineering,
JP EP BiH, Sarajevo 2007–2011
Srećko Vučina, B.Sc. Electrical Engineering,
JP Elektroprivreda HZ HB, Mostar 2007–2011

Dr. Fadil Nadarević, B.Sc. Electrical Engineering,		
	JP EP BiH, TE Tuzla	2011–2015
Dr. Tatjana Konjić, B.Sc. Electrical Engineering,		
	Faculty of Electrical Engineering, Tuzla	2012–2015
Mr. Nikola Rusanov, pensioner		
	JP EP BiH/NOS BiH	2015–2019

Study committees – presidents

STK 11	*Rotating machines*	
	Dr. Šemsudin Mašić, B.Sc. Electrical Engineering,	
	Faculty of Electrical Engineering, Sarajevo	1993–2002
STK 12	*Transformers*	
	Ninoslav Vidović, B.Sc. Electrical Engineering,	
	JP EP BiH Elektroprijenos, Sarajevo	1993–2002
STK 13	*Switching equipment*	
	Mr. Mirsad Kapetanović, B.Sc. Electrical Engineering,	
	Energoinvest IRCE, Sarajevo	1993–2002
STK 14	*DC connections and power electronics*	
	Dejan Grubić, B.Sc. Electrical Engineering,	
	Energoinvest, Sarajevo	1994–1996
	Ekrem Poljskić	1996–1997
	Mustafa Vatrenjak, B.Sc. Electrical Engineering,	
	Energoinvest, Sarajevo	1997–1999
	Dr. Nijaz Hadžimejlić, B.Sc. Electrical Engineering,	
	Faculty of Electrical Engineering Sarajevo	1999–2002
STK 15	*Materials for electrotechnology*	
	Dr. Kemo Sokolija, B.Sc. Electrical Engineering,	
	Faculty of Electrical Engineering, Sarajevo	1993–2002
STK 21	*High voltage insulated cables*	
	Malik Kulender, B.Sc. Electrical Engineering,	
	JP EP BiH, Sarajevo	1993–2002
STK 22	*Overhead lines*	
	Bajro Isaković, B.Sc. Electrical Engineering,	
	JP EP BiH, Sarajevo	1993–2000
	Ismet Orahovac, B.Sc. Electrical Engineering,	
	Energoinvest IDV	2000–2002

STK 23	*Substations*	
	Mr. Mensur Lačević, B.Sc. Electrical Engineering,	
	Electroforce Sarajevo	1993–2001
STK 31	*Power system distribution*	
	Milivoje Tomić, B.Sc. Electrical Engineering,	
	JP EP BiH, Sarajevo	1993–2002
STK 33	*Power systems insulation coordination*	
	Dr. Salih Čaršimamović, B.Sc. Electrical Engineering,	
	Faculty of Electrical Engineering, Sarajevo	1993–2002
STK 34	*Power systems protection and local control*	
	Prof. Dr. Franjo Božuta, B.Sc. Electrical Engineering,	
	JP EP BiH, Sarajevo	1993–1996
	Mr. Božo Perkić, B.Sc. Electrical Engineering,	
	Ministry of Tuzla Canton	1996–1999
	Prof. Dr. Zijo Pašić, B.Sc. Electrical Engineering,	
	Faculty of Electrical Engineering, Sarajevo	1999–2002
STK 35	*Power systems communications and telecontrol*	
	Mr. Luka Deak, B.Sc. Electrical Engineering,	
	JP EP BiH, Sarajevo	1993–1995
	Zahid Turbić, B.Sc. Electrical Engineering,	
	JP EP BiH, Sarajevo	1995–1999
	Mevludin Hadžimehmedagić, B.Sc. Electrical Engineering,	
	JP EP BiH, Sarajevo	1999–2002
STK 36	*Power systems electromagnetic compatibility*	
	Dr. Rasim Gačanović, B.Sc. Electrical Engineering,	
	Federal Ministry of Transport and Communications	1993–2002
STK 37	*Power systems planning and development*	
	Mr. Sedina Erić, B.Sc. Electrical Engineering,	
	JP EP BiH, Sarajevo	1993–1995
	Aćif Hadrović, B.Sc. Electrical Engineering,	
	JP EP BiH, Sarajevo	1995–2002
STK 38	*Power systems analysis and techniques*	
	Mr. Nikola Rusanov, B.Sc. Electrical Engineering,	
	JP EP BiH, Sarajevo	1993–2002
STK 39	*Power system operation and control*	
	Dr. Mensur Hajro, B.Sc. Electrical Engineering,	
	Faculty of Electrical Engineering, Sarajevo	1993–2002

In accordance with the reorganization of study committees of the International CIGRE, presented at the General Assembly of International CIGRE, and based on the decision of the Administrative Council and Technical Committee of the International CIGRE, adopted after discussions within the national committees, and articles 6 and 24 of the Statute of BH K CIGRE, the Administrative board at the 48th session held on September 26, 2002, adopted the Decision on the reorganization of the study committees. Based on Article 13 of the Statute of the Bosnia and Herzegovina CIGRE Committee, the Presidency had passed the Decision on the election of the president and vice-president of the study committees of BH K CIGRE.

Study committees – presidents

STK A1	*Rotating electrical machines*	
	Dr. Šemsudin Mašić, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo	2002–2015
	Vedad Korajlić, B.Sc. Electrical Engineering, JP EP BiH, Hydropower plants on Neretva	2015–
STK A2	*Transformers*	
	Ninoslav Vidović, B.Sc. Electrical Engineering, pensioner Elektroprijenos, OP Sarajevo	2002–2015
	Mr. Mirza Dževlan, B.Sc. Electrical Engineering, JP EP BiH, Hydropower plants on Neretva	2015–2019
	Dr. Mensur Kasumović, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Tuzla	2019–
STK A3	*High voltage equipment*	
	Dr. Mirsad Kapetanović, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo	2002–2015
	Fikret Velagić, B.Sc. Electrical Engineering, Elektroprijenos BiH, OP Sarajevo	2015–
STK B1	*Cables*	
	Malik Kulender, B.Sc. Electrical Engineering, C&G, Sarajevo	2002–2011
	Dr. Suada Penava, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo	2011–2015
	Mijo Terkeš, B.Sc. Electrical Engineering, JP EP HZ HB, Mostar	2015–

STK B2	*Overhead lines*	
	Ismet Orahovac, B.Sc. Electrical Engineering, Energoinvest IDV	2002–2015
	Senad Osmović, B.Sc. Electrical Engineering, Elektroprijenos BiH, OP Sarajevo	2015–
STK B3	*Substations*	
	Dr. Rasim Gačanović, B.Sc. Electrical Engineering, Institute for the application of telematic technologies of the City of Sarajevo	2002–2015
	Kerim Balta, B.Sc. Electrical Engineering, Balta Consultant	2015–
STK B4	*DC high voltage (HVDC) and power electronics*	
	Dr. Osman Mušić, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo	2002–2007
	Dr. Nijaz Hadžimejlić, B.Sc. Electrical Engineering, Faculty of Electrical Engineering Sarajevo	2007–2015
	Dr. Mustafa Musić, B.Sc. email, JP EP BiH, Sarajevo	2015–
STK B5	*Power systems protection and local control*	
	Dr. Zijo Pašić, B.Sc. Electrical Engineering, ANU BiH, Sarajevo	2002–2015
	Dr. Sead Kreso, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo	2015–2018
	Mr. Adamir Jahić, B.Sc. Electrical Engineering, JP EP BiH, Elektrodistribucija, Tuzla	2018–2021
	Mr. Sead Arnautalić, B.Sc. Electrical Engineering, JP EP BiH, OP Tuzla	2021–
STK C1	*System development and economics*	
	Dr. Vedran Boras, B.Sc. Electrical Engineering, JP EP HZ HB, Mostar	2002–2003
	Mr. Nikola Rusanov, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo	2003–2007
	Mr. Husnija Ferizović, B.Sc. Electrical Engineering, NOS BiH	2007–2015
	Mr. Bojan Zečević, B.Sc. Electrical Engineering, NOS BiH	2015–
STK C2	*System management and operation*	
	Dr. Mensur Hajro, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo	2002–2007

	Dr. Smajo Bišanović, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo	2007–2015
	Dr. Samir Avdaković, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo	2015–2021
	Mr. Husnija Ferizović, B.Sc. Electrical Engineering, NOS BiH	2021–
STK C3	*System and environment*	
	Dr. Alija Muharemović, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo	2002–2007
	Kadira Močević, Prof. of biology, JP EP BiH, Sarajevo	2007–2015
	Dr. Irfan Turković, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo	2015–
STK C4	*Technical properties of the system*	
	Mr. Miroslav Ljevak, B.Sc. Electrical Engineering, Energoinvest, Sarajevo	2002–2007
	Dr. Amir Tokić, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Tuzla	2007–
STK C5	*Electricity market*	
	Mr. Mirsad Šabanović, B.Sc. Electrical Engineering, JP EP BiH	2002–2015
	Dr. Omer Hadžić, B.Sc. Electrical Engineering, NOS BiH	2015–
STK C6	*Distribution systems and small power plants*	
	Milivoje Tomić, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo	1993–2006
	Branko Antunović, B.Sc. Electrical Engineering, JP Elektroprivreda HZ HB, Mostar	2006–2011
	Dr. Drago Bago, B.Sc. Electrical Engineering, JP Elektroprivreda HZ HB, Mostar	2011–
STK D1	*Materials and new technologies*	
	Dr. Kemo Sokolija, B.Sc. Electrical Engineering, Faculty of Electrical Engineering Sarajevo	2002–2011
	Mr. Amra Omeragić, B.Sc. Electrical Engineering, Elektroprijenos BiH	2011–2015
	Dr. Meludin Veledar, B.Sc. Electrical Engineering, pensioner NOS in BiH	2015–2017
	Dr. Adnan Mujezinović, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo	2017–

STK D2	*Information systems and telecommunications*	
	Duško Vicković, B.Sc. Electrical Engineering, JP EP BiH/NOS in BiH	2002–2015
	Dr. Džemo Borovina, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo	2015–

Members of the Executive Board from the ranks of scientific and professional workers

Prof. Dr. Sead Softić, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo	1992–2005
Dr. Salih Čaršimamović, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo	1992–1993
Sabaheta Sadiković, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo	1992–1995
Tomaš Babić, B.Sc. Electrical Engineering,	1993–1995
Mr. Džemail Vlahovljak, B.Sc. Electrical Engineering, Energoinvest	1995–2007
Dr. Ahmet Gavranović, B.Sc. Electrical Engineering, Faculty of Electrical and Mechanical Engineering in Zenica	1995–1999
Hamdija Đuliman, B.Sc. Electrical Engineering, Energoinvest, Sarajevo	1999–2003
Dr. Nediljko Bilić, B.Sc. Electrical Engineering, Faculty of Electrical Engineering, Sarajevo	1999–2007
Aćif Hadrović, B.Sc. Electrical Engineering, JP EP BiH, Sarajevo	2003–2007
Mr. Nedžad Rašidbegović, B.Sc. Electrical Engineering, BH Telecom	2007–2011
Marko Ivan Blažević, B.Sc. Electrical Engineering, JP EP HZ HB, Mostar	2007–2011
Mr. Azra Hajro, B.Sc. Electrical Engineering, Elektroprijenos BiH, Sarajevo	2007–2011
Dubravka Nikolić, B.Sc. Electrical Engineering, retired, JP EP BiH	2007–2011
Dr. Izudin Kapetanović, B.Sc. Electrical Engineering, SODA SO, Tuzla	2007–2011
Branko Antunović, B.Sc. Electrical Engineering, JP Elektroprivreda HZ HB, Mostar	2011–2015

Mr. Vinko Bošnjak,
JP Elektroprivreda BiH, d. d. Sarajevo,
Elektrodistribucija, Zenica 2011–2015

The Supervisory Board of the Bosnia and Herzegovina CIGRE Committee

Ahmed Erkočević, B.Sc. Electrical Engineering, member,
JP EP BiH, Sarajevo 1995–1999
Boro Bjelobrk, B.Sc. Electrical Engineering, member,
JP EP BiH, Sarajevo 1995–1999
Dževad Ganić, B.Sc. Electrical Engineering, president,
Energoinvest 1995–2015
Jakub Zečić, B.Sc. Electrical Engineering, member,
JP EP BiH, TE Tuzla 1995–1999
Uzeir Muratović, B.Sc. Electrical Engineering, member,
JP EP BiH, HPP on Neretva 1995–1999
Aćif Hadrović, B.Sc. Electrical Engineering, member, pensioner
JP EP BiH, Sarajevo 2007–2015
Marko Lončar, B.Sc. Electrical Engineering, member,
Elektroprijenos BiH 2007–2015
Nikola Antić, B.Sc. Electrical Engineering, member, pensioner
JP EP BiH 2011–2015
Dr. Alija Muharemović, B.Sc. Electrical Engineering, member,
Faculty of Electrical Engineering, Sarajevo 2011–2015

Secretariat of the Bosnia and Herzegovina CIGRE Committee

General Secretaries

Srećko Nuić 1992–1994
Luka Deak 1994–1995
Jasmina Jakić 1995–2013
Dr. Mario Kokoruš 2013–2015

Employees
Radžija Muratović 1994–1997

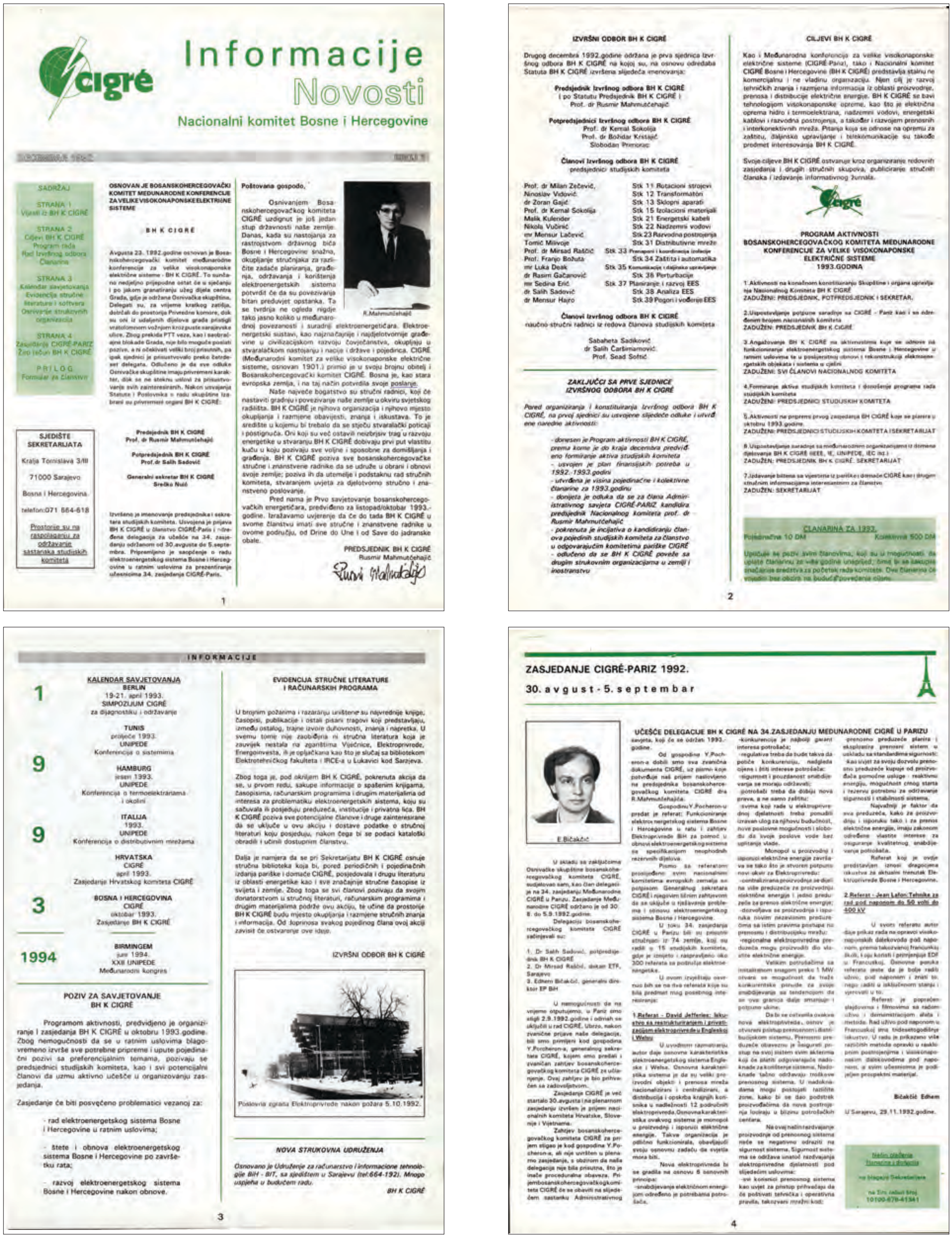


Figure 4.4 Information number 1. (first printed copy of *Novosti* (News) BH K CIGRÉ, December 1992)

Sarajevo 23.8.1992.god.

ZAPISNIK

sa I osnivačke Skupštine BIH K CIGRE
održane 23.8.1992.godine u Sarajevu, u prostorijama Privredne komore BiH

Skupu predsjedava Dr. Rusmir Mahmutćehajić. Ukupno prisutnih 40 članova.

Sjednicu je otvorio Dr. Rusmir Mahmutćehajić, uvodnim obrazloženjem o potrebi osnivanja BIH K CIGRE, i upoznao prisutne sa procedurom konstituisanja Nacionalnog komiteta. Svi prisutni delegati, u svojstvu članova Inicijativnog odbora, čine osnivačku Skupštinu BIH K CIGRE i donose odluku o radu Skupštine.

Usvojen je prijedlog da radno predsjedništvo čine **Dr. Rusmir Mahmutćehajić, ing. Edhem Bičakčić, ing. Sabaheta Sadiković, Dr. Salih Sadovič i Dr. Mirsad Raščić**. Izvršeno je imenovanje zapisničara, **Mr. Sedina Erić** i dva ovjerivača, **Mr. Nikola Rusanov i Dr. Mensur Hajro**.

Prihvaćen je predloženi dnevni red:

1. Donošenje odluke o osnivanju BiH K CIGRE
2. Usvajanje Poslovnika o radu.
3. Usvajanje Statuta
4. Izbor privremenih organa BiH K CIGRE
5. Prijava BiH K CIGRE u članstvo Međunarodne Konferencije CIGRE-PARIS
6. Izbor delegacije za učešće na 34 zasjedanju CIGRE-PARIS (30.8.-4.9.92.)
7. Izrada saopštenja o radu EES BiH u ratnim uslovima
8. Program aktivnosti
9. Privremeni način finansiranja
10. Saopštenje za javnost

AD-1 Na prijedlog Inicijativnog odbora svi prisutni članovi jednoglasno su donijeli:

Odluku
Osniva se BiH K CIGRE sa sjedištem u Sarajevu

AD-2 Izvjestilac po II tački dnevnog reda, Poslovniku o radu Skupštine, je Mr Nikola Rusanov. Uz obrazloženje da zbog objektivnih teškoća Poslovnik nije iskopiran u potrebnom broju primjeraka, prisutni su upoznati sa sadržajem akta. Nakon toga, Poslovnik o radu Skupštine je jednoglasno usvojen, uz obavezu da se naknadno dostavi svim članovima.

AD-3 Dubravka Nikolić je izložila osnovne članove Statuta BiH K CIGRE, naglašavajući one koji se odnose na obaveze i prava Skupštine. Statut BiH K CIGRE, osim manjih prilagođavanja, u osnovi potpuno odgovara Statutu Međunarodne CIGRE. Statut BiH K CIGRE je jednoglasno usvojen.

AD-4 Uz obrazloženje predsjedavajućeg da zbog saobraćajne blokade i [illegible] veza nije bilo moguće obezbijediti prisustvo svih zainteresovanih, sve odluke ove Skupštine imaju privremeni karakter, dok se ne steknu uslovi za normalno održavanje sjednice.

a) Za prijedlog privremenih organa BiH K CIGRE imenovana je radna grupa u sastavu **Bičakčić Edhem, Vlakovljak Mr. Džemo, Raščić Dr. Mirsad**

b) Prijedlog imenovanja privremenih predsjednika i sekretara studijskih komiteta-Stk izložio je **Sadović Dr. Salih**, uz napomenu da se Stk BiH K CIGRE razlikuju od pariške samo u slučaju Stk br.14 DC Links za koji za sada ne postoji potreba te je umjesto njega ustanovljen Stk br.31 Distributivne mreže.

Poslije kraće diskusije usvojen je slijedeći prijedlog privremenih predsjednika i sekretara Stk BiH K CIGRE uz obrazloženje da se radi o istaknutim stručnjacima iz oblasti koja je predmet djelovanja komiteta.

Stk 11 Rotacioni strojevi
prof. Dr.Milan Zečević, predsjednik
Mr. Šemsudin Mašić, sekretar

Stk 12 Transformatori
Ninoslav Vidović, predsjednik
Mr.Šaćir Džirlo, sekretar

Stk 13 Sklopni aparati
Dr. Zoran Gajić, predsjenik
Mr. M.Kapetanović, sekretar

Stk 15 Izolacioni materijali
Dr. Kemal Sakolija, predsjenik
Mr. Miroslav Ljevak, sekretar

Stk 21 Energetski kabeli
Malik Kulender, predsjednik
biće naknadno imenovan, sekretar

Stk 22 Nadzemni vodovi
Nikola Vučinić, predsjenik
Bajro Isaković, sekretar

Stk 23 Razvodna postrojenja
Mr. Mensur Lačević, predsjednik
Amra Grubić, sekretar

Stk 31 Distributivne mreže
Tomić Milivoje, predsjednik
Lidija Doutlik, sekretar

Stk 33 Prenaponi i koordinacija izolacije
Dr. Mirsad Raščić, predsjednik
I.Bajramović, sekretar

Stk 34 Zaštita i automatika
Franjo Božuta, predsjednik
prof. Zijo Pašić, sekretar

Stk 35 Komunikacije i daljinsko upravljanje
Mr. Luka Deak, predsjednik
Hajrudin Šuman, sekretar

Stk 36 Perturbacije
Dr. Rasim Gačinović, predsjednik
Munib Gadžo, sekretar

Stk 37 Planiranje i razvoje elektroenergetskih sistema
Mr. Sedina Erić, predsjednik
Dr. Milorad Papić, sekretar

Stk 38 Analiza elektroenergetskih sistema
Dr. Salih Sadović, predsjednik
Mr. Nikola Rusanov, sekretar

Stk 39 Pogon i vođenje elektroenergetskih sistema
Dr. Mensur Hajro, predsjednik
Kreso Enver,sekretar

Nakon pauze prijedlog Radne grupe za privremene organe BiH K CIGRE, izložio je Edhem Bičakčić.

Predsjednik BiH K CIGRE - Dr. Rusmir Mahmutćehajić
Podpredsjednik BiH K CIGRE - Dr. Salih Sadović
Generalni sekretar BiH K CIGRE - Srećko Nuić

Nadzorni odbor:
Boro Bjelobrk
Mr. Alija Muharemović
Veseljko Đurđević
Salih Čaršimamović
Slobodan Primorac

Prijedlog je jednoglasno usvojen, uz jedan uzdržani glas za izbor predsjednika BiH K CIGRE.

AD-4 Pročitan je i usvojen tekst pisma za prijavu BiH K CIGRE u međunarodnu organizaciju CIGRE.

AD-5 U diskusiji je ukazano na značaj prisustva BiH K CIGRE na 34 zasjedanju CIGRE-PARIS sa zadatkom da stručnjake iz oblasti elektroenergetskih sistema upozna sa situacijom u kojoj se nalazi EES BiH, a takođe zatraži i pomoć od članica CIGRE u stručnoj radnoj snazi i prioritetnoj opremi za funkcionsanje sistema i ukaže na mogućnost izvoza viškova električne energije iz BiH nakon uspostavljanja prenosnih veza sa UCPTE.

Prihvaćeno je da se na 34 zasjedanje CIGRE-PARIS uputi delegacija u sastavu:

Predsjednik Dr. Rusmir Mahmutćehajić
Potpredsjednik Dr. Salih Sadović
Generalni sekretar Srećko Nuić
Generalni direktor EP BiH Edin Bičakčić

Ovlašćuju se Predsjednik, Potpredsjednik i Generalni sekretar da se u skladu sa mogućnostima, delegacija proširi.

AD-6 Za izradu saopštenja o radu EES BiH u ratnim uslovima zadužuju Edhem Bičakčić, Dr. Rusmir Mahmutćehajić i Dr. Salih Sadović. Saopštenje će biti podnijeto na 34 zajedanju CIGRE-PARIS.

AD-7 Prijedlog programa aktivnosti iznio je Dr Salih Sadović. Program aktivnosti u najkraćem obuhvata učešće delegacije BiH K CIGRE na 34 zasjedanju u Parizu, izrada izvještaja funkcionisanju EES BiH u ratnim uslovima koji će biti prezentiran na ovom skupu, uspostavljanje međunarodnih kontakata neophodnih za buduću saradnju, konstituisanje stalnih organa BIH K CIGRE čim se za to steknu uslovi, aktivnosti Stk na konstituisanju (formiranje komiteta putem prijavnih listova), te pripreme za zasjedanje BIH CIGRE, čije je održavanje predviđeno za april 1993.godine. Program rada je jednoglasno usvojen.

AD-8 Odlučeno je da se do normalizacija situacije i sticanja uslova za finansiranje BiH K CIGRE na način na koji se finansira i međunarodna organizacija, finansiranje vrši iz budžeta Vlade. U tom smislu potrebno je odmah podnijeti zahtjev Vladi BiH za osiguranje sredstava za početni rad.
Privremeno sjedište BiH K CIGRE će se nalaziti u prostorijama EP BiH, Omladinsko šetalište 20, tel. 651-722, Sarajevo.
Svečani čin konstituisanja BiH K CIGRE, iskorišten je da se oda priznanje dugogodišnjim aktivnim članovima CIGRE, i rofesorima koji su tokom brojnih godina rada obrazovali generacije studenata ETF u Sarajevu.

Prilog: 1. Spisak prisutnih
2. Program rada
3. Tabele sa članstvom

imenovanjem za počasne članove BiH K CIGRE to priznanje je dato prof. Softić Seadu i prof. Ibrahimpašić Mensuru.
Napomenuto je da ovo priznanje zadužuju još neki poznati stručnjaci, ali je njihovo proglašenje počasnim članovima odgođeno za drugu priliku, zbog

činjenice da mnogi nisu bili u mogućnosti da budu prisutni.

AD-9 Dr Kemo Sokalija iznio je koncept Saopštenja, za javnost u kome je usaglašen značaj organizovanja BiH K CIGRE, brojno prisustvo stručnjaka i pored teških ratnih prilika, okolnosti pod kojima radi EES BiH itd.

Koncept je prihvaćen, te će po izradi saopštenje biti predato u javnost.

Sjednica Skupštine BiH K CIGRE završena je u 11,30.

ZAPISNIK VODILA
Mr. Sedina Erić
Erić S.

OVJERIVAČI
Dr. S.Sadović
Mr. N.Rusanov

30 YEARS cigre BH

Current Organisation of BH K CIGRE

President of BH K CIGRE	Assembly	Steering committee
Supervisory board	Secretariat	

Part of the management with members of the secretariat of BH K CIGRE

Management of BH K CIGRE

President of BH K CIGRE

Edhem Bičakčić

Electrical Engineering, Faculty of Electrical Engineering, University of Sarajevo;
Author and co-author of several professional papers for JUKO CIGRE, BH K CIGRE, SEERC;
General Director of Elektroprivreda BiH (1992–1996);
President of the BH K CIGRE delegation at the CIGRE Assembly in Paris in 1992 when the application for reception of BH K CIGRE was submitted;
Head of the Independent Power Supply Project of Sarajevo under wartime conditions on 35 kV voltage in 1994 and 110 kV voltage in 1995.

President of BH K CIGRE from November 25, 2015;
Member of the Administrative Council of CIGRE Paris since 2016;
Member of the SEERC Steering committee since 2016;
Honorary member of CIGRE Paris since 2022.

Contributions to the development of CIGRE:

- Participant of the Founding Assembly of BH K CIGRE, held on August 23, 1992;
- Bearer of BH K CIGRE reforms in accordance with the commitments of the umbrella organization CIGRE Paris;
- An active role in finding an acceptable model for the transition of the energy sector of Bosnia and Herzegovina from coal to renewable sources (reduction in the use of fossil fuels, increase in energy efficiency, intensive integration of RES);
- Supported the work of round tables within BH K CIGRE;

- The first named author of the Monograph 25 years of the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems, Sarajevo in 2018;
- Significant support for the activities of students and young researchers for membership in CIGRE Paris, but also for their participation in BH K CIGRE conferences;

Assembly

The Assembly is the highest organ of the Association which consists of all members of the Association.
President of the Assembly of BH K CIGRE:
M.Sc. Aleksandar Cincar, B.Sc. Electrical Engineering.

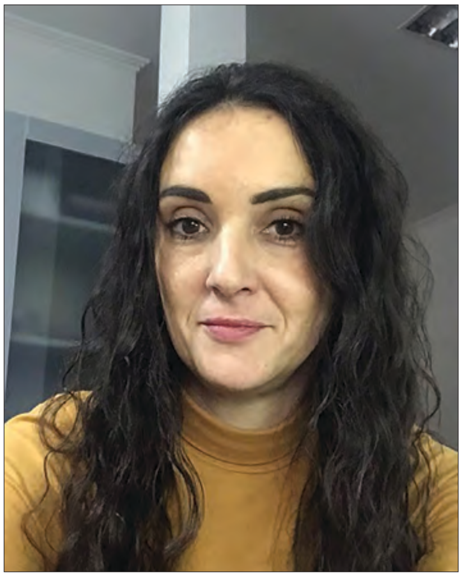
Steering committee

The Steering committee is the executive body of the Association. The Steering committee consists of 21 members: the president, four vice-presidents and 16 members. The members of the Steering committee are elected and dismissed by the Assembly.

Members of the Steering committee of Bosnia and Herzegovina CIGRE Committee

Edhem Bičakčić, President

Prof. Dr. Zijad Bajramović, Vice President



Dr. Nada Cincar, Vice President

Prof. Dr. Alija Muharemović, Vice President

Mato Žarić, Vice President

Alaudin Alihodžić, member

Prof. Dr. Samir Avdaković, member

Prof. Dr. Drago Bago, member

Dr. Džemo Borovina, member

Mr. Mirza Dževlan, member

Dr. Omer Hadžić, member

Enes Hasanhodžić, member

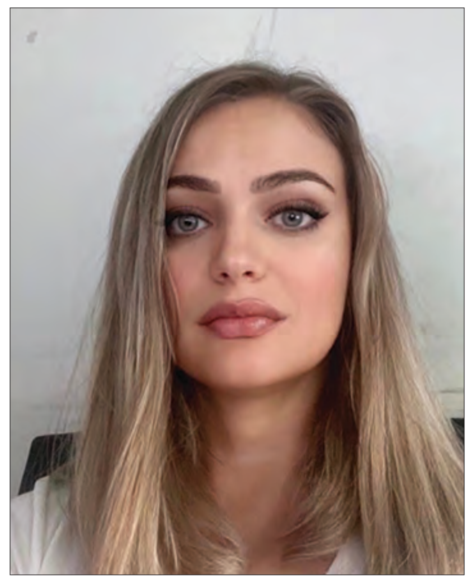
Prof. Dr. Selim Hasović, member

M.Sc. Marko Ikić, member

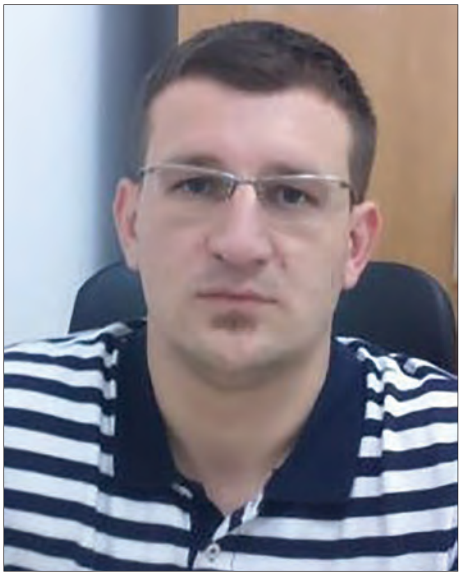
Prof. Dr. Anton Jekauc, member

Doc. Dr. Milodrag Košarac, member

Dr. Ajla Merzić, member



M.Sc. Sabina Dacić-Lepara, member



Doc. Dr. Ivan Ramljak, member

Prof. Dr. Amir Tokić, member

Prof. Dr. Irfan Turković, member

Supervisory Board

The Supervisory Board has a president and four members who are elected and dismissed by the Assembly of the Association.

Members of the Supervisory Board of the Bosnia and Herzegovina CIGRE Committee

Irfan Durmić, president

Avdo Kambur, member

Sejda Kruščica-Fejzić, member

Namik Nuhanović, substitute member

Bojan Zečević, member

Zlatan Gafić, substitute member

Monija Nogulić, member

Secretariat of BH K CIGRE

General Secretary of BH K CIGRE:

Fadil Haverić	2015–2020
Esad Tanović	2020–

Employees of BH K CIGRE

Edina Mašnić	1996–
Aida Toromanović	2016–

Women in Energy Forum

The *Women in Energy* Forum within BH K CIGRE started work in 2019.

The *Women in Energy* Forum is dedicated to promoting women experts in this field, inspiring them to follow their professional and academic interests in engineering.

Vision and mission of the Women in Energy *Forum*

The *Women in Energy* Forum aims to help women experts in their career development, including increasing self-confidence and improving professional skills.

The *Women in Energy* Forum will focus on current and future challenges and opportunities for women in the energy and power industry.

Objectives of the Women in Energy *Forum*

- increasing the participation of women in the total membership of BH K CIGRE;
- increasing the participation of women experts in the field of activity of BH K CIGRE;
- increasing the participation of women experts in the management structures of BH K CIGRE;
- organizing workshops at major technical conferences, gatherings and consultations in order to improve networking and promote membership in BH K CIGRE;
- facilitating the process of hiring and retaining women in technical disciplines;
- providing assistance in the formation of new affinity groups and supporting current activities;
- recognition of outstanding achievements of women in electrical engineering through nominations for awards and recognition;
- facilitating the development of programs and activities that promote access and retention of women in engineering programs;
- support for women experts in their careers to work successfully in their preferred environments;

- active work of an organized group that deals with negative bias against women experts by providing equal opportunities;
- creating assumptions for women experts to achieve a notable career within the power sector

Meetings and quorum of the Women in Energy *Forum*

Forum meetings are held once a year, and if necessary, more often, usually during important gatherings (conferences, round tables, assemblies...). The quorum of the Forum is at least 5 (five) present women, members of BH K CIGRE. BH K CIGRE managers who are not members of the Forum, journalists and other interested persons may attend the Forum meeting, but without the right to vote. Meetings are scheduled by the President of the Forum. If the president does not schedule a meeting at the insistence of women members, the meeting can be scheduled at the initiative of at least 5 women - individual members of the Forum. At the meetings, the topic given in the content of the work and activities of the *Women in Energy* Forum is considered.

Making proposals, suggestions and conclusions

The forum makes proposals, suggestions and conclusions by the majority of votes of the present women, members of BH K CIGRE, and submits them to the president of BH K CIGRE for further action.

Management of the Women in Energy *Forum*

The members of the Women in Energy Forum (hereinafter referred to as the Forum) are all women, members of BH K CIGRE. Currently, the Forum has 81 members, which represents more than 20% of the total number of BH K CIGRE members.

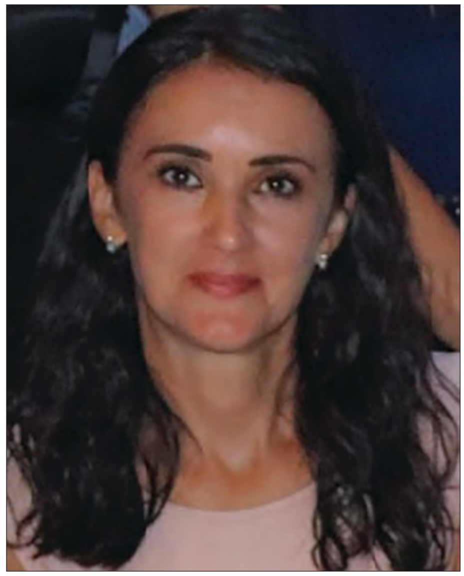
The Forum has a management: a president and two deputy presidents.

Held topics within the Women in Energy Forum at BH K CIGRE
All topics held are financially supported by CIGRE Paris.

At the 14th conference of BH K CIGRE in Neum from October 20 to 23, 2019, the following topics were presented:

1. *Cross-section of the state and position of women in engineering*, Maja Muftić Dedović, Nada Cincar, Marina Pejić

President:
Maja Muftić Dedović, M.Sc. B.Sc. Eng. el.



Vice President:
Dr. Nada Cincar, B.Sc. Eng. el.

Monija Nogulić, B.Sc. oecc

2. *Glass ceiling*, Emina Ćosićkić, Alma Bijedić, Fatima Omerović andJasmina Muslimović

At the second work-consultative session of the *Women in Energy* Forum, held on September 17, 2020 in Sarajevo, the following topics were presented:

1. *Does motherhood affect the productivity of female engineers at work*, Nada Cincar
2. *Does motherhood encourage subconscious gender discrimination in the workplace*, Maja Muftić Dedović
3. *My experience as a woman in engineering*, Mirsada Aličehić

At the 15th conference of BH K CIGRE in Neum from October 17 to 20, 2021 the following topics were presented:

1. *How did you decide to study engineering / Why did you want to be an engineer*, Alma Bijedić
2. *How to encourage girls to enrol in technical faculties*, Maja Muftić Dedović and Nada Cincar
3. *BEING AN ENGINEER: Identity construction and women's resistance in engineering schools*, Esma Music

Next Generation Network

The *Next Generation Network* aims to encourage the active membership of engineers and experts in BH K CIGRE in the early stages of their careers, including providing opportunities for personal and professional development and networking, and thus ensure the future sustainability of BH K CIGRE.

Vision of the Next Generation Network

The *Next Generation Network* aims to help young engineers under the age of 35 in career development, including increasing self-confidence and improving professional skills. The *Next Generation Network* is focused on the current and future challenges and opportunities of young engineers in the power sector.

Content of the work and activities of the Next Generation Network

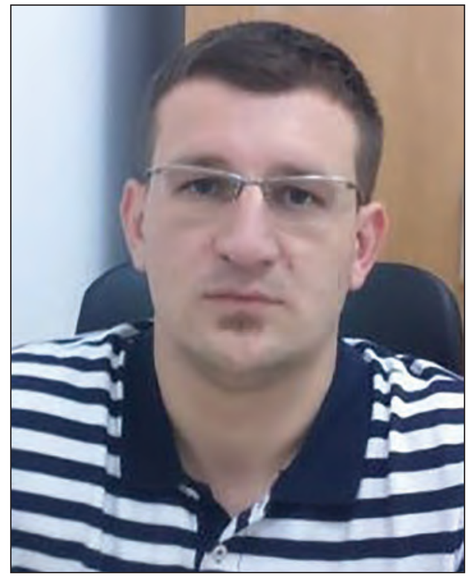
- increasing the participation of young engineers in the overall membership and field of activity of BH K CIGRE;
- increasing the participation of young engineers in the management structures of BH K CIGRE;
- organizing workshops at major technical conferences, gatherings and consultations in order to improve networking and promote membership in BH K CIGRE;
- facilitation of the process of employment of young engineers in technical disciplines;
- providing assistance in the formation of new affinity groups and supporting ongoing activities;
- recognition of outstanding achievements in engineering through nominations for awards and recognition.

Members and management of the Next Generation Network

Members of the Next Generation Network are all interested young engineers, members of BH K CIGRE. The Network has a management: a president and two deputy presidents. The leadership of the Network, from among young engineers - individual members, is elected and dismissed by the Steering Committee BH K CIGRE.

Dr. Adnan Mujezinović – president

Dr. Mladen Banjanin – vice president



Dr. Ivan Ramljak - vice president

At the Second conference of the Bosnia and Herzegovina CIRED Committee in Mostar, from October 25 to 27, 2020, the First working-consultative session of the BH K CIGRE *Next Generation Network* was held, where the management was elected.

As part of the 15th conference of the Bosnia and Herzegovina CIGRE Committee held in the period from October 18, 2021 to October 21, 2021 in Neum, a meeting of the *Next Generation Network* was held. The following presentations were held as part of the Network:

1. *European CO2 Emissions Trading System – MoEE*, Ajdin Alihodžić, B.Sc. Electrical Engineering
2. *Activities of EPBIH on the path of transition of coal regions - MoEE*, Nedim Turković, B.Sc. Electrical Engineering

Accolades from CIGRE Paris

In 2022, CIGRE, based in Paris, awarded the high honor of CIGRE Honorary Member to Edhem Bičakčić, president of the Bosnia and Herzegovina CIGRE Committee.

The award is given for an exceptional contribution to the activities of the Association, as the president of the National Committee of Bosnia and Herzegovina since 2015 and a member of the Administrative Council of CIGRE since 2016.

On behalf of the Administrative Council of Cigre,
the President and the Secretary General
Have the honour to bestow upon

Edhem BICAKCIC

The title of

HONORARY MEMBER

In recognition of his outstanding contribution to the activities of the Association, as Chairman of the National Committee of Bosnia & Herzegovina since 2015 and as member of the CIGRE Administrative Council since 2016.

Michel Augonnet
Président

2022
cigre

Philippe ADAM
Secretary General

Figure 4.5 Awarding of the CIGRE Honorary Member award to Edhem Bičakčić, president of the Bosnia and Herzegovina CIGRE Committee

Figure 4.6 Awarding of CIGRE Honorary Member

The title of *Distinguished Member* is awarded to a large number of long-term members who have contributed to CIGRE through participation in technical work or in the framework of national committees.

In 2006, CIGRE Paris awarded the *Distinguished Members* award to members of the National Committee of Bosnia and Herzegovina:

1. Prof. Dr. Rusmir Mahmutćehajić,
2. Prof. Dr. Mirsad Kapetanović and
3. Prof. Dr. Mensur Hajro

Figure 4.7 Prof. Dr. Mensur Hajro and Prof. Dr. Mirsad Kapetanović

Recognitions and Awards of BH K CIGRE

A systematic solution for awarding recognition and awards

The awarding of recognitions and awards should be an ongoing process so that it is systemically regulated, through the appropriate Ordinance that was adopted on May 17, 2017. Recognition and awards for their work can be received by members, honorary members, friends and sponsors of the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE - BH K CIGRE. The awarding of recognitions and prizes according to this model began during the 13th conference of BH K CIGRE in Neum from September 17 to 21, 2017.

The following recognitions can be awarded for the contribution to the creation, work and affirmation of BH K CIGRE:

1. *Lifetime achievement award*;
2. *Plaque*;
3. *Praise*;
4. *Diploma for distinguished report*.

As a sign of gratitude for the significant contribution to the improvement, acquisition and exchange of knowledge and experience in the field of electric power or other areas that are responsible for the development, testing, production and use of electric power equipment, lifetime achievement awards were awarded, as the highest recognition of BH K CIGRE (2017– 2021):

Emerik Blum
Prof. Dr. Vefik Karabdić
Prof. Franjo Božuta
Prof. Dr. Jovo Mandić
Acc. Prof. Dr. Kemal Hanjalić
Prof. Dane Maljković
Acc. Prof. Dr. Branislava Peruničić
Hakija Turajlić
Acc. Prof. Dr. Božidar Matić
Acc. Prof. Dr. Svetozar Zimonjić, posthumously
Prof. Mesud Ibrahimpašić
Acc. Prof. Dr. Zijo Pašić
Prof. Srećko Draženović, posthumously

Figure 4.8 Lifetime Achievement Award

Figure 4.9 Awarded Lifetime Achievement Award, Neum, 17–21. September 2017

Figure 4.10 Awarded Lifetime Achievement Award to Dr. Jovo Mandić, in his home, Herceg Novi, in 2017

Figure 4.11 Fourteenth conference of BH K CIGRE, Neum, October 2019

Figure 4.12 Lifetime Achievement Award

The awarding of the *Lifetime Achievement Award* as a sign of gratitude for a significant contribution to the advancement, acquisition and exchange of knowledge and experience in the fields of power system development to academician Dr. Zijo Pašić, professor emeritus and professor Mesud Ibrahimpašić was held in the premises of the Secretariat of the Bosnia and Herzegovina CIGRE Committee in 2021.

As a sign of gratitude for exceptional professional and scientific work at BH K CIGRE (written reports at consultations, conferences, etc.) and activities for the affirmation of BH K CIGRE, plaques were awarded to individuals, as a special recognition (2017–2021):

Dr. Meludin Veledar
Prof. Dr. Salih Čaršimamović
Prof. Dr. Mirsad Kapetanović
Dr. Šeila Gruhonjić-Ferhatbegović
Prof. Dr. Tatjana Konjić
Prof. Dr. Zijad Bajramović
Prof. Dr. Amir Tokić
Prof. Dr. Koviljka Stanković
Prof. Dr. Predrag Osmokrović
Prof. Dr. Miladin Jurošević
Damir Raljević
Mr. Mahir Muratović
Dr. Adnan Mujezinović
Mr. Adnan Bosović
Dr. Anes Kazagić
Doc. Dr. Drago Bago
Mr. Edina Aganović
Dr. Hidajet Salkić
Prof. Dr. Irfan Turković
Doc. Dr. Ivan Ramljak
Prof. Dr. Mensur Kasumović
Mr. Meliha Džizić
Prof. Dr. Mustafa Music
Mr. Nedžad Hasanspahić
Prof. Dr. Samir Avdaković
Mr. Sanela Suljović-Fazlić
Mr. Senad Hadžić
Boris Brestovec
Aleksandar Cincar
Mr. Sabina Dacić-Lepara
Bojan Zečević
Mr. Omer Hadžić
Mr. Mirza Dževlan

Mato Žarić
Irfan Durmić
Vedad Korajlić
Mijo Terkeš
Raska Denjalić
Hajdar Arifagić
Osman Hasanbegović
Amila Omersoftić
Dr. Ajla Merzić
Dr. Elvisa Bećirović
Doc. Dr. Milodrag Košarac
Prof. Dr. Nerdina Mehinović
Maja Muftić Dedović
Adem Lujnović
Senad Osmović
Kerim Balta
Enes Hasanhodžić
Duško Vicković
Sejda Kruščica Fejzić
Salih Purišević
Prof. Dr. Viktor Milardić
Stefan Hoppert, A. Eberle
Mr. Ninoslav Simić

Figure 4.13 Awarding of plaques to individuals, as a special recognition for exceptional professional and scientific work in BH K CIGRE

Figure 4.14 Awarding of plaques to individuals, as a special recognition for exceptional professional and scientific work in BH K CIGRE, Neum, 2017

Figure 4.15 Mr. Ninoslav Simić, Nikola Tesla Institute of Electrical Engineering, Belgrade

Figure 4.16 Awarding of plaques to individuals, as a special recognition for many years of work on the organization and affirmation of BH K CIGRE

Figure 4.17 Awarding of plaques to K CIGRE individuals

As a sign of gratitude for many years of work on the organization and affirmation of BH K CIGRE, plaques were awarded to individuals, as a special recognition (2017–2021):

Srećko Nuić
Aćif Hadrović
Sabaheta Sadiković
Prof. Kadira Močević
Mr. Nikola Rusanov
Jasmina Jakić

As a sign of gratitude for the significant contribution to supporting the work and affirmation of BH K CIGRE, plaques were awarded as a special recognition in Mostar in 2018:

Prof. Dr. Dragan Čović
Bajazit Jašarević
Mato Žarić
Admir Anđelija

As a sign of gratitude for the collective membership, sponsorship, long-term cooperation and contribution to the development and affirmation of BH K CIGRE, plaques were awarded to organizations: companies, institutions, associations, faculties, institutes and other organizations, as a special recognition.

Plaques as a token of appreciation for the patronage of BH K CIGRE conferences:

- Public enterprise Elektroprivreda Bosne i Hercegovine, d. d. Sarajevo
- Public enterprise Elektroprivreda Hrvatske zajednice Herceg Bosne, d. d. Mostar

Figure 4.18 Public enterprise Elektroprivreda Hrvatske zajednice Herceg Bosne, d. d. Mostar

Figure 4.19 Public enterprise Elektroprivreda Bosne i Hercegovine, d. d. Sarajevo

In gratitude for collective membership, sponsorship, long-term cooperation and contribution to the development and affirmation of BH K CIGRE, plaques were awarded to organizations: companies, institutions, associations, faculties, institutes and other organizations, as special recognition (2017–2021):

ABB d.o.o., Zagreb, Croatia
Academy of Sciences and Arts, Sarajevo
Aries – Zagreb, Croatia
Bosnian-Herzegovinian-American Academy of Sciences and Arts – BHAAAS, Louisville, Kentucky, USA
CET Energy d. o. o. Sarajevo
Shareholder company BH Telecom, Sarajevo
State Regulatory Commission for Electricity, Tuzla
ELCOM, Tuzla
Faculty of Electrical Engineering Sarajevo, University of Sarajevo
Faculty of Electrical Engineering, University of East Sarajevo
Faculty of Electrical Engineering, University of Banja Luka
Faculty of Electrical Engineering, University of Tuzla
Environmental Protection Fund of the Federation of BiH
GE Grid Solutions
HUAWEI
ISKRAEMECO Sarajevo d.o.o.
Public enterprise Elektroprivreda Bosne i Hercegovine, d. d. Sarajevo
Public enterprise Elektroprivreda Hrvatske zajednice Herceg Bosne, d. d. Mostar
JP BH Telecom, Sarajevo
JP Elektroprenos/Elektroprijenos BiH, Banja Luka
KONČAR d.d., Zagreb, Croatia
MICOM BH d.o.o., Sarajevo
Independent system operator in Bosnia and Herzegovina, Sarajevo
OMICRON electronics GmbH, Klaus, Austria
Operator for renewable energy sources and efficient cogeneration, Mostar
Schneider Electric, Sarajevo, Zagreb, Croatia
Siemens Aktiengesellschaft Österreich, Sarajevo
Tectra – Zagreb, Croatia
TTU Energetics, Tuzla

Figure 4.20 Awarding of plaques to organizations for collective membership, long-term cooperation and contribution to the development and affirmation of BH K CIGRE for many years of work on the organization and affirmation of BH K CIGRE

Figure 4.21 Awarding of plaques to organizations for collective membership, long-term cooperation and contribution to the development and affirmation of BH K CIGRE for many years of work on the organization and affirmation of BH K CIGRE

Figure 4.22 Awarding of plaques to organizations for long-term cooperation and contribution to the development and affirmation of BH K CIGRE, 15th conference – ABB

Figure 4.23 Awarding of plaques to organizations for long-term cooperation and contribution to the development and affirmation of BH K CIGRE, 15th conference – SIEMENS

Figure 4.24 Awarding of plaques to organizations for long-term cooperation and contribution to the development and affirmation of BH K CIGRE, 15th conference – BH Telecom

Figure 4.25 Awarding of plaques to organizations for long-term cooperation and contribution to the development and affirmation of BH K CIGRE, 15th conference – Cet Energy

Figure 4.26 Awarding of a plaque as a sign of gratitude for sponsorship and contribution to the development and affirmation of BH K CIGRE at the 15th conference – HUAWEI

Figure 4.27 Awarding of a plaque of gratitude for long-term cooperation and contribution to the development and affirmation of BH K CIGRE – Faculty of Electrical Engineering, University of Tuzla

Figure 4.28 Awarding of the Plaque in gratitude for long-term cooperation and contribution to the development and affirmation of BH K CIGRE – KONČAR

Figure 4.29 Awarding of a plaque as a sign of gratitude for collective membership, sponsorship, long-term cooperation and contribution to the development and affirmation of BH K CIGRE – OMICRON

Figure 4.30 Awarding of a plaque as a sign of gratitude for collective membership, sponsorship, long-term cooperation and contribution to the development and affirmation of BH K CIGRE – SCHNEIDER ELECTRIC

Figure 4.31 Awarding of plaques to individuals as a sign of gratitude for exceptional professional and scientific work in BH K CIGRE and/or activities for the affirmation of BH K CIGRE - 15th conference

Honorary members:

1. Prof. Dr. Antun Jekauc
2. Prof. Dr. Selim Hasović
3. Prof. Kadira Močević
4. Bajazit Jašarević
5. Avdo Đumrukčić
6. Acc. Svetozar Zimonjić
7. Mr. Mensur Lačević
8. Prof. Sead Softić
9. Prof. Dr. Milan Zečević
10. Prof. Dr. Salih Sadović
11. Prof. Mesud Ibrahimpašić
12. Prof. Branko Knežević
13. Prof. Dr. Kemo Sokolija
14. Prof. Dr. Izudin Kapetanović
15. Prof. Dr. Vlado Madžarević
16. Aćif Hadrović
17. Sabaheta Sadiković
18. Zoran Dragnić
19. Mr. Ninoslav Vidović
20. Milivoje Tomić
21. Prof. Fuad Cerić
22. Prof. Srećko Draženović
23. Mr. Zoran Rimac
24. Prof. Dr. Slobodan Milojković

Recognitions on the occasion of 15 years of work of BH K CIGRE

On the occasion of 15 years of work of the Bosnia and Herzegovina CIGRE Committee, at the 8th BH CIGRE conference in Neum on October 23, 2007, in accordance with the conclusions of the BH CIGRE Steering Committee, awards were given for scientific, professional and organizational contribution to the following members, associates and supporters:

Figure 4.33 Appearance of Recognition for scientific, professional and organizational contribution

Figure 4.32 Awarding of recognition at the Eighth conference, Neum, 2007

Nediljko Bilić
Salih Čaršimamović
Zoran Dragnić
Hamdija Đuliman
Rasim Gačanović
Aćif Hadrović
Mensur Hajro
Bajro Isaković
Jasmina Jakić
Mirsad Kapetanović
Josip Kreh
Malik Kulender
Mirza Kušljugić
Mensur Lačević
Miroslav Ljevak
Rusmir Mahmutćehajić
Ognjen Marković
Šemsudin Mašić
Edina Mašnić
Božidar Matić
Radžija Muratović
Osman Mušić
Savo Nikolić
Ismet Orahovac
Zijo Pašić
Nikola Rusanov
Sabaheta Sadiković
Kemo Sokolija
Sead Softić
Mirsad Šabanović
Milivoje Tomić
Duško Vicković
Ninoslav Vidović
Džemail Vlahovljak

Collectives:

Energoinvest d. d. Sarajevo
JP Elektroprivreda BiH, Sarajevo
BH Telecom, Sarajevo
Federal Ministry of Energy, Mining and Industry

Visits From Paris CIGRE Management

High officials of the International CIGRE visited BH K CIGRE:

Figure 4.34 Jean Kowal, Secretary General of International CIGRE, Sixth conference, Neum, September 2003

Figure 4.35 Philippe Adam, Secretary General of the International CIGRE, Sarajevo, First SEERC colloquium, Sarajevo, October 2019

Figure 4.36 Jean Kowal, Secretary General of International CIGRE, Sixth conference, Neum, September 2003

Figure 4.37 Michel Chamia, president of International CIGRE, visit to BH K CIGRE, Sarajevo, July 1998

Figure 4.38 André Merlin, President of International CIGRE, Ninth conference, Neum, September 29, 2009

Figure 4.39 André Merlin, President of International CIGRE, Ninth conference, Neum, September 29, 2009

Participation in Current Zero Club

During the 18th session of CIGRE in 1960 in Paris, many engineers and physicists, who were dealing with gas discharges in circuit breakers, met privately to discuss these problems. They agreed that a forum should be formed to allow free, informal discussion of switch problems and research that would not be limited by commercial, national or similar concerns. This is how the *Current Zero Club, International Research Group on Interruption Phenomena of Power Switching Devices*, abbreviated to *Current Zero Club*, or *CZC* or *Club*, was born. The mission of the *Current Zero Club* is to promote the advancement of science and technology and is limited to current breaking and resulting phenomena in power switchgear, including short circuit current limitation. *Current Zero Club*, as a scientific and technical forum for discussion, is formed by its members with equal rights, responsibilities and duties. Members should be outstanding international experts who are actively and personally engaged in major research as defined in the field of activity. Since this is not practically feasible, and in order to ensure efficient and open discussions, the number of members is limited to 30. This kind of approach was not possible at CIGRE meetings, where the function of each delegate is to represent his country and/or company, institution, etc. The first meeting was held in Arnhem in the Netherlands in 1961, in which twenty members from ten countries participated. Each member represented only himself, not his company, university or institution.

The *Club* has two levels of meetings. The first consists of plenary sessions presided over by the president of the *Current Zero Club* and meetings of sections, presided over by vice-presidents. Plenary sessions cover the entire scope of work and are attended by members. The president of the CIGRE study committee, A3 – *Portable and distribution equipment*, is invited to these sessions. Section meetings focus on specific parts of the scope:

a) Vacuum switching technology (vacuum section);
b) Switching technology in SF6 and other gases (gas section);
c) Switching technology at low voltage (low voltage section).

At section meetings, non-members are welcome to attend and present their works from the scope of the Club. The President will report to CIGRE on the main scientific and technical issues related to the scope that require further open discussion. The President of the Club will also report to members on any feedback or discussions with CIGRE that he believes should be further considered for open discussion. Discussions and presentations are strictly limited to technical and scientific topics only and commercial or other business topics are not discussed.

Figure 4.40 Current Zero Club meeting, Liverpool, 2009, England. Mirsad Kapetanović gave an introductory lecture at the meeting

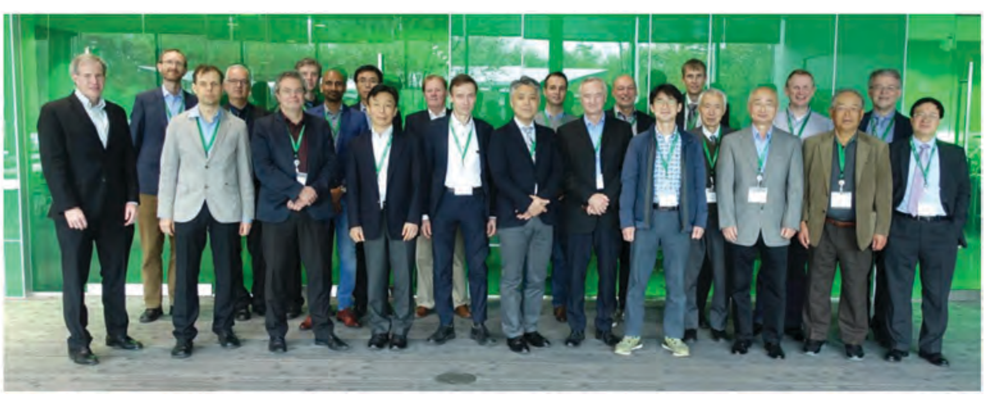


Figure 4.41 Current Zero Club, Andover (USA), 2019, Dr. Mahir Muratović gave a presentation as a guest

A Word from Distinguished Managers, Sponsors, Distinguished Members and Friends

Admir Anđelija, general manager
JP Elektroprivreda BiH d. d. Sarajevo

Dear colleagues, members of the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems - CIGRE, today, when the 30th anniversary of the existence and activity of the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems - CIGRE is being celebrated, feelings of satisfaction and pride are especially present because they are a confirmation of continuity, and additional motivation to continue working together, and providing a roadmap for new generations. First of all, as an engineer, but also as the general manager of the largest electrical company in Bosnia and Herzegovina - JP Elektroprivreda BiH, I see the cooperation with BH K CIGRE over the past 30 years, first of all, as a joint mission within the power sector of Bosnia and Herzegovina. Our partnership, with full understanding for creating the backbone of the electric power sector, results in a stronger engineering community in Bosnia and Herzegovina. JP Elektroprivreda BiH has confirmed its support for the work of BH K CIGRE through a series of activities in the past years. Engineers and employees of JP Elektroprivreda BiH, through the work of study committees of BH K CIGRE, by preparing professional and scientific papers in which topics of importance and interest for business were discussed, created for themselves, as well as for the company, a training ground for professional exchange of knowledge, support for technical solutions and business ventures and space for professional development. These are values that are especially valued in the business world, and which as a company we strive to implement in our business standards and practice.

This cooperation is more necessary and significant today than ever before. In accordance with its long-term plans, JP Elektroprivreda BiH is committed to a sustainable transition and decarbonization of the energy sector, as well as continuous development, safe operation and reliable maintenance of power plants and their systems. Our engineering community has confirmed, throughout its existence over the past years, that it is worthy of facing the problems and everyday challenges of business. I am also convinced that in the coming period we will further strengthen our cooperation, considering the needs and challenges that await us in the electric power sector, but also in the energy sector in general. The tasks that await us, in terms of decarbonization and digitization aligned with the development cycle of the EU Green Deal, are our joint obligation and we are confident that we will successfully find solutions as before. Through its many years of work, BH K CIGRE confirmed its commitment, selfless help and commitment, and provided significant professional support to the electric power system of Bosnia and Herzegovina. I am not speaking only on my own behalf when I say that BH K CIGRE's conferences are, in addition to being a place for exchanging knowledge, also a place for good company and creating memories. We always advise young engineers to be actively involved in the work of BH K CIGRE, considering that in this way they are provided with wide opportunities to obtain information and knowledge that will benefit them in their work and professional development. Due to all of the above, I take the opportunity to congratulate the National Committee - Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE - BH K CIGRE on this great jubilee, on behalf of JP Elektroprivreda BiH d.d. Sarajevo, and on my own behalf, with the belief that our partnership will continue for many years through even stronger and more responsible cooperation for the benefit of the entire community. With expressions of deep respect and desire for continued successful work and cooperation,

Admir Anđelija

Mato Matan Žarić, general manager
Elektroprenos - Elektroprijenos BiH

Electricity is undoubtedly currently one of the most important forms of energy used by mankind because it is relatively easy to transport and is easily converted into other useful forms of energy, such as kinetic and thermal, and is therefore one of the most valuable products of modern civilization. The need for electricity is constant and constantly growing.

The electric power system is described as a complex, dynamic system for the production, transmission and distribution of electricity, whose primary function is to safely, reliably and economically supply consumers with sufficient quantities of high-quality electricity. According to its scope, it belongs to the group of large systems. It is a system of technologically complex processes that lives and functions twenty-four hours a day, every day of the year, and must respond to all requirements in order to deliver electricity of appropriate quality and in sufficient quantity. The electric power system could not function as a coherent whole if all its subsystems did not function well. By the very fact that it connects production and distribution and enables the transmission of electricity between them, the transmission system can be said to represent the backbone of a country's power system. In addition, with the transmission system, i.e. interconnections, the connection of power systems of several countries and their joint functioning is realized. In order to fulfill its task, the transmission system should grow and develop according to the needs of society and the environment and the progress of modern technology, even more faster than others, keeping in mind its importance and role.

Elektroprenos - Elektroprijenos BiH is one of the most important entities in Bosnia and Herzegovina. Not only because it is responsible for a spatially large, and functionally important part of the electric power system, but also because it has grown into a respectable and socially responsible company. The company, as an important factor in the functioning of the electric power system, provides a high degree of security of electric power transmission, which is of utmost importance that, in addition to meeting the appropriate level of operational efficiency, new technologies and trends are adequately monitored and applied in electricity transmission. As a result, more efficient operation of the system and transmission of electricity is achieved, operating costs are reduced, and at the same time it "keeps up" with other companies and systems from the surrounding area and beyond.

Synergy in any necessary and useful activity makes both society and activity develop and progress in the right direction. Ensuring that synergy between the scientific and professional community provides the appropriate impetus for the adequate development of both.

One of the ways of successful scientific and professional cooperation, which can be an example to other sectors and parts of society, is BH K CIGRE, which represents a point of contact and a successful link between these two important segments of the electric power sector. By gathering a large number of experts and ensuring their active participation through their bodies, it has become an indispensable segment of professional and scientific activity.

In addition to acquiring new knowledge (*know-how*) and transferring one's own experiences from many years of work, a very important segment of activity within BH K CIGRE is the establishment of contacts (popularly known today as networking) with other members of the scientific and professional community from the region and beyond, which stands out on a global level as the most important segment of successful work and development.

Elektroprenos – Elektroprijenos BiH, as one of the active members, over the years, has successfully contributed to further development and cohesive action within BH K CIGRE, both in management bodies and through study committees, expert consultations, round tables, and other forms of participation. By participating in various professional and scientific gatherings, an appropriate contribution is made to the exchange of knowledge and the solution of various problems, achievements in the field are presented, and possible directions for further work are given.

In our society, it is present that the knowledge and experience of the academic community is not used to its full capacity, nor that the full potential of cooperation between the scientific and professional community is used adequately, to the satisfaction of all parties. The existence of bodies/institutions such as BH K CIGRE gives the possibility of developing quality cooperation and progress. Therefore, we should all work to preserve and further improve such bodies and institutions, while also keeping in mind their appropriate development in accordance with the times and given circumstances. Therefore, it is important to once again emphasize the need and importance of joint action on the improvement of the electric power industry, in which the operation and further development of BH K CIGRE occupies a special place.

The Monograph on the occasion of 30 years of existence and activity of BH K CIGRE will remain as a reminder to future generations who will contribute to the further progress of the electric power sector. On this occasion, I would like to congratulate the management and all members on the anniversary of BH K CIGRE and wish them another 30 years of successful work, to the satisfaction and benefit of the entire society.

Mato Matan Žarić

Mr. sc. Marinko Gilja, general manager
Elektroprivreda Hrvatske zajednice Herceg Bosne

Dear members of the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems - CIGRE, first of all, I would like to congratulate everyone on the thirtieth anniversary of the establishment and operation of BH K CIGRE on behalf of myself and on behalf of all the employees of Elektroprivreda Hrvatske zajednice Herceg Bosne, of which I am the head. Also, I want to acknowledge and express gratitude to BH K CIGRE for its immeasurable contribution to the development and reliable functioning of the electric power system in BiH over the past 30 years.

Energy is the lifeblood of every modern society, and electricity as the noblest form of energy and the power system as a whole represent one of the key state interests. Therefore, all segments of society, government institutions, the scientific community, and especially all participants in the power system and the sector as a whole, professional associations and power utility companies, must work together to improve the power industry and ensure reliable, high-quality and affordable power for everyone. Cooperation and synergistic action are needed in solving the problems of development, construction, operation and maintenance of electric power plants for the production, distribution and transmission of electric energy, as well as the management and management of the entire electric power system. The ideal forum for achieving such cooperation and coordination is BH K CIGRE.

As a socially responsible company, we at Elektroprivreda Hrvatske zajednice Herceg Bosne always emphasize that our strategic commitment is sustainable development based on three pillars: first, our actions must positively affect the business of EP HZHB; secondly, it must be beneficial to the wider social community, but also to the local community in which we operate, and thirdly, it must be acceptable to the environment and the local population. This is an extremely challenging time, we are in the middle of the fourth industrial revolution which is completely changing the world and all segments of our life and business. At the same time, there is an ongoing energy transition that is radically changing relationships, functioning and the philosophy of leading and managing the electric power system. The goal of the transition is to establish an electric power system without CO_2 emissions by the middle of the century, and its main drivers are decarbonisation, digitalization and democratization of the electric power system (so-called 3D megatrends). We are fully committed to the transition.

The transition goes with us or without us and we have to get involved and control the processes so as not to be late and have a chaotic transition. This is our obligation according to international agreements, especially the Treaty on the Energy Community and the Sofia Declaration and the accompanying Green Program for the Western Balkans. But, even more, it is our obligation towards future generations, to whom we must enable to satisfy their needs and have a quality life, to leave them a clean nature and this wonderful planet. Therefore, we must not understand the transition as an imposed concept, but as the only viable option for the further development of the electric power system.

On these foundations, we wish to cooperate and act as a member of BH K CIGRE. The transition of the electric power sector and the power industry poses exceptional challenges, but also opens up unimagined opportunities. It requires the use of renewable energy sources, digitalisation, the introduction of inventive technologies and new business models, and opens countless questions. The transition cannot be carried out effectively by any single electricity industry activity or individual electricity industry entity, but by all of them, coordinated and in synergy. Here we see the role of BH K CIGRE. We have provided and will continue to support the holding of expert meetings: BH K CIGRE conferences every other year, BH K CIRED conferences and round tables on certain current topics as needed at the moment. Such gatherings are precious. There, ideas, knowledge and experiences are exchanged, old and new colleagues are met and cooperation is improved. At these gatherings, solutions to existing problems are offered and answers to specific open questions are sought, up to answers to global issues such as, for example, solving the so-called energy trilemma, that is, how to achieve a balance between three contradictory requirements: safe electrical energy - affordable electrical energy - environmentally friendly electrical energy.

In addition, the professional public through BH K CIGRE should positively influence the adoption of strategic documents and laws in this area and thereby help political decision makers in creating a quality framework and positive atmosphere for the progress and development of the electric power system and the sector in general. This is a challenging time for everyone, for those of us who deal with (electrical) energy, for ordinary citizens, for companies as well as for decision makers. It is up to us to ensure that this industrial revolution and energy transition benefits our companies, our economy, all citizens and society as a whole. It is up to us to shape the electric power industry of tomorrow and make a quality difference. And in this, BH K CIGRE can make a great contribution.

With the hope and desire for even more successful cooperation, I once again congratulate the thirtieth anniversary of the establishment of BH K CIGRE, I wish all of us successful work in the challenging decades to come, and I sincerely greet you all,

Marinko Gilja

Bisera Hadžialjević, director
Energoinvest, d. d. Sarajevo

The founders of the Bosnia and Herzegovina CIGRE committee bravely advocated optimism and a permanent connection between scientists and builders. Ever since the war in 1992, guided by the principles of the CIGRE International Council on Large Electrical Systems, Bosnian and Herzegovinian engineers have promoted the improvement of knowledge and construction activities in the development of the power system, and the establishment of connections with individuals and organizations in the country and the world in order to exchange and improve theoretical and practical knowledge about production, transmission and distribution of electricity.

Our company Energoinvest d. d. Sarajevo has, by implementing large and demanding projects in the world in the field of transmission lines, substations, cathodic protection as well as the protection of the human environment, transferred concrete experiences to the scientific community through expert papers that were presented at the CIGRE committee. In fact, it was a continuation of our scientific and construction history created by generations before. Over seventy years of experience of our Bosnian and Herzegovinian company, Energoinvest, at the world level, show the inseparability of these spaces from the world we live in and the possibility of joint action in a series of generations for general human construction.

For years, Energoinvest has helped and instructed its engineers to selflessly share knowledge and exchange achievements through membership and participation in the work of CIGRE study committees. The names of many of them are recorded in the conference proceedings, which testify to the scope and difficulty of the author's professional and scientific works, as well as the skill of organizing such important gatherings.

We greatly appreciate and truly support the efforts of BH K CIGRE because before all of us, including the engineering community of BH K CIGRE, is the task to continue with openness for cooperation and expansion of the field of activity in the coming time, to systematically facilitate the acquisition and promotion of knowledge, gather relevant members capable and determined to use their knowledge and experience to influence the development and strengthening of existing forms of organization in study committees, and to contribute to the common good of our society. Energoinvest has consistently done this for all 71 years of its existence.

Bisera Hadžialjević

Srećko Nuić, first general secretary
BH K CIGRE

I remember well, it was the year 1992 and the merciless aggression against Bosnia and Herzegovina. Summer, August '92. year, Sarajevo surrounded, blocked, a city without electricity, without water, no trams, no buses, due to shelling from the surrounding hills. The city seemed sinister. In such a situation, I don't know how, I was informed to come to the premises of the Chamber of Commerce on August 23, 1992 for the establishment of the national CIGRE Committee of Bosnia and Herzegovina, which will operate within the framework of the International Committee of CIGRE Paris. Of course, I was happy about it because it acted as a resistance to the uncertainty and brutality of the aggression against Sarajevo.

I remember that hot summer day, I left on time towards the Sarajevo centre from the Sarajevo settlement of Alipašino Polje, along the main street that connects Ilidža with Sarajevo. The street was almost empty. Nobody anywhere. Only a few cars drive by at high speed to reduce the risk of snipers and grenades. I luckily arrived at the meeting where about thirty of our colleagues gathered exclusively from Sarajevo. Colleagues from other cities could not attend due to the blockade of entry and exit from Sarajevo. On that occasion, the leadership of the BH committee was elected. I was elected secretary general of the BH committee. After that, the management of the study committees for individual areas was chosen based on CIGRE Paris. I remember that the then director of Elektroprivreda BiH, Edhem Bičakčić, as the head of the delegation, left via the Sarajevo airport, went to Paris, attended and addressed the General Assembly of CIGRE, presented the electricity situation in Bosnia and Herzegovina and returned to besieged Sarajevo, which was without electricity and water. This was followed by the organizational and professional activities of the BH CIGRE Committee, which resulted in the First BH Committee Conference at the end of 1993, which was held in the cold rooms of the Holiday Inn Hotel in Sarajevo, under grenades and without electricity, water and gas.

In such difficult conditions, we managed to publish the Proceedings from that conference. And later the next conferences came, it was still difficult, but much easier. So here we are, celebrating 30 years of active work and activities of our BH committee, which should really be proud of the successful organization of its 15 conferences and dozens of other various gatherings where hundreds of papers were published.

On this occasion, I congratulate the thirtieth anniversary of the successful work of the BH committee. I especially congratulate the current president on the high and well-deserved award Honorary Member of CIGRE 2022 to Mr. Edhem Bičakčić, which was presented to him by the President of CIGRE International during the ceremonial opening of the 49th session of CIGRE in Paris, at the end of August 2022.

Zagreb, 10.09.2022.

Srećko Nuić

Jasmina Jakić, general secretary
BH K CIGRE (1995–2013)

Dear colleagues, whenever you remember the joy of belonging to CIGRE activities, you should take a look at this Monograph, which tells about the founding, development and successes of the Bosnia and Herzegovina CIGRE Committee.

It is the diary of several generations of Bosnian and Herzegovinian power engineers who, with their enthusiasm and activities, contributed to making our CIGRE committee recognizable and respected in the country, the region and the world.

This is evidenced by fifteen BH K CIGRE conferences and two BH K CIRED conferences, in which BiH experts and experts from the region and the world participated, six international colloquiums, in which world experts from all continents of the world, and over thirty gatherings (round tables, presentations, tutorials, lectures...) held in Bosnia and Herzegovina. Furthermore, our experts participate with their papers in the meetings of the International CIGRE in Paris, as well as in many conferences of the national committees of CIGRE and CIRED in the region.

Many members of the Bosnia and Herzegovina Committee of CIGRE contributed to the work of International CIGRE through the activities of their study committees and work groups. The Bosnia and Herzegovina Committee of CIGRE established contacts with national committees in the region and Europe, with the aim of exchanging experiences and mutual information of all members on current topics in the field of electric power.

We were especially honoured by the presidents of the International CIGRE: Michel Chamia, who visited the Bosnia and Herzegovina CIGRE Committee in 1998, André Merlin, who participated in the 9th conference in 2009, and Jean Kowal, the general secretary, at the 6th conference in 2003. The Government of Bosnia and Herzegovina with the competent ministries, Energoinvest, Elektroprijenos BiH, Iskraemeco Sarajevo, representatives of ABB and SIEMENS, Končar Croatia, BH Gas, USAID, regulatory commissions for energy and many others gave great support through the sponsorship of the activities. With the development of IT technologies, in 1997 the

Bosnia and Herzegovina CIGRE Committee prepared and presented its website www.bhkcigre.ba, where it posted all information about the activities of our Committee, International CIGRE and national committees in the region.

Professional gatherings, organized by the Bosnia and Herzegovina CIGRE Committee, were places to give and receive knowledge, establish contacts, create new friendships and have a good time. The inclusion of young engineers in the work of the Bosnia and Herzegovina CIGRE Committee opened wide opportunities for obtaining information that will be useful for their further work and improvement in their profession. All these activities were organized by the Secretariat of the Bosnia and Herzegovina CIGRE Committee with the support of the authorities and all members of our Committee. Edin Zametica, Zoran Dujković, Kenan Pekmezović and Tarik Čengić made a special contribution through volunteer work, who with their selfless work helped the Secretariat to successfully organize all meetings. This Monograph, on the occasion of 30 years of work of the Bosnia and Herzegovina CIGRE Committee, makes us proud of the achieved results and at the same time obliges us to improve the further work of our Committee with common ideas.

Jasmina Jakić

5

BH K CIGRE Conferences

From 1993 to 2021, the Bosnia and Herzegovina CIGRE Committee has organized 15 conferences, a total of 1,873 professional and scientific papers were prepared and published.

FIRST BH K CIGRE CONFERENCE

Poster of the First BH K CIGRE conference

Sarajevo, December 1993.
65 papers, 89 authors and co-authors, 150 participants
The conference was held in wartime conditions in the besieged city of Sarajevo.


First BH K CIGRE conference, Sarajevo, 2/3. December 1993

First BH K CIGRE conference, Sarajevo, 2/3. December 1993

First conference of BH K CIGRE: Sabaheta Sadiković, Prof. Dr. Rusmir Mahmutćehajić, Edhem Bičakčić, Academician Zijo Pašić and Muhamed Cico, Sarajevo, 2/3. December 1993

First conference of BH K CIGRE: Zaim Karamehmedović, Prof. Dr. Rusmir Mahmutćehajić, Srećko Nuić, Sabaheta Sadiković and Aćif Hadrović, Sarajevo, 2/3. December 1993

Ceremonial opening of the First conference of BH K CIGRE, Sarajevo, 2/3. December 1993

First BH K CIGRE conference: Zaim Karamehmedović, Prof. Dr. Rusmir Mahmutćehajić, Srećko Nuić, Sabaheta Sadiković and Aćif Hadrović, Sarajevo, 2/3. December 1993

First BH K CIGRE conference: Edhem Bičakčić, Sarajevo, 2/3. December 1993

SECOND BH K CIGRE CONFERENCE

Poster of the Second BH K CIGRE conference

Tuzla, September 1995.
86 papers, 110 authors and co-authors, 229 participants
The conference was held in wartime conditions.

Second BH K CIGRE conference: Srećko Nuić, M.Sc. Ognjen Marković, Jasmina Jakić, Prof. Dr. Rusmir Mahmutćehajić, Sabaheta Sadiković, Prof. Dr. Mirza Kušljugić, Tuzla, 3-5. September 1995

Second BH K CIGRE conference: Prof. Dr. Mirsad Kapetanović, Nasiha Njemčević, Tuzla, 3-5. September in 1995

Second BH K CIGRE conference, Tuzla, 3-5. September 1995

Second BH K CIGRE conference: Hajrudin Šuman and Prof. Dr. Mensur Hajro, Tuzla, 3-5. September 1995

Second BH K CIGRE conference, Tuzla, 3-5. September 1995

THIRD BH K CIGRE CONFERENCE

Poster of the Third BH K CIGRE conference

Cazin, September 1997.
94 papers, 149 authors and co-authors, 264 participants

Third BH K CIGRE conference: Mirsad Veladžić, President of the Una-Sana Canton, Cazin, August 31 – September 3, 1997

Third BH K CIGRE conference: M.Sc. Branka Živković, Prof. Franjo Božuta, academician Zijo Pašić and Savo Nikolić, Cazin, August 31 – September 3, 1997

Third BH K CIGRE conference, Cazin, August 31 - September 3, 1997

Third BH K CIGRE conference, Cazin, August 31 - September 3, 1997

Third BH K CIGRE conference, TECTRA d.o.o. exhibition, Cazin, August 31 - September 3, 1997

FOURTH BH K CIGRE CONFERENCE

Poster of the Fourth BH K CIGRE conference

Neum, September 1999.
106 papers, 158 authors and co-authors, 310 participants

At the Third Regular Assembly, held in Neum on September 16, 1999, the FINAL DOCUMENT was adopted. The Assembly of the Bosnia and Herzegovina CIGRE Committee welcomes the establishment and operation of the Joint Electricity Coordination Center. The Assembly emphasizes the need to build and develop a clear energy strategy for Bosnia and Herzegovina. The economic progress of Bosnia and Herzegovina and the entire region depends, among other things, on the preservation and development of the personnel base.

Fourth BH K CIGRE conference: Prof. Franjo Božuta, M.Sc. Džemail Vlahovljak, Meho Obradović, academician Božidar Matić, Jasmina Jakić, Prof. Dr. Rusmir Mahmutćehajić, Milivoje Tomić, M.Sc. Nikola Rusanov and Tarik Čaršimamović behind the podium, Neum, 12–16. September 1999

Fourth BH K CIGRE conference: Academician Zijo Pašić, Neum, 12–16. September 1999

Fourth BH K CIGRE conference, Exhibition ABB, Neum, 12–16. September 1999


Fourth BH K CIGRE conference, Neum, 12–16. September 1999

Fourth BH K CIGRE conference: Prof. Franjo Božuta, M.Sc. Džemail Vlahovljak, Meho Obradović, academician Božidar Matić, Jasmina Jakić, Prof. Dr. Rusmir Mahmutćehajić, Milivoje Tomić, M.Sc. Nikola Rusanov and the speaker Edhem Bičakčić, Neum, 12–16. September 1999

Fourth BH K CIGRE conference: Prof. Franjo Božuta, M.Sc. Džemail Vlahovljak, Meho Obradović, academician Božidar Matić, Jasmina Jakić, Prof. Dr. Rusmir Mahmutćehajić, Milivoje Tomić, M.Sc. Nikola Rusanov and Prof. Dr. Franc Jakl, SLOKO CIGRE, Neum, 12-16. September 1999

FIFTH BH K CIGRE CONFERENCE

Poster of the Fifth BH K CIGRE conference

Neum, September 2001.
142 papers, 226 authors and co-authors, 305 participants

At the Fourth Regular Assembly, on September 27, 2001, the STATEMENT ON THE BOSNIA AND HERZEGOVINA ELECTRIC ENERGY ECONOMY was adopted.

The participants of the fifth conference of the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE propose and demand urgent and complete changes in the approaches to reconstructing and reorganizing Bosnia and Herzegovina's electricity economy, in accordance with scientific and professional criteria, the best interests of Bosnia and Herzegovina's citizens and transition processes in society and the state with protected human rights, rule of law and free enterprise.

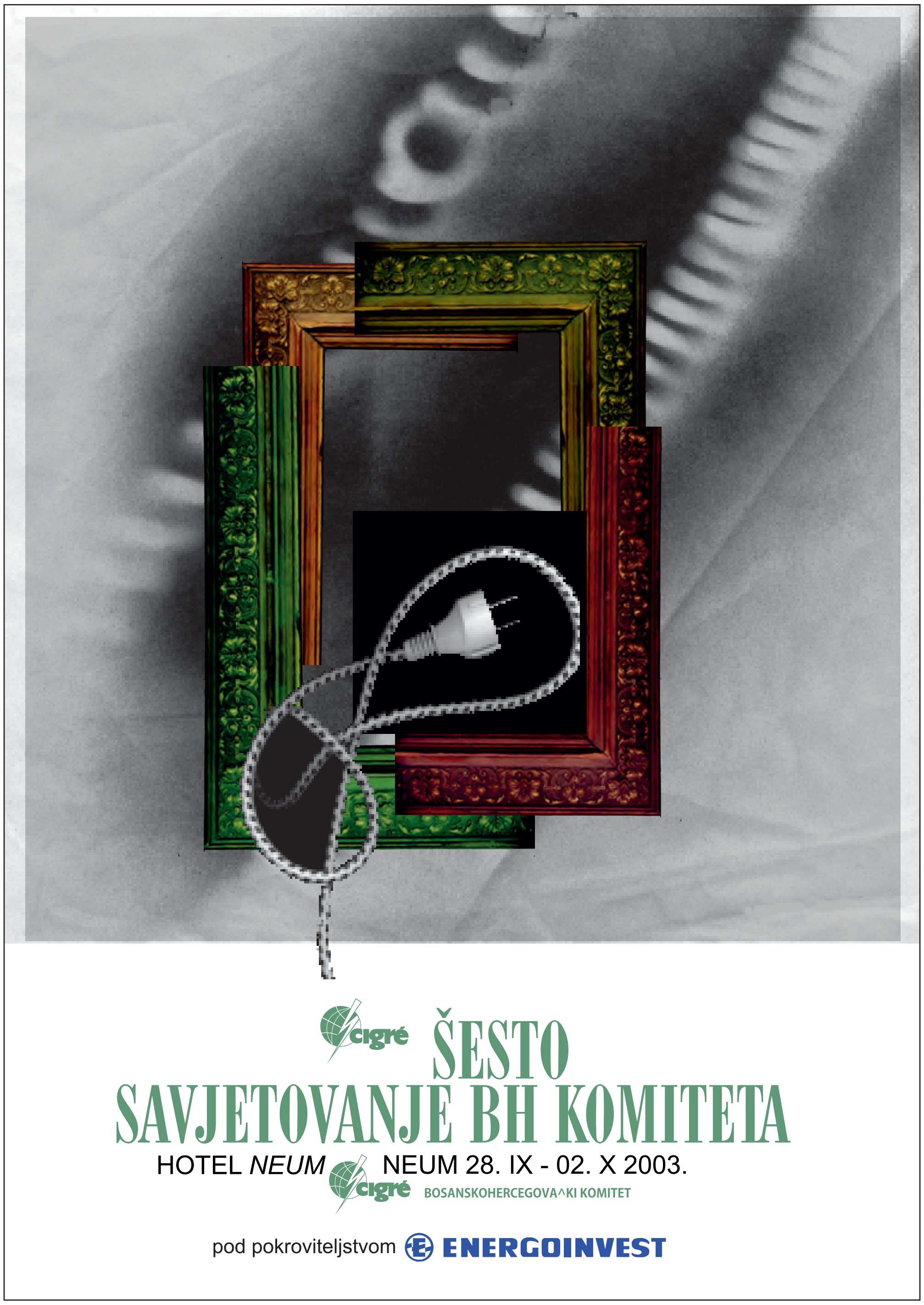
Fifth BH K CIGRE conference: working presidency Prof. Dr. Mensur Hajro, Josip Kreh, Sabaheta Sadiković, Prof. Dr. Rusmir Mahmutćehajić, M.Sc. Ognjen Marković, M.Sc. Nikola Rusanov and Milivoje Tomić, Neum, 23–27. September 2001

Fifth BH K CIGRE conference, Exhibition ISKRAEMECO Sarajevo, Neum, 23-27. September 2001

Fifth BH K CIGRE conference: Slobodan Vukašinović, Elektroprivreda Crne Gore, Neum, 23-27. September 2001

Fifth BH K CIGRE conference, Neum, 23–27. September 2001

Fifth BH K CIGRE conference, SIEMENS Exhibition, Neum, 23–27. September 2001



Poster of the Sixth BH K CIGRE conference

Neum, September/October 2003.
136 papers, 236 authors and co-authors, 285 participants

At the Plenary Session of the Fifth Regular Assembly, held on October 2, 2003, the final document WARNING TO THE POLITICAL PUBLIC ON THE SITUATION IN THE BOSNIA AND HERZEGOVINA ELECTRIC ENERGY ECONOMY was adopted.

Sixth BH K CIGRE conference: M.Sc. Nikola Rusanov, Tatjana Kovačina, Jean Kowal, Secretary General of CIGRE Paris, Prof. Dr. Rusmir Mahmutćehajić, Jasmina Jakić, Dr. Nediljko Bilić and Academician Zijo Pašić, Neum, September 28 - October 2, 2003

Sixth BH K CIGRE conference, Neum, September 28 - October 2, 2003

Sixth BH K CIGRE conference: M.Sc. Nikola Rusanov, Tatjana Kovačina, Jean Kowal, Secretary General of CIGRE Paris, Prof. Dr. Rusmir Mahmutćehajić, Jasmina Jakić, Dr. Nediljko Bilić and Academician Zijo Pašić, Neum, September 28 - October 2, 2003

Sixth BH K CIGRE conference, opening ceremony, Neum, September 28 - October 2, 2003

Sixth BH K CIGRE conference: Dr. Nediljko Bilić, Academician Zijo Pašić and speaker Edhem Bičakčić, Neum, September 28 - October 2, 2003

SEVENTH BH K CIGRE CONFERENCE

Poster of the Seventh BH K CIGRE conference

Neum, September 2005.
121 papers, 216 authors and co-authors, 327 participants

At the Final Plenary Session, the members of the Bosnia and Herzegovina CIGRE Committee adopted a series of conclusions, among which was a WARNING TO THE PROFESSIONAL AND POLITICAL PUBLIC OF BOSNIA AND HERZEGOVINA. During the Seventh Consultation, the following presentations were organized:

1. M.Sc. Nikola Rusanov, *Resynchronization of the First and Second UCTE zones and regional processes in Southeast Europe* (introductory presentation in the framework of the 1st plenary session of the Assembly of BH K CIGRE);
2. M.Sc. Ognjen Marković, *Bosnia and Herzegovina and the Treaty. Requests arising from the document to the electric power sector of BiH, status and implementation plans* (introductory presentation within the framework of the 1st plenary session of the Assembly of BH K CIGRE);
3. Kemo Sokolija, Ph.D., *Electrical Engineering Faculties of Bosnia and Herzegovina and scientific research work in power engineering: Heritage, state and future.*

Seventh BH K CIGRE conference: Tatjana Kovačina, Prof. Dr. Rasim Gačanović, Prof. Dr. Kemo Sokolija, Prof. Dr. Rusmir Mahmutćehajić, Jasmina Jakić, Dr. Nediljko Bilić and M.Sc. Nikola Rusanov, Neum, 25–29. September 2005

Seventh BH K CIGRE conference, opening ceremony, Neum, 25-29. September 2005

Seventh BH K CIGRE conference, welcome address by Prof. Dr. Franc Jakl, Neum, 25–29. September 2005

EIGHTH BH K CIGRE CONFERENCE

Poster of the Eighth BH K CIGRE conference

Neum, October 2007.
123 papers, 254 authors and co-authors, 360 participants

At the Final Plenary Session, the members of the Bosnia and Herzegovina CIGRE Committee adopted a series of conclusions, among which was a WARNING TO THE BOSNIA AND HERZEGOVINA PUBLIC about energy policy problems in the country.

Presentations that were organized during the Eighth conference:

1. Dr. Mirza Kušljugić, *Political economy and reform of the electric power sector – experiences of the reform in BiH and Southeastern Europe*;
2. M.Sc. Ognjen Marković, *Continuation of the reform of the energy sector in Bosnia and Herzegovina*.

Eighth BH K CIGRE conference: Savo Nikolić, Branko Antunović, Prof. Dr. Mirza Kušljugić, Prof. Dr. Rusmir Mahmutćehajić, Jasmina Jakić, M.Sc. Ognjen Marković, M.Sc. Azra Hajro and Prof. Dr. Rasim Gačanović, Neum, 21–25. October 2007

Eighth BH K CIGRE conference, Neum, 21–25. October 2007

Eighth BH K CIGRE conference, STK A2 Transformers: Fikret Velagić, Ninoslav Vidović and Sulejman Čeligija, Neum, 21–25. October 2007

Eighth BH K CIGRE conference, Exhibition KONČAR d. d., Croatia, Neum, 21–25. October 2007

NINTH BH K CIGRE CONFERENCE

Poster of the Ninth BH K CIGRE conference

Neum, September/October 2009.
114 papers, 196 authors and co-authors, 330 participants

Professional presentations:

1. M.Sc. Nikola Rusanov, *Experiences and development directions of EPS BiH and its position in the region of Southeast Europe*;
2. M.Sc. Azra Hajro, *Status and development perspectives of the Bosnia and Herzegovina high-voltage network*;
3. André MERLIN (President of CIGRE & Special Adviser of the European Commissioner for Energy), *The Strategic Role of Power Grids in the Implementation of a European Energy Policy*.

Round table:

Electromagnetic fields of low frequencies – ELF EMF – legislation

Ninth BH K CIGRE conference: Ivan Marko Blažević, Sabaheta Sadiković, Prof. Dr. Rusmir Mahmutćehajić, Jasmina Jakić, Prof. Dr. Rasim Gačanović, Duško Vicković, Neum, September 27 – 1. October 2009

Ninth BH K CIGRE conference, Neum, September 27 - October 1, 2009

Ninth BH K CIGRE conference: Ivan Marko Blažević, Sabaheta Sadiković, Prof. Dr. Rusmir Mahmutćehajić, Jasmina Jakić, Prof. Dr. Rasim Gačanović, Duško Vicković and behind the speaker, M.Sc. Azra Hajro, Neum, September 27 - October 1, 2009

Ninth BH K CIGRE conference, Neum, September 27 - October 1, 2009

Ninth BH K CIGRE conference, Neum, September 27 - October 1, 2009

TENTH BH K CIGRE CONFERENCE

Poster of the Tenth BH K CIGRE conference

Sarajevo, September 2011.
114 papers, 267 authors and co-authors, 420 participants

Presentation at the Opening Ceremony:

1. Dr. Mirza Kušljugić (Parliament of Bosnia and Herzegovina, Sarajevo), *State and development perspectives of EPS BiH*

Tenth BH K CIGRE conference: Branko Antunović, Jasmina Jakić, Prof. Dr. Rusmir Mahmutćehajić, Zdenko Vukić and Prof. Dr. Tatjana Konjić, Sarajevo, 25–29. September 2011

Tenth BH K CIGRE conference: first row - Đulizara Hadžimustafić, Prof. Dr. Mirza Kušljugić and Sanela Pokrajčić, Sarajevo, 25–29. September 2011

Tenth BH K CIGRE conference, Session STK C6, Sarajevo, 25–29. September 2011

Tenth BH K CIGRE conference: Branko Antunović, Jasmina Jakić, Prof. Dr. Rusmir Mahmutćehajić, Zdenko Vukić, Prof. Dr. Tatjana Konjić and speaker Duško Vicković, Sarajevo, 25–29. September 2011

Tenth BH K CIGRE conference, Exhibition ISKRAEMECO, Sarajevo, 25-29. September 2011

Tenth BH K CIGRE conference: Jasmina Jakić, Prof. Dr. Rusmir Mahmutćehajić, Zdenko Vukić, Prof. Dr. Tatjana Konjić, Branko Antunović and speaker Dr. Elvedin Grabovica, general director of JP Elektroprivreda BiH, Sarajevo, 25-29. September 2011

ELEVENTH BH K CIGRE CONFERENCE

Poster of the Eleventh BH K CIGRE conference

Neum, September 2013.
140 papers, 324 authors and co-authors, 410 participants

Presentations at the Opening Ceremony:

1. Prof. Dr. Mirza Kušljugić (Faculty of Electrical Engineering, University of Tuzla), *Electricity sector of Bosnia and Herzegovina: Status and perspectives*;
2. Zdenko Vukić (Elektroprijenos BiH a. d. Banja Luka), *Elektroprijenos Bosnia and Herzegovina. Between profession and politics. What to do next*;
3. Prof. Dr. Tatjana Konjić (Faculty of Electrical Engineering, University of Tuzla), *Education of Bosnia and Herzegovina power engineers*.

Eleventh BH K CIGRE conference: Jasmina Jakić, Prof. Dr. Rusmir Mahmutćehajić, Prof. Dr. Rasim Gačanović and Dr. Mario Kokoruš, Neum, 15–19. September 2013

Eleventh BH K CIGRE conference, Session STK B2 Overhead lines, Neum, 15–19. September 2013

Eleventh BH K CIGRE conference, Neum, 15–19. September 2013

Eleventh BH K CIGRE conference, Neum, 15–19. September 2013

Eleventh BH K CIGRE conference: Prof. Dr. Rusmir Mahmutćehajić, Prof. Dr. Rasim Gačanović, Dr. Mario Kokoruš and the speaker Prof. Dr. Tatjana Konjić, Neum, 15-19. September 2013

TWELFTH BH K CIGRE CONFERENCE

Poster of the Twelfth BH K CIGRE conference

Neum, October 2015
155 papers, 411 authors and co-authors, 400 participants

Presentations at the Opening Ceremony:

1. Husnija Ferizović, *Bosnia and Herzegovina's transmission network: Issues of current functioning*;
2. M.Sc. sc. Edin Zametica, *Electricity sector of Bosnia and Herzegovina on the way to the European Union*;
3. Prof. Dr. Tatjana Konjić, B.Sc. Electrical Engineering (editor of the journal), *Journal B&H Electrical Engineering*.

Twelfth BH K CIGRE conference: Dr. Mario Kokoruš, Prof. Dr. Rusmir Mahmutćehajić, Prof. Dr. Tatjana Konjić and Prof. Dr. Rasim Gačanović, Neum, 4–8. October 2015

Twelfth BH K CIGRE conference, Neum, 4–8. October 2015

Twelfth BH K CIGRE conference, OMICRON Roadshow Truck, Neum, 4–8. October 2015


Twelfth BH K CIGRE conference, Neum, 4–8. October 2015

Twelfth BH K CIGRE conference: Dr. Mario Kokoruš, Prof. Dr. Rusmir Mahmutćehajić, Prof. Dr. Tatjana Konjić, Prof. Dr. Rasim Gačanović and the speaker Melika Mahmutbegović, Vice President of the Federation of BiH, Neum, 4–8. October 2015

THIRTEENTH BH K CIGRE CONFERENCE

Poster of the Thirteenth BH K CIGRE conference

Neum, September 2017
158 papers, 344 authors and co-authors, 450 participants

Introductory reports:

1. Edhem Bičakčić, *Proposal of guidelines for the synthesis of the energy strategy of Bosnia and Herzegovina*;
2. Mustafa Musić, Ajla Merzić, Edin Lapandić, *Usage Perspectives of coal in BiH with regard to new trends and requirements for decarbonization of energy systems*;
3. Mustafa Music, *Development of new technologies - a challenge for the educational and economic system*;
4. Omer Hadžić, Sejid Tešnjak, *Balanced electricity market in BiH, with reference to renewable sources of electricity and the future of the organized electricity market in BiH*;
5. Alaudin Alihiodžić, *Development of the transmission network in Bosnia and Herzegovina, including interconnecting lines.*

Round table:

Coordination of EPS development in BiH at different voltage levels (HV and MV networks and facilities)

Thirteenth BH K CIGRE conference, ceremonial opening: Sabina Dacić Lepara and speaker Edhem Bičakčić, Neum, 17–21. September 2017

Thirteenth BH K CIGRE conference, opening ceremony, Neum, 17–21. September 2017

Thirteenth BH K CIGRE conference, Neum, 17–21. September 2017

FOURTEENTH BH K CIGRE CONFERENCE

Poster of the Fourteenth BH K CIGRE conference

Neum, October 2019
164 papers, 337 authors and co-authors, 450 participants

5 introductory presentations on important and current issues from the electricity distribution industry were presented:

1. Edhem Bičakčić, Prof. Dr. Mustafa Musić, *Projection of the development of the energy sector by 2035*;
2. Dr. Ajla Merzić, Prof. Dr. Mustafa Musić, *Transition of the energy sector of Bosnia and Herzegovina – from coal to renewable sources*;
3. Dalibor Marinčić, *VE Mesihovina, from design to commissioning, political and legal framework, obstacles and challenges*;
4. M.Sc. Omer Hadžić, Prof. Dr. Sejid Tešnjak, *Stock Exchange and organized electricity market in Bosnia and Herzegovina*;
5. Dr. Suada Penava, M.Sc. Adnan Bosović, *Electromobility and their influence on the development of the electric power sector.*

Fourteenth BH K CIGRE conference, Neum, 20–23. October 2019


Fourteenth BH K CIGRE conference, Neum, 20–23. October 2019

Fourteenth BH K CIGRE conference, SIEMENS presentation, Neum, 20–23. October 2019

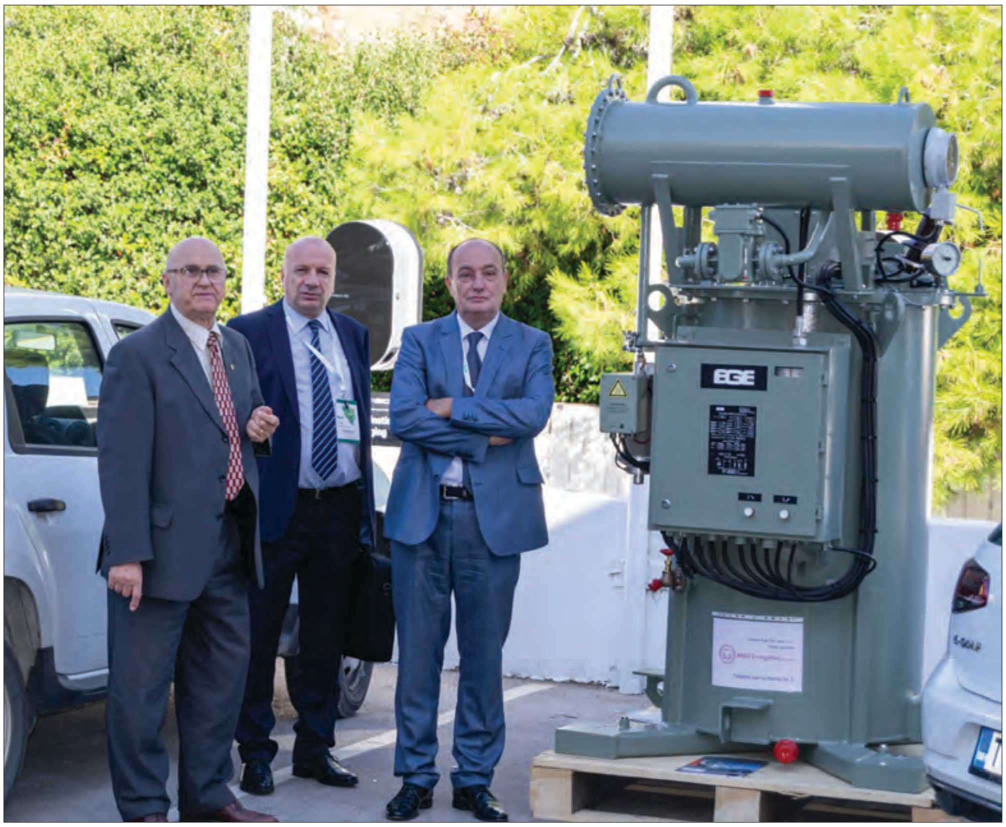

Fourteenth BH K CIGRE conference: Edhem Bičakčić and Mrs. Turajlić, posthumous awarding of recognition for lifetime achievement to Hakija Turajlić, Neum, 20–23. October 2019

Fourteenth BH K CIGRE conference, Neum, 20–23. October 2019

Fourteenth conference BH K CIGRE, Session STK A2 Transformers: Dr. Nada Cincar and Fikret Velagić, Neum, 20–23. October 2019

Fourteenth BH K CIGRE conference, Exhibition MICOM BH, Neum, 20-23. October 2019

Fourteenth BH K CIGRE conference, Women in Energy Forum session, Neum, 20–23. October 2019



Fourteenth BH K CIGRE conference: Irfan Durmić, Prof. Dr. Zijad Bajramović and Edhem Bičakčić, Neum, 20–23. October 2019

FIFTEENTH BH K CIGRE CONFERENCE

Poster of the Fifteenth BH K CIGRE conference

Neum, October 2021
155 papers, 347 authors and co-authors, 450 participants

Four introductory presentations on important and current issues were presented:

1. Edhem Bičakčić, Merima Karabegović, *Energy and climate change*;
2. Ivica Jakić, Goran Slipac, *The role and significance of green hydrogen in the energy transition*;
3. Ajla Merzić, Mustafa Music, Michael Schuhr, Denis Aunedi, *Challenges of building power generation facilities in the conditions of a pandemic (COVID-19) – Example of Podveležje Wind farm*;
4. Anes Kazagić, *Paying for CO_2 emissions - Key influences and trends.*

Round tables were also held during the 15th conference:

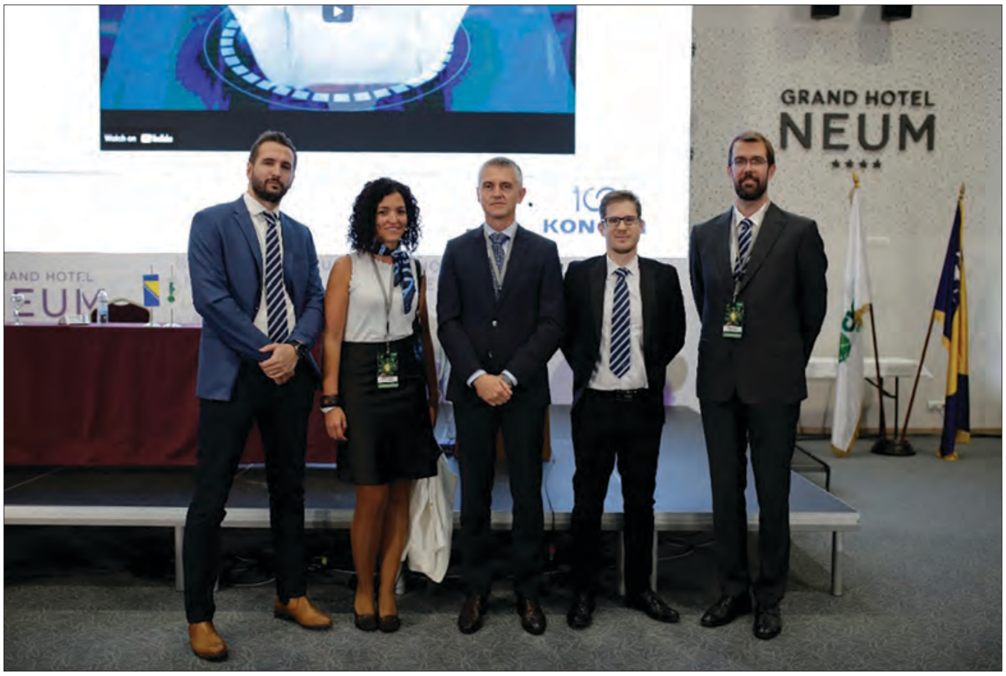
1. *The perspective of the development of electromobility in Bosnia and Herzegovina and its role in the electric power sector*;
2. *Perspectives of RES integration in EPS BiH from the aspect of participation in the electricity market and provision of system services.*

Fifteenth BH K CIGRE conference, Neum, 17-20. October 2021

Fifteenth BH K CIGRE conference, welcome address: Gordan Kolak, President of the Management Board of KONČAR d.d., Croatia, Neum, 17-20. October 2021

Fifteenth BH K CIGRE conference, Neum, 17-20. October 2021

Fifteenth BH K CIGRE conference, welcome address: Admir Anđelija, general director of JP Elektroprivreda BiH, Neum, 17-20. October 2021



Fifteenth BH K CIGRE conference, representatives of KONČAR d.d. Croatia Neum, 17-20. October 2021

Fifteenth BH K CIGRE conference, Neum, 17–20. October 2021

Fifteenth BH K CIGRE conference, OMICRON Exhibition, Austria, Neum, 17–20. October 2021

Table 5.1. Overview of the number of authors/co-authors and papers by conference

Conference	Year	No. of authors/co-authors	Total reports
1. Sarajevo	1993.	89	65
2. Tuzla	1995.	110	86
3. Cazin	1997.	149	94
4. Neum	1999.	158	106
5. Neum	2001.	226	142
6. Neum	2003.	236	136
7. Neum	2005.	216	121
8. Neum	2007.	254	123
9. Neum	2009.	196	114
10. Sarajevo	2011.	267	114
11. Neum	2013.	324	140
12. Neum	2015.	411	155
13. Neum	2017.	344	158
14. Neum	2019.	337	164
15. Neum	2021.	347	155

6

Domestic Meetings Held in Bosnia and Herzegovina

Figure 6.1 Round table *Transition of the energy sector in Bosnia and Herzegovina*, Sarajevo, May 2022

For many years, the CIGRE Committee of Bosnia and Herzegovina has been successfully organizing domestic meetings on various current topics from the power sector. Round tables and expert lectures organized by BH K CIGRE:

- Round table *Chokes - Production and exploitation*, BH K CIGRE - STK 23 Distribution plants, Sarajevo, 1994;
- Round table *Medium voltage plants*, BH K CIGRE – STK Distribution plants, Zenica, 1996;
- *Operation and management* of EPS BiH in wartime conditions, BH K CIGRE - STK 39 Operation and management of electric power systems, Tuzla, 1996;
- *Metal Oxide Surge Arresters*, BH K CIGRE – STK 33 Surge voltages and insulation coordination, Sarajevo, 1996;
- *Drying of power transformers at the installation site*, BH K CIGRE - STK 12 Transformers, Tuzla, 1996;
- *Renewal of the production of high-voltage metering transformers in Energoinvest*, BH K CIGRE - STK 12 Transformers, Sarajevo, 1998;
- *Protection and Local Control in distributing*, Faculty of Electrical Engineering, University of Sarajevo and BH K CIGRE, Sarajevo, 1999;
- Round table *Reform of the electric power sector*, BH K CIGRE – STK 37, 38 and 39, Sarajevo, 2002.
- *Numerical protection and control*, Faculty of Electrical Engineering, University of Sarajevo and BH K CIGRE, Sarajevo, 2002;

Figure 6.2 Round table *Treatment of the neutral point in MV networks of the power system*, Sarajevo, November 2016

- Round table *Losses of electricity in electricity distribution*, JP Eleketroprivreda BiH and BH K CIGRE, Zenica, 2003;
- *Electrical Power System Restructuring and New EU Energy Policy*, Faculty of Electrical Engineering in Tuzla and BH K CIGRE -CIRED, Tuzla, July 2007;
- Public discussion *The state and future of Bosnia and Herzegovina's electrical power industry*, Sarajevo, May 2011;
- Expert meeting *Renewable energy sources and smart grids - Current situation and perspectives*, Faculty of Electrical Engineering in Tuzla and BH K CIGRE, Tuzla, June 2014;
- Public discussion *The state of science and technology in Bosnia and Herzegovina*, Sarajevo, February 2015;

Figure 6.3 Round table *The role and importance of natural gas in Bosnia and Herzegovina - Current situation and development trends*, Sarajevo, May 2022

- Round table *Treatment of the neutral point in MV networks of the electric power system*, Sarajevo, November 2016;
- 9th days of BHAAAS, BH K CIGRE co-organizer, Teslić, May 2017:
  BH K CIGRE co-organized three important symposia in the field of technical sciences:
  1. *The International Symposium on Standardization and Implementation of Standards – ISSIS 2017*;
  2. *The International Symposium on Power Quality – ISPQ 2017*;
  3. *The International Symposium on Advanced Electrical Power Systems (Planning, Operation and Control) – ISAPS 2017.*
- Round table *Coordination of EPS development in BiH at different voltage levels (HV and MV networks and facilities)*, Neum, September 2017;
- Round table *Impact of thermal power plants on the environment*, Sarajevo, December 2017;
- 10th days of BHAAAS, BH K CIGRE co-organizer, Jahorina, June 2018:
  BH K CIGRE co-organized four symposiums in the technical field of technical sciences:
  1. *International Symposium on Advanced Electrical Power Systems – ISAPS 2018*;
  2. *International Symposium on Power Quality – ISPQ 2018*;
  3. *International Symposium on Standardization and Implementation of Standards – ISSIS 2018*;
  4. *International Symposium on Computer Modelling and Simulations for Engineering Applications – ISCoMS 2018.*

– Round table *Advanced signal processing and analysis techniques in power systems*, Jahorina, June 2018;
– Round table *Automatic voltage regulation in modern power systems*, Jahorina, June 2018;
– Round table *Reducing the risks of wind farm construction*, Mostar, July 2018;
– Round table Electromagnetic fields EMF - ELF, legislation, Mostar, October 15, 2018;
– The 11th days of the Bosnian-Herzegovinian-American Academy of Arts and Sciences (BHAAAS) in BiH were held in Sarajevo from June 20 to 23, 2019. During the 11th days, BH K CIGRE was the co-organizer of the symposium in the field of technical sciences:
  1. *International Symposium on Innovative and Interdisciplinary Applications Advances Technologies – IAT 2019*;
– On the 12th days of BHAAAS in BiH organized by BH K CIGRE, there were two presentations and established proposals and conclusions:
  1. *Presentation of 25 years of successful work and activities of the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE – BH K CIGRE with a projection of the development of the electric power sector*;
  2. *Presentation of the conceptual solution of the technical museum*;
– Round table *Cyber security challenges in electric power companies*, June 13, 2019 in the premises of the Academy of Sciences and Arts of BiH;
– Round table *The future of energy production from coal in Bosnia and Herzegovina*, 21 October 2019, Neum;
– At the 14th conference, on October 21, 2019, a meeting of the Women in Energy Forum was organized in Neum.
– BH K CIRED organized and held its second conference in Mostar from 25 to 27 October 2020. In September 2020, the fourth work-consultative session of the Women in Energy Forum, which operates within the framework of BH K CIGRE, was held, where 3 topics were presented and a discussion was held about them;
– On the 13th days of BHAAAS in BiH, organized by BH K CIGRE, two presentations were held and proposals and conclusions were established:
  1. *30 years since the establishment and operation of the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE - BH K CIGRE*;

2. *Transition of EPBiH in the context of decarbonization of the electric power sector within the framework of sustainable systemic and economic-financial parameters as well as social conditions*;

- During 2021, BH K CIGRE organized the following round tables:
  1. *Production of electricity for own needs*;
  2. *Perspectives of RES integration in EES BiH from the aspect of participation in the electricity market and provision of system services*;
  3. *The perspective of the development of electromobility in Bosnia and Herzegovina and its role in the electric power sector.*
- During the 15th conference from October 17 to 20, 2021, the Women in Energy Forum and Next Generation Network were held;
- Round table on *The transition of the energy sector in Bosnia and Herzegovina*, Sarajevo, May 2022;
- Round table *The role and importance of natural gas in Bosnia and Herzegovina - Current state and development trends*, Sarajevo, May 2022;
- Round table *Decarbonization of the energy sector in BiH*, Sarajevo, June 2022, 13 days BHAAAS, Sarajevo;
- Round table *Cyber security challenges in power companies*, Sarajevo, September 2022.

Figure 6.4 Ninth days of BHAAAS, Teslić, 2017

Figure 6.5 a) Round table *Decarbonization of the energy sector in Bosnia and Herzegovina*, Sarajevo, June 2022

Figure 6.5 b) Round table *Decarbonization of the energy sector in Bosnia and Herzegovina*, Sarajevo, June 2022

Figure 6.6 a) Round table on *The transition of the energy sector in Bosnia and Herzegovina*, Sarajevo, May 2022

Figure 6.6 b) Round table on *The transition of the energy sector in Bosnia and Herzegovina*, Sarajevo, May 2022

Figure 6.6 c) Round table on *The transition of the energy sector in Bosnia and Herzegovina*, Sarajevo, May 2022

Figure 6.7 a) Round table *The role and importance of natural gas in Bosnia and Herzegovina - Current state and development trends*, Sarajevo, May 2022

Figure 6.7 b) Round table *The role and importance of natural gas in Bosnia and Herzegovina - Current state and development trends*, Sarajevo, May 2022

Figure 6.7 c) Round table *The role and importance of natural gas in Bosnia and Herzegovina - Current state and development trends*, Sarajevo, May 2022

Figure 6.8 a) Round table *Reducing the risks of wind farm construction*, Mostar, July 2018

Figure 6.8 b) Round table *Reducing the risks of wind farm construction*, Mostar, July 2018

Figure 6.9 Tenth days of BHAAAS, Jahorina, June 2018

Figure 6.10 Tenth days of BHAAAS, signing of the Agreement, Jahorina, June 2018

Figure 6.11 Eleventh days of BHAAAS, Sarajevo, from June 20 to 23, 2019

Figure 6.12 Round table *Cyber security challenges in power companies*, June 13, 2019 in the premises of the Academy of Sciences and Arts of BiH

Figure 6.13 Round table *The future of energy production from coal in Bosnia and Herzegovina*, 21 October 2019, Neum

Figure 6.14 Women in Energy Forum, Neum, October 2019

Figure 6.15 Round table Medium voltage plants BH K CIGRE – STK Distribution plants, Zenica, 1996

Figure 6.16 a) *Numerical protection and control*, Faculty of Electrical Engineering, University of Sarajevo and BH K CIGRE, Sarajevo, 2002

Figure 6.16 b) *Numerical protection and control*, Faculty of Electrical Engineering, University of Sarajevo and BH K CIGRE, Sarajevo, 2002

Figure 6.16 c) *Numerical protection and control*, Faculty of Electrical Engineering, University of Sarajevo and BH K CIGRE, Sarajevo, 2002

Figure 6.17 a) Awarding of recognition to Edhem Bičakčić, president of BH K CIGRE as a sign of gratitude for successful long-term cooperation with BHAAAS. The award is presented by Mahira Tanović, president of BHAAAS. Twelfth Days of BHAAAS, Mostar, 2021

Figure 6.17 b) Transition of EPBiH in the context of decarbonization of the electric power sector within the framework of sustainable systemic and economic-financial parameters as well as social conditions, Mostar, 2021

Figure 6.18 Round table *Cyber security challenges in power companies*, Sarajevo, September 2022

7

International Meetings Held in Bosnia and Herzegovina

The Bosnia and Herzegovina CIGRE committee has organized a number of international meetings in Bosnia and Herzegovina in the past period:

- *Composite Insulators: Why Yes - Why No*, BH K CIGRE – STK 15 Materials for electro technology, Sarajevo, 1998;
- International colloquium *Asset Management of Switching Equipment and New Trends in Switching Technologies*, BH K CIGRE and SC A3 International CIGRE, Sarajevo, September 2003;
- Tutorial *International School on High Voltage Circuit Breakers*, BH K CIGRE, SC A3 International CIGRE and Faculty of Electrical Engineering, University of Sarajevo, Sarajevo, September 2003;
- International colloquium *Power Frequency Electromagnetic Fields – ELF EMF*, BH K CIGRE and CIGRE SCs, B2, B1, B3, B4, C3 and C4, Sarajevo, June 2009;

Figure 7.1 International Colloquium *Asset Management of Switching Equipment and New Trends in Switching Technologies*, Sarajevo, September 2003

Figure 7.2 Tutorial *International School on High Voltage Circuit Breakers*, BH K CIGRE, SC A3 International CIGRE and Faculty of Electrical Engineering, University of Sarajevo, Sarajevo, September 2003



Figure 7.3. International Colloquium *Power Frequency Electromagnetic Fields – ELF EMF*, June 2009

- Second round table *Power Frequency Electromagnetic Fields – ELF EMF - Legislative*, Sarajevo, September 2011;
- International colloquium *Power Quality and Lightning*, Committee for Bosnia and Herzegovina and CIGRE SC C4, Sarajevo, May 2012;
- First SEEERC colloquium *Energy-climate National strategies 2030 and challenges for electric power sector*, Sarajevo, October 25, 2019.

Figure 7.4. International Colloquium *Power Quality and Lightning*, Sarajevo May 2012

Figure 7.5 a) First SEEERC Colloquium *Energy-climate National strategies 2030 and challenges for electric power sector*, Sarajevo, October 25, 2019

Figure 7.5 b) First SEEERC Colloquium *Energy-climate National strategies 2030 and challenges for electric power sector*, Sarajevo, October 25, 2019

8

Participation of BH K CIGRE in the International CIGRE

BH K CIGRE is a fully equal member of CIGRE Paris (one of 61 committees - members of CIGRE Paris), which is evident when proposing and making decisions in CIGRE Paris bodies, especially in the Administrative Council. During 2021, BH K CIGRE had 100 equivalent members (a sort of collection of individual and collective members from BH K CIGRE) in CIGRE Paris. During 2022, a further increase in equivalent members was recorded. In addition to the above equivalent members, BH K CIGRE in CIGRE Paris also has ten student members, students of the Faculty of Electrical Engineering Sarajevo and the Faculty of Electrical Engineering East Sarajevo. They, as students and members of BH K CIGRE, have the right to access all databases of CIGRE Paris, and that completely equally as regular members. Student members do not pay any compensation in the name of membership fees in CIGRE Paris, but they do not have the right to vote when deciding on processes concerning the work of CIGRE Paris.

Members of the Administrative Council and Other Administrative and Work Groups of Cigre Paris from Bosnia and Herzegovina

Full members of the Administrative Council with the right to vote from BH K CIGRE, where one of the conditions for full membership of the national committee in CIGRE Paris is that the national committees have 40 or more equivalent members, in the Administrative Council of the International Council on Large Electrical Systems CIGRE are:

- Prof. Dr. Rusmir Mahmutćehajić, the first president of BH K CIGRE and member of the Administrative Council of CIGRE Paris (1993–2016)
- Edhem Bičakčić, current president of BH K CIGRE and member of the Administrative Council of CIGRE Paris (2016–)

At the General Assembly of CIGRE Paris, held in June 2022, Mr. Edhem Bičakčić was re-elected as a member of the Administrative Council for a period of two years, i.e. until August 2024.

Papers from Bosnia and Herzegovina in the International Cigre after the Formation of BH K CIGRE

After the formation of BH K CIGRE in August 1992, the following papers have been published from Bosnia and Herzegovina in the International CIGRE:

38th session of the International CIGRE in 2000

1. Mirsad Kapetanović, Almir Ahmethodžić, *Behaviour of interrupters on principles using arc-energy in direct and synthetic test circuit insulators – SC 13*
2. Kemo Sokolija, Mirsad Kapetanović, Mensur Hajro, R. Hartings, *Use of natural ageing test for the improvement of the design concepts of composite insulators – SC 33*

39th session of the International CIGRE in 2002

1. A. Brkanić, K. Samardžić, *A practical approach to the design of a power utility multiservice telecommunication network – SC 35*

41st session of the International CIGRE in 2006

1. Mirsad Kapetanović, Almir Ahmethodžić, *Model of the new mechanism for double-motion of contacts in a single break HV SF6 circuit breaker – SC A3*
2. Salih Čaršimamović, Zijad Bajramović, Meludin Veledar, Miroslav Ljevak, Predrag Osmokrović, *Switching overvoltages in air-insulated substation (AIS) due to disconnector and circuit breaker switching – SC C4*

42nd session of the International CIGRE in 2008

1. Salih Čaršimamović, Zijad Bajramović, Meludin Veledar, Miroslav Levak, Srećko Nuić, Predrag Osmokrović, *IMPACT OF TOWER DIMENSIONS ONTO LEVELS OF ELF ELECTRIC AND MAGNETIC FIELDS OF 400 KV OVERHEAD LINES – SC C4*

45th session of the International CIGRE in 2014

1. Meludin Veledar, Zijad Bajramović, Salih Čaršimamović, Milan Savić, Omer Hadžić, *Overhead line tower's foundation type a impulse grounding resistance – SC C4*

46th session of the International CIGRE in 2016

1. Mario Kokoruš, Wolfgang Eyrich, Rasim Gačanović, *OVERHEAD LINE TOWER'S FOUNDATION TYPE A IMPULSE GROUNDING RESISTANCE IMPLEMENTATION OF BUILDING INFORMATION MODELLING (BIM) PROCESS IN SUBSTATION DESIGN SOFTWARE TO INCREASE DESIGN QUALITY – SC B3*
2. Dragan Mlakić, Ljubomir Majdandžić, *FUZZY RULE BASED EXPERT SYSTEM FOR SCADA CYBER SECURITY – SC D2*

47th session of the International CIGRE in 2018

1. Adem Lujnović, Salih Čaršimamović, Meludin Veledar, Zijad Bajramović, Adnan Mujezinović, *EXPERIENCE OF THE APPLICATION GENERATOR CIRCUIT BREAKERS IN TPP KAKANJ – SC C4*

Figure 8.1 Poster presentation of BH K CIGRE members at the 49th session of CIGRE Paris, 2018

48th session of the International CIGRE in 2020 (virtual session)

1. Đenana Čampara, Andrea Hrustemović, Adnan Ahmethodžić, N. Mansourov, Meludin Veledar, *APPLYING AUTOMATED CYBER RISK ASSESMENT FOR THE SMART GRID –SC D2*
2. Esma Music, Adnan Bosović, Ajla Merzić, Mustafa Musić, *HYBRID POWER SYSTEM AND MICROGROD DESIGN FOR REMOTE TOURISTIC VILLAGE – SC C1*

49th session of the International CIGRE in 2022

At this Session of CIGRE Paris, held in the period from August 28 to September 2, 2022, the members of BH K CIGRE published the largest number of papers, since its establishment in 1992.

Figure 8.2 Part of the BH K CIGRE delegates at the 49th session of CIGRE Paris, 2022

These papers were published:

1. Anes Kazagić, Dragan Komljenović, Emira Kozarević, Hasan Avdić, Nedim Suljić, Admir Softić, Ognjen Marković, Dinko Marić, *ASSET MANAGEMENT AS A FRAMEWORK FOR ENERGY TRANSITION OF POWER UTILITIES IN DEVELOPING COUNTRIES – SC C1*
2. Ajla Merzić, Nedžad Hasanspahić, Elma Redžić, Elvisa Bećirović, Nedim Turković, Almin Redžić, Anes Kazagić, Mustafa Musić, *PHOTOVOLTAIC POWER PLANTS ON DEGRADED MINING, SLAG AND ASH DUMP AREAS – A CONTRIBUTION TO COAL REGION TRANSITION PROCESSES – SC C3*
3. Omer Hadžić, Adnan Mujezinović, Zijad Bajramović, Irfan Turković, *RISK EVALUATION FOR ANCILLARY SERVICE - SC C5*

4. Anthony Giacomoni, Diego Alvarado, Livia Amorim, Kenneth Bruninxs, Brian Joseph, Anes Kazagić, Rodrigo Moreno, Subhendu Mukherjee, Yonann Thomas, Jarrad Wright, *CARBON PRICING AND WHOLESALE ELECTRICITY MARKETS - KEY IMPACTS AND TRENDS FROM AROUND THE WORLD - SC C5*
5. Đenana Čampara, Andrea Hrustemović, Adnan Ahmethodžić, Nikolai Mansourov, *ROLE OF DIGITAL ENGINEERING AND DIGITAL TWIN TECHNOLOGY IN CYBERSECURITY OF ELECTRICAL GRID – SC D2*

Figure 8.3 Poster presentation of members of BH K CIGRE at the 49th session of CIGRE Paris, 2022

Participation of BH K CIGRE Members in Working Groups of CIGRE Paris

Nine of our distinguished members are active in CIGRE Paris working groups. The following members of BH K CIGRE have been accepted as working group members and are currently actively participating in their work:

1. Dr. Ivan Ramljak¸ TOR-WG B2.73 Guide for Prevention of Vegetation Fires Caused by Overhead Line Systems;
2. Dr. Anes Kazagić, TOR-WG C5.32 Carbon Pricing in Wholesale Electricity Markets;
3. Dr. Džemo Borovina, TOR-JWG C5/C6.29 New Electricity Markets, Local Energy Communities;
4. Dr. Šeila Gruhonjić Ferhatbegović, TOR-WG B5.65 Enhancing Protection System Performance by Optimizing the Response of Inverter-Based Sources;
5. Đenana Čampara, TOR-WG D2.50 Electric power utilities' cyber security for contingency operations;
6. Dr. Adnan Mujezinović, TOR-WG B2.80 Numerical Simulation of electrical fields on AC and DC Overhead Line Insulator Strings;
7. Mr. Sead Arnautalić, TOR-WG B5.74 Busbar protection considerations when using IEC 61850 process bus;
8. Nedim Turković, TOR-WG C5.35 Integration of hydrogen in electricity markets and sector regulation;
9. Dr. Adnan Bosović, TOR-WG C5.34 Summary of current uses of electric vehicle charge/discharge flexibility in wholesale energy markets and reliable grid operation.

Members of Study Committees of CIGRE Paris from BH K CIGRE

National CIGRE committees can nominate their experts to study committees (SC) of the International Council on Large Electrical Systems CIGRE in the status: regular member *R - regular* or observer member *O - observer*. From 1996 to 2020, the following members participated in the study committees of International CIGRE from Bosnia and Herzegovina:

SC A2	Fikret Velagić – observer
SC A3	Prof. Dr. Mirsad Kapetanović – regular
	Mr. Almir Ahmethodžić – regular
	Dr. Sead Delić – regular
	Dr. Mahir Muratović – observer
SC B3	Dr. Mario Kokoruš – observer
SC B5	Acc. Prof. Dr. Zijo Pašić – observer
SC C1	Mr. Nikola Rusanov – observer
	Prof. Dr. Mirza Kušljugić – observer
	Mr. Edina Aganović – observer
SC C2	Prof. Dr. Mensur Hajro – observer
	Dr. Smajo Bišanović – observer
	Mr. Jasenko Dobranić – observer
SC C4	Dr. Meludin Veledar – observer
	Prof. Dr. Zijad Bajramović – observer
SC C5	Mr. Mirsad Šabanović – observer
	Muris Dlakić – observer
SC C6	Milivoje Tomić – observer
	Prof. Dr. Tatjana Konjić – observer
	Dr. Drago Bago – observer
SC D1	Prof. Dr. Kemo Sokolija – observer
SC D2	Duško Vicković – observer
	Mr. Amela Čaušević – observer

During 2018 and 2019, activities were started for more active participation of our members in the work of CIGRE Paris study committees. As a result of these activities, in the period from 2020 to 2022, 14 of our members were accepted and participated in the work of CIGRE Paris study committees, namely:

SC A2	Prof. Dr. Mensur Kasumović – observer
SC A3	Dr. Mahir Muratović – regular
SC B2	Dr. Meludin Veledar – observer
SC B3	Dr. Sead Delić – observer
SC B4	Prof. Dr. Senad Huseinbegović – observer
SC B5	Šeila Gruhonjić Ferhatbegović – observer
SC C1	Mr. Edina Aganović – observer
SC C2	Prof. Dr. Samir Avdaković – observer
SC C3	Dr. Anes Kazagić – observer
SC C4	Prof. Dr. Zijad Bajramović – observer
SC C5	Dr. Omer Hadžić – observer
SC C6	Prof. Dr. Drago Bago – observer
SC D1	Prof. Dr. Adnan Mujezinović – observer
SC D2	Selma Kovačević – observer

For the period from 2022 to 2024, 14 of our members were accepted as members of study committees of CIGRE Paris, namely:

SC A1	Dino Haračić – observer
SC A2	Prof. Dr. Mensur Kasumović – observer
SC A3	Dr. Mahir Muratović – regular
SC B1	Zorica Mandarić – observer
SC B2	Dr. Meludin Veledar – observer
SC B3	Dr. Sead Delić – observer
SC B5	Dr. Šeila Gruhonjić Ferhatbegović – observer
SC C1	Mr. Edina Aganović – observer
SC C2	Mr. Husnija Ferizović – observer
SC C3	Dr. Anes Kazagić – observer
SC C4	Prof. Dr. Amir Tokić – observer
SC C5	Dr. Omer Hadžić – observer
SC C6	Prof. Dr. Drago Bago – observer
SC D1	Prof. Dr. Adnan Mujezinović – observer

Figure 8.4 Meeting of the Study Committee 13 – Switching devices, Arnhem, 2001, the Netherlands, Prof. Dr. Mirsad Kapetanović participating in the work

Figure 8.5 Meeting of the Study Committee 13 – Switching devices, Arnhem, 2001, The Netherlands, Mirsad Kapetanović, Harry Kempen, Zoran Gajić

Figure 8.6 Fortieth session of CIGRE, Paris, 2004

Figure 8.7 Fortieth session of CIGRE, Paris, 2004, Ljubomir Kojović, Zoran Gajić, Mirsad Kapetanović, Milan Saravolac

Figure 8.8 Forty-first session of CIGRE, Paris, 2006

Figure 8.9 Forty-first session of CIGRE, Paris, 2006, Ismet Orahovac, Mirsad Kapetanović, Ognjen Marković, Halida Mahmutćehajić, Rusmir Mahmutćehajić, Jasmina Jakić

Figure 8.10 The forty-first session of CIGRE, Paris, 2006, in front Meludin Veledar, Salih Čaršimamović, Jasmina Jakić, behind Ognjen Marković

Figure 8.11 Colloquium of Study Committee A3 – High-voltage equipment, Sarajevo, 2003

Figure 8.12 Colloquium of Study Committee A3 – High-voltage equipment, Sarajevo, 2003. Mirsad Kapetanović, Rusmir Mahmutćehajić, Klaus Fröhlich, Edelhard Kynast, Kemo Sokolija

Figure 8.13 Prof. Mirsad Kapetanović at CIGRE SC 13 meeting – Switching devices, Brisbane, 1997, Australia

Figure 8.14 Working group CIGRE A3.41, Paris, 2018

Figure 8.15 CIGRE Joint Colloquium on High Voltage Equipment and Substations, Nagoya, Japan, from September 28 to October 2, 2015, Dr. Sead Delić

Figure 8.16 Working group CIGRE WG B2.80, Paris, 2022, with participation of Prof. Dr. Adnan Mujezinović

9

BH K CIRED

General

CIRED (Congrès International des Réseaux Electriques de Distribution, Fr.; International Conference on Electricity Distribution) is a leading international organization in the field of electricity distribution, where the best international practice in technology and management of electricity distribution is presented. CIRED's goal is to increase professional competence and abilities, skills and knowledge in the broadest field of electrical distribution, including distributed generation. CIRED was founded in 1970 by the Belgian AIM (Association of Engineers of the Electro technical Institute of Liege) and the British IEE (now IET: Institution of Engineering and Technology). CIRED is a non-profit non-governmental association registered in Belgium. CIRED's administration is financially and staff led by AIM and IET and the General Assembly. More than 35 countries from all over the world participate in the work of the international CIRED.

CIRED's activities are based on the activities of direct and associate members.

1. Countries that are extremely active in CIRED (organized approach and internal organization, number of papers and participants in conferences, participation in work...) have the status of direct member. Countries with direct member status have their own representative on the CIRED Directing Committee. Direct members of CIRED are obliged to:
   a. have a National Committee,
   b. promote the activity of CIRED and
   c. actively participate in CIRED power distribution conferences and other activities.
2. Countries cooperating with CIRED have associate member status, but they do not have a recognized national committee. Countries with an associated national committee are considered associate members of CIRED.
   Associated members are obliged to:
   a. have a National Liaison Committee and
   b. promote the activity of CIRED in the country and encourage its members to participate in conferences on electricity distribution CIRED and others gatherings

With the reorganization of CIGRE in Paris in 2002, its field of activity expanded to include distribution systems. This is motivated primarily by the development of distributed generation and the impact on the planning and operation of the transmission network. The issue, which was dealt with within Committee 37 *Network Planning and Development*, grew into the content of the work of Study Committee C6 *Distribution Networks and Small Power Plants*. This Study Committee 6 was established in 2002, as a place to exchange experiences with distributed production in the electric power system, whereby the field of activity was extended to consumption management and energy storage. All other internal problems of distribution systems fell to CIRED: plants, development, operation and management of the distribution network, quality of electricity supply and other issues related to customers, as well as the organization, management and operation of distribution companies in a new competitive environment.

Formation of BH K CIRED

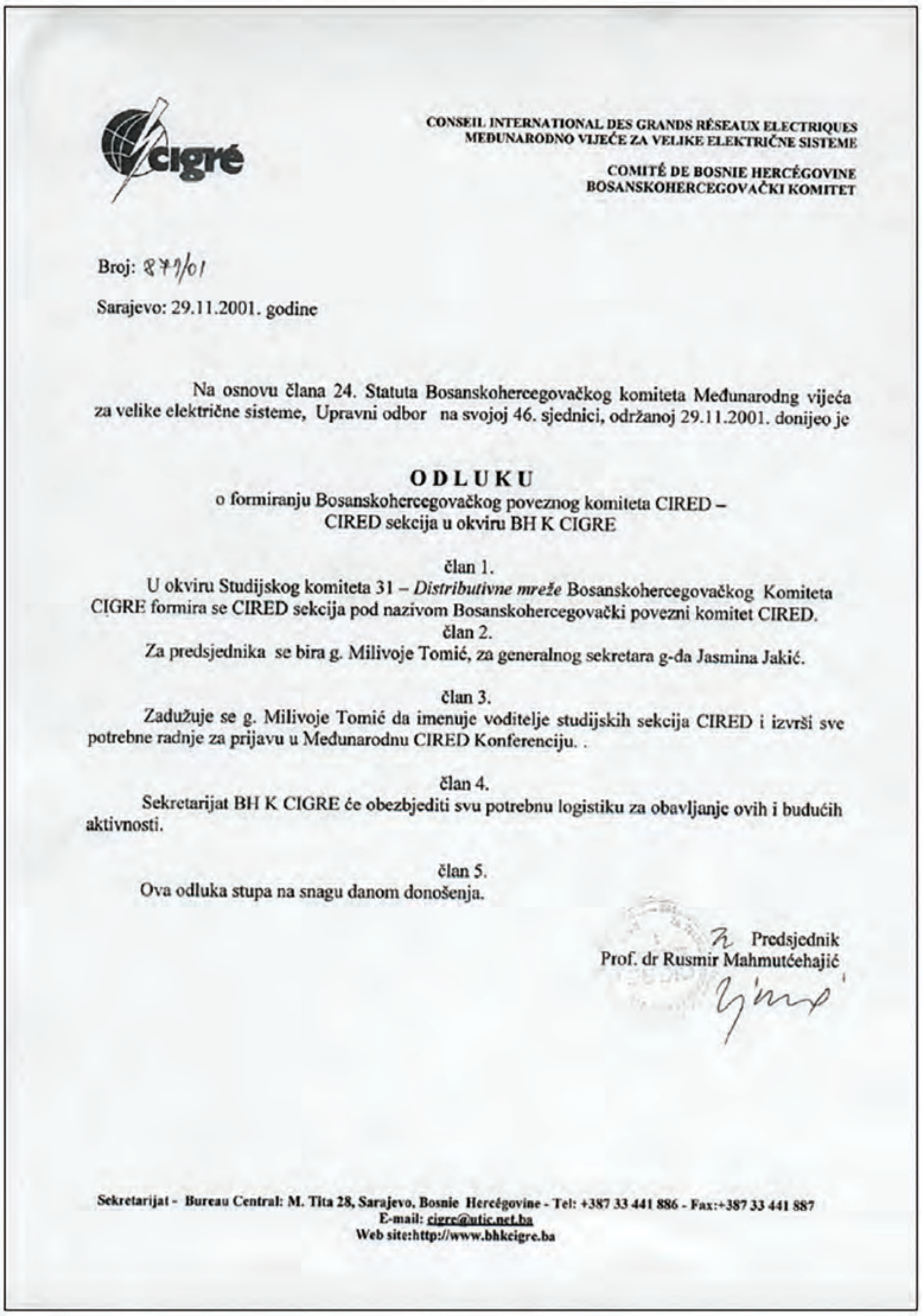
The initiative to establish BH K CIRED dates back to December 1998. when the Working Group headed by Milivoje Tomić was formed, president of the then STK 31 *Distribution Networks*. The task of this working group was to prepare draft decisions and appropriate materials for the establishment of the CIGRE - CIRED Section or the CIRED Committee for Bosnia and Herzegovina. On the basis of the proposal of the Working Group, the Steering committee of BH K CIGRE, by Decision No. 871/01, dated 29 November 2001, formed the Bosnia and Herzegovina CIRED Liaison Committee - CIRED section within BH K CIGRE. Milivoje Tomić was elected as president, and Jasmina Jakić as general secretary. Milivoje Tomić is in charge of appointing heads of study sections and performing the necessary actions for applying to the CIRED International Conference.

BH K CIRED was admitted to the International CIRED Conference in 2001. In the period from 2004 to 2007, three expert meetings were held:

1. **Seminar** *Restructuring of the electric power system and the new energy policy of the European Union*, Tuzla, July 2007,
2. **Round table** *Regulation in the field of electricity distribution - current situation and problems*, Tuzla, December 2004 and
3. **Round table** *Electric distribution systems in conditions of increased distributed production*, Tuzla, March 2007.

The CIRED Committee of Serbia and Montenegro, in cooperation with our committee and the CIRED Committee of Romania, as well as companies and experts from Macedonia and other countries in the region, have organized the First International Regional Conference on Electricity Distribution Networks, which was held in Herceg-Novi in October 2004.

However, after several years of inactivity, BH K CIRED ceased to be a member of this International Organization.



CONSEIL INTERNATIONAL DES GRANDS RÉSEAUX ELECTRIQUES
MEĐUNARODNO VIJEĆE ZA VELIKE ELEKTRIČNE SISTEME

COMITÉ DE BOSNIE HERCÉGOVINE
BOSANSKOHERCEGOVAČKI KOMITET

Broj: 871/01

Sarajevo: 29.11.2001. godine

Na osnovu člana 24. Statuta Bosanskohercegovačkog komiteta Međunarodng vijeća za velike električne sisteme, Upravni odbor na svojoj 46. sjednici, održanoj 29.11.2001. donijeo je

ODLUKU

o formiranju Bosanskohercegovačkog poveznog komiteta CIRED – CIRED sekcija u okviru BH K CIGRE

član 1.

U okviru Studijskog komiteta 31 – *Distributivne mreže* Bosanskohercegovačkog Komiteta CIGRE formira se CIRED sekcija pod nazivom Bosanskohercegovački povezni komitet CIRED.

član 2.

Za predsjednika se bira g. Milivoje Tomić, za generalnog sekretara g-da Jasmina Jakić.

član 3.

Zadužuje se g. Milivoje Tomić da imenuje voditelje studijskih sekcija CIRED i izvrši sve potrebne radnje za prijavu u Međunarodnu CIRED Konferenciju. .

član 4.

Sekretarijat BH K CIGRE će obezbjediti svu potrebnu logistiku za obavljanje ovih i budućih aktivnosti.

član 5.

Ova odluka stupa na snagu danom donošenja.

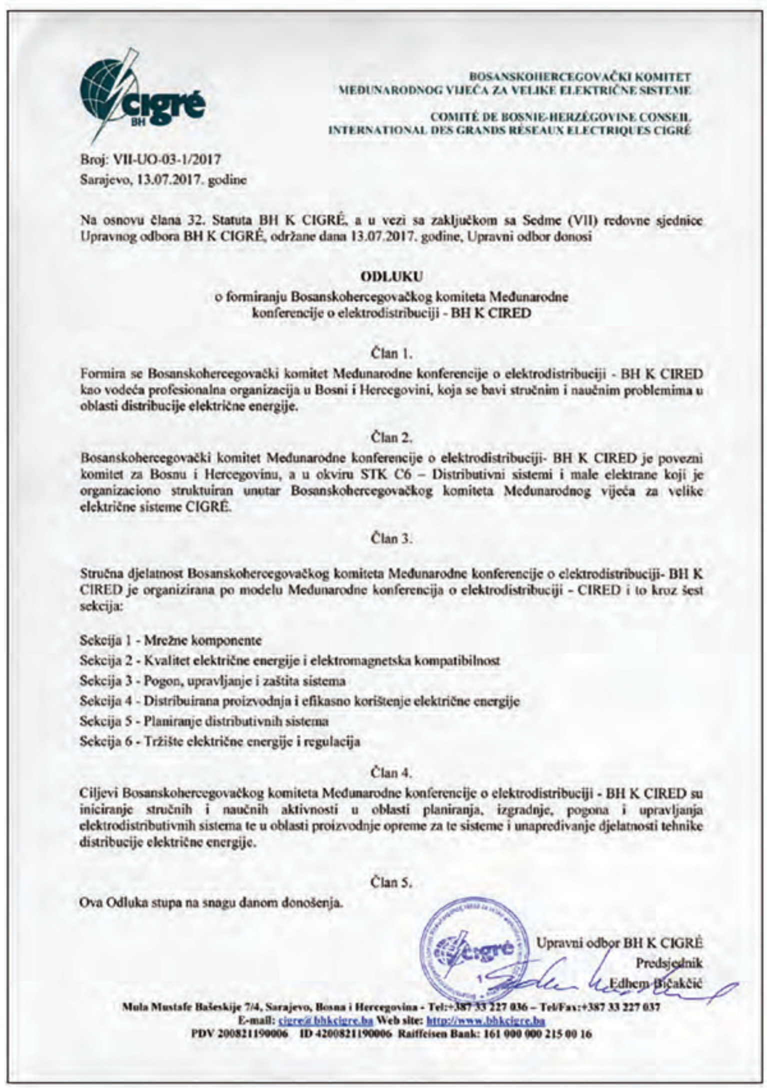
Predsjednik
Prof. dr Rusmir Mahmutćehajić

Sekretarijat - Bureau Central: M. Tita 28, Sarajevo, Bosnie Hercégovine - Tel: +387 33 441 886 - Fax:+387 33 441 887
E-mail: cigre@utic.net.ba
Web site:http://www.bhkcigre.ba

Figure 9.1 Decision number 871/01 of the Steering commitee on the formation of BH K CIRED, November 29, 2001

At the proposal of the president of BH K CIGRE, Edhem Bičakčić, a systematic approach is taken to resolve the status of BH K CIRED, and the Steering Committee of BH K CIGRE, at its Seventh session, held on July 13, 2017 in Sarajevo, made a Decision, i.e. adopts the Rulebook on the work of Bosnia and Herzegovina committee of the International Conference on Electricity Distribution - BH K CIRED. At the 10th session of the Steering Committee of BH K CIGRE, held on November 14, 2017 in Sarajevo, the management of BH K CIRED was appointed with Doc. Dr. Drago Bago, president, and Mr. Sead Spahić, deputy president of BHK CIRED, who were tasked to undertake activities for BHK CIRED to become an associate member of the International Conference on Electricity Distribution – CIRED.

Figure 9.2 Logo of BH K CIRED



BOSANSKOHERCEGOVAČKI KOMITET
MEĐUNARODNOG VIJEĆA ZA VELIKE ELEKTRIČNE SISTEME

COMITÉ DE BOSNIE-HERZÉGOVINE CONSEIL
INTERNATIONAL DES GRANDS RÉSEAUX ELECTRIQUES CIGRÉ

Broj: VII-UO-03-1/2017
Sarajevo, 13.07.2017. godine

Na osnovu člana 32. Statuta BH K CIGRÉ, a u vezi sa zaključkom sa Sedme (VII) redovne sjednice Upravnog odbora BH K CIGRÉ, održane dana 13.07.2017. godine, Upravni odbor donosi

ODLUKU

o formiranju Bosanskohercegovačkog komiteta Međunarodne konferencije o elektrodistribuciji - BH K CIRED

Član 1.

Formira se Bosanskohercegovački komitet Međunarodne konferencije o elektrodistribuciji - BH K CIRED kao vodeća profesionalna organizacija u Bosni i Hercegovini, koja se bavi stručnim i naučnim problemima u oblasti distribucije električne energije.

Član 2.

Bosanskohercegovački komitet Međunarodne konferencije o elektrodistribuciji- BH K CIRED je povezni komitet za Bosnu i Hercegovinu, a u okviru STK C6 – Distributivni sistemi i male elektrane koji je organizaciono struktuiran unutar Bosanskohercegovačkog komiteta Međunarodnog vijeća za velike električne sisteme CIGRÉ.

Član 3.

Stručna djelatnost Bosanskohercegovačkog komiteta Međunarodne konferencije o elektrodistribuciji- BH K CIRED je organizirana po modelu Međunarodne konferencija o elektrodistribuciji - CIRED i to kroz šest sekcija:

Sekcija 1 - Mrežne komponente
Sekcija 2 - Kvalitet električne energije i elektromagnetska kompatibilnost
Sekcija 3 - Pogon, upravljanje i zaštita sistema
Sekcija 4 - Distribuirana proizvodnja i efikasno korištenje električne energije
Sekcija 5 - Planiranje distributivnih sistema
Sekcija 6 - Tržište električne energije i regulacija

Član 4.

Ciljevi Bosanskohercegovačkog komiteta Međunarodne konferencije o elektrodistribuciji - BH K CIRED su iniciranje stručnih i naučnih aktivnosti u oblasti planiranja, izgradnje, pogona i upravljanja elektrodistributivnih sistema te u oblasti proizvodnje opreme za te sisteme i unapređivanje djelatnosti tehnike distribucije električne energije.

Član 5.

Ova Odluka stupa na snagu danom donošenja.

Upravni odbor BH K CIGRÉ
Predsjednik
Edhem Bičakčić

Mula Mustafe Bašeskije 7/4, Sarajevo, Bosna i Hercegovina - Tel:+387 33 227 036 – Tel/Fax:+387 33 227 037
E-mail: cigre@bhkcigre.ba Web site: http://www.bhkcigre.ba
PDV 200821190006 ID 4200821190006 Raiffeisen Bank: 161 000 000 215 00 16

Figure 9.3 Decision on the formation of BH K CIRED, 13 July 2017

The Bosnia and Herzegovina CIRED Committee - BH K CIRED was formed on July 13, 2017 as a leading professional organization in Bosnia and Herzegovina that deals with professional and scientific problems in the field of electricity distribution, studying the functioning of the electricity market, the regulation process and its impact on technological, functional and economic development of the electrical distribution system. At the centre of BH K CIRED's activities are issues related to the electrical distribution system, including design, construction, operation, management, maintenance, organization, as well as electrical equipment.

BH K CIRED is the liaison committee for Bosnia and Herzegovina, and is within STK C6 *Distribution systems and small power plants*, which is organizationally structured within the Bosnia and Herzegovina committee of the International Council on Large Electrical Systems - BH K CIGRE.

The goals of BH K CIRED are: initiation of professional and scientific activities in the field of planning, construction, operation and management of electrical distribution systems and in the field of production of equipment for these systems and improvement of the activities of electrical energy distribution techniques in the professional, scientific and organizational field.

Sessions are the basic organizational form of activity of BH K CIRED. They are studying a certain issue from the scope of BH K CIRED. As a rule, the number of Sessions and the content of their work corresponds to the Sessions of the International Conference on Electricity Distribution - CIRED.

The professional activity of BH K CIRED is organized according to the model of the International Conference on Electricity Distribution - CIRED, through six Sessions:

Session 1: Network Components
Session 2: Power Quality & Electromagnetic Compatibility
Session 3: Operation
Session 4: Protection, Control and Automation
Session 5: Planning of Power Distribution Systems
Session 6: Customers, Regulation, DSO Business & Risk Management

Management of BH K CIRED

BOSANSKOHERCEGOVAČKI KOMITET
MEĐUNARODNOG VIJEĆA ZA VELIKE ELEKTRIČNE SISTEME

COMITÉ DE BOSNIE-HERZÉGOVINE CONSEIL
INTERNATIONAL DES GRANDS RÉSEAUX ELECTRIQUES CIGRÉ

Broj: X-UO-11-1/2017
Sarajevo, 14.11.2017. godine

Na osnovu člana 32. Statuta BH K CIGRÉ, a u vezi sa zaključkom sa Desete (X) redovne sjednice Upravnog odbora BH K CIGRÉ, održane dana 14.11.2017. godine, Upravni odbor donosi

ODLUKU
o imenovanju rukovodstva Bosanskohercegovačkog komiteta Međunarodne konferencije o elektrodistribuciji - BH K CIRED

Član 1.

Za predsjednika Bosanskohercegovačkog komiteta Međunarodne konferencije o elektrodistribuciji - BH K CIRED imenuje se doc.dr. Drago Bago.

Za zamjenika predsjednika Bosanskohercegovačkog komiteta Međunarodne konferencije o elektrodistribuciji - BH K CIRED imenuje se Sead Spahić.

Za sekretara Bosanskohercegovačkog komiteta Međunarodne konferencije o elektrodistribuciji - BH K CIRED imenuje se dr. Ivan Ramljak.

Član 2.

Imenuju se predsjednici Sekcija Bosanskohercegovačkog komiteta Međunarodne konferencije o elektrodistribuciji- BH K CIRED i to:

Za predsjednika Sekcije 1 - Mrežne komponente - imenuje se Mijo Terkeš.
Za predsjednika Sekcije 2 - Kvalitet električne energije i elektromagnetska kompatibilnost - imenuje se dr. Ivan Ramljak.
Za predsjednika Sekcije 3 - Pogon, upravljanje i zaštita sistema - imenuje se dr. Šeila Gruhonjić Ferhatbegović.
Za predsjednika Sekcije 4 - Distribuirana proizvodnja i efikasno korištenje električne energije - imenuje se Zlatan Gafić.
Za predsjednika Sekcije 5 - Planiranje distributivnih sistema - imenuje se Sejda Kruščica - Fejzić.
Za predsjednika Sekcije 6 - Tržište električne energije i regulacija - mr. Senad Aganović.

Član 3.

Zadužuju se predsjednik Bosanskohercegovačkog komiteta Međunarodne konferencije o elektrodistribuciji - BH K CIRED doc.dr. Drago Bago i zamjenik predsjednika Bosanskohercegovačkog komiteta Međunarodne konferencije o elektrodistribuciji - BH K CIRED Sead Spahić da pokrenu aktivnosti da Bosanskohercegovački komitet Međunarodne konferencije o elektrodistribuciji - BH K CIRED postane pridruženi član Međunarodne konferencije o elektrodistribuciji CIRED.

Član 4.

Ova Odluka stupa na snagu danom donošenja.

Upravni odbor BH K CIGRÉ
Predsjednik
Edhem Bičakčić

Mula Mustafe Bašeskije 7/4, Sarajevo, Bosna i Hercegovina - Tel:+387 33 227 036 – Tel/Fax:+387 33 227 037
E-mail: cigre@bhkcigre.ba Web site: http://www.bhkcigre.ba
PDV 200821190006 ID 4200821190006 Raiffeisen Bank: 161 000 000 215 00 16

Figure 9.4 Decision on the appointment of the management of BH K CIRED, November 14, 2017

Management of BH K CIRED from 2017 to 2019.

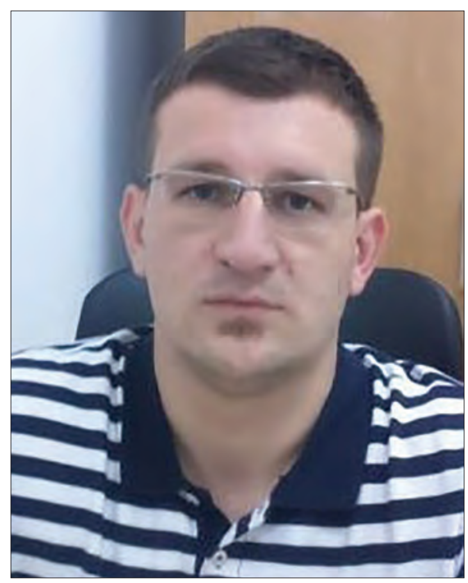
President: Prof. Dr. Drago Bago, B.Sc. Electrical Engineering
Deputy President: Sead Spahić, B.Sc. Electrical Engineering
Secretary: Doc. Dr. Ivan Ramljak, B.Sc. Electrical Engineering

Figure 9.5 Tenth session of the Steering Committee of BH K CIGRE

Management of BH K CIRED - from 2019 to present day

Prof. Dr. Drago Bago, B.Sc. Electrical Engineering, president

Dr. sc. Elvisa Bećirović, B.Sc. Electrical Engineering, deputy president



Doc. Dr. Ivan Ramljak, B.Sc. Electrical Engineering, secretary

Section/Study Committee 1
Mijo Terkeš, B.Sc. Electrical Engineering, president
Zorica Mandarić, B.Sc. Electrical Engineering, deputy president
Josip Baković, B.Sc. Electrical Engineering, secretary

Section/Study Committee 2
Doc. Dr. Ivan Ramljak, B.Sc. Electrical Engineering, president
Monija Nogulić, B.Sc. oec., deputy president
Marin Bakula, B.Sc. Electrical Engineering, secretary

Section/Study Committee 3
Dr. Sc. Šeila Gruhonjić-Ferhatbegović, B.Sc. Electrical Engineering, president
Mr. Sc. Sanela Suljović-Fazlić, B.Sc. Electrical Engineering, deputy president
Dino Bošnjaković, B.Sc. Electrical Engineering, secretary

Section/Study Committee 4
Dr. Sc. Marko Ikić, B.Sc. Electrical Engineering, president
Dr. Sc. Ajla Merzić, B.Sc. Electrical Engineering, deputy president
Mr. Sc. Nedžad Hasanspahić, B.Sc. Electrical Engineering, secretary

Section/Study Committee 5
Sejda Kruščica-Fejzić, B.Sc. Electrical Engineering, president
Emir Naimkadić, B.Sc. Electrical Engineering, secretary

Section/Study Committee 6
Mr. Sc. Senad Aganović, B.Sc. Electrical Engineering, president
Mr. Sc. Sanela Cigić, B.Sc. oec., secretary

Conferences BH K CIRED

BH K CIRED has organized two conferences in the past period where a total of 125 professional and scientific papers were prepared and published. According to the data, the average number of participants at BH K CIRED conferences is around 350.

First BH K CIRED conference, from October 14 to 16, 2018

The first conference was held in the period from October 14 to 16, 2018 in Mostar, Hotel Mepas. At the First conference, 65 accepted regular reports were presented. Accepted papers, apart from Bosnia and Herzegovina, were also submitted by authors from Croatia, Serbia, Slovenia and Germany. A total of 5 introductory papers were presented, which deal with current issues in the field of electricity distribution. The introductory papers that were presented are:

1. *Methodology of transition from 10 kV to 20 kV voltage level*, Doc. Dr. Sc. Drago Bago, Doc. Dr. Ivan Ramljak, Marin Bakula, EP HZ HB;
2. *Smart grids, (solutions, technologies, integration into existing networks, challenges and benefits)*, Prof. Dr. Mustafa Musić, EP BiH;
3. *Implementation of SCADA/DMS/OMS system in the electrical distribution system of JP EPBiH (virtualization, integration, challenges and benefits)*, M.Sc. Emil Hadžović, Igor Primorac, M.Sc. Amela Čaušević, EP BiH;
4. *Net measurements of electricity production from renewable energy sources in distribution networks*, M.Sc. Dalibor Muratović, EP RS;
5. *Automation of the distribution medium voltage network (implementation of remotely controlled objects on the network, line disconnectors and failure indicators)*, Dr. Sc. Šeila Gruhonjić Ferhatbegović, Dr. Sc. Ekrem Softić, EP BiH.

During the first conference, a round table was held on the topic of *Electromagnetic fields EMF - ELF, legislation*. There were also thematic presentations of sponsors and exhibitions of manufacturers of electrical power equipment.


1. SAVJETOVANJE
BH K/O CIRED
Mostar, 14. - 16. listopad/oktobar 2018.


CIRED
BH
1. SAVJETOVANJE
BH K/O CIRED
Mostar, 14. - 16. listopad/oktobar 2018.


HOTEL
MEPAS
HOTEL
MEPAS


Definitions
HOTEL

Second BH K CIRED conference, from October 25 to 27, 2020

The second conference was organized from October 25 to 27, 2020 in Mostar, Hotel Mepas. The conference was held in a hybrid form (parallel live and virtual) due to the period of the COVID-19 pandemic. The second conference was organized and held in the difficult conditions of the pandemic. The organization itself was a challenge, and maintaining it was an even bigger challenge. It is important to say that this conference is one of the few in the wider area that was held at all. At the Second conference, 60 accepted regular papers were presented. Papers are presented within six Sessions. Accepted papers were submitted, apart from Bosnia and Herzegovina, by authors from Croatia, Serbia and Germany. The introductory papers presented at the Second conference are:

1. *Presentation of the study Concept of the new organization of EP BiH with a focus on organizational separation of distribution activities and adaptation to business on the open electricity market – basic changes in the organization*, Mustafa Beća, JP Elektroprivreda BiH;
2. *Impact of Covid-19 on the operation of the electric power system*, Edhem Bičakčić, BH K CIGRE;
3. *Determination of the optimal portfolio of renewable sources of electricity*, Prof. Dr. Mirza Kušljugić, Faculty of Electrical Engineering, Tuzla;

Expert presentations by sponsor Končar Croatia were also held during the conference.

Third BH K CIRED conference, from October 16 to 18, 2022

BH K CIRED is organizing its Third Conference, which will be held from October 16 to 18, 2022 in Mostar, at the Mepas Hotel and the Mostar Hotel. Over 60 professional and scientific papers will be presented during the conference.

Participation in the Activities of the International CIRED

BH K CIRED also actively coordinates and participates in activities of the international CIRED.

Since the formation of BH K CIRED, experts from Bosnia and Herzegovina have participated in the last two conferences, namely:

a. CIRED, 25th International Conference, Madrid, from June 3 to 6, 2019, Spain and
b. CIRED, online, 26th international conference, Geneva, from 20 to 23 September 2021, Switzerland.

Figure 9.6 Photo from the archives of CIRED participants, Madrid, 2019

The following papers were presented from Bosnia and Herzegovina:

1. *Experimental investigation of ferroresonance and mitigation measures in 35 kv isolated networks*, Maja Muftić Dedović, Adnan Mujezinović, Nedim Turković, Nedis Dautbašić, Irfan Turković, Amir Tokić, Zijad Bajramović, CIRED 2019;

2. *Rational use of connected capacities in purpose of more electricity efficient power distribution network*, Senad Aganović, Edina Aganović, Tatjana Konjić, CIRED 2019;
3. *Modeling the propagation of harmonic voltages in large medium voltage distribution networks*, Adnan Bosović, Herwig Renner, Andreas Abart, Ewald Traxler, Jan Meyer, Max Domagk, Mustafa Music, CIRED 2019;
4. *Distribution grid planning and analyzing using smart metering data*, Ivan Ramljak, Drago Bago, CIRED 2019;
5. *Influence of PV plant 1 MWp connected on MV overhead line on voltage quality in PCC – case study*, Drago Bago, Ivan Ramljak, CIRED 2019;
6. *Modeling of flicker in large real medium voltage distribution networks*, Adnan Bosović, Herwig Renner, Andreas Abart, Ewald Traxler, Mustafa Musić, CIRED 2021;
7. *Application of business intelligence tools for efficient managing business processes and data in distributed system operator Elektroprivreda B&H*, Amer Aščerić, Selma Kovačević, CIRED 2021.

In the previous period, before the formation of BH K CIRED, experts from Bosnia and Herzegovina also have participated in CIRED conferences:

a. CIRED, 20th international conference, from June 8 to 11, 2009, Czech Republic and
b. CIRED, 21st international conference, Frankfurt, from June 6 to 9 2011, Germany.
   1. *Dynamic response of distributed synchronous generators on faults in HV and MV networks*, Elvisa Bećirović, Mirza Kušljugić, CIRED 2009;
   2. *Quality of electricity supply indices – JP Elektroprivreda B&H*, Elvisa Bećirović, Meliha Džizić, Snježana Tepavčević, CIRED 2009;
   3. *Practical statistical methods in distribution load estimation*, Seka Kuzmanović, Goran Švenda, Zoran Ovčina, CIRED 2009;
   4. *Implementation of AMR/AMM system: Results and plans - Elektroprivreda BiH*, Elvisa Bećirović, Mustafa Musić, Suada Penava, CIRED 2011.

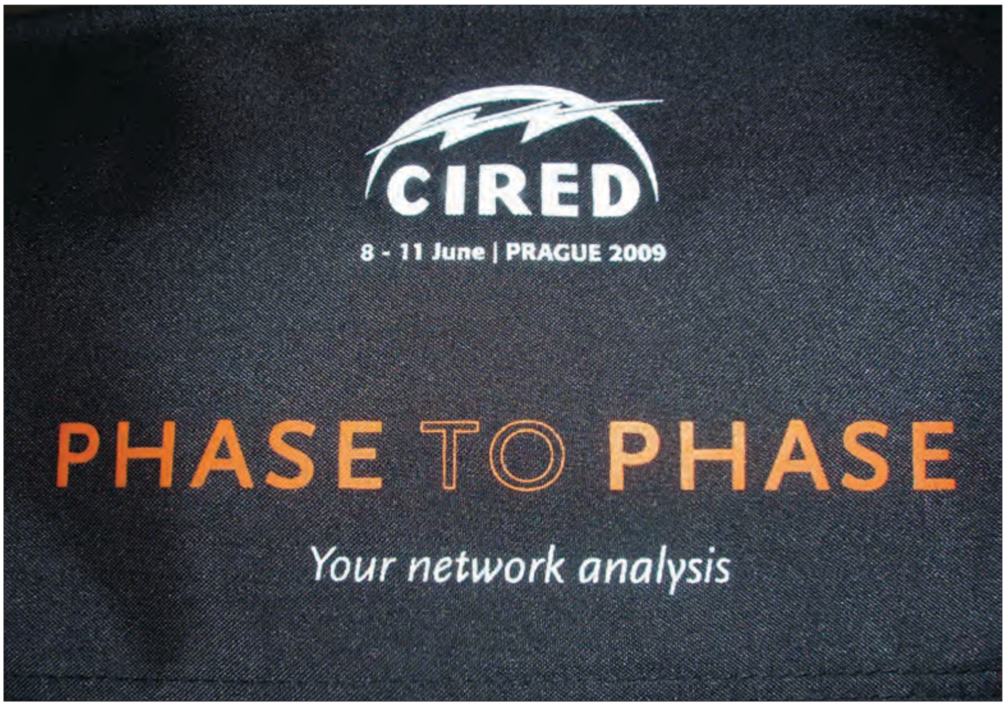


Figure 9.7 Photo from the archives of CIRED participants, Prague, 2009


Figure 9.8 Photo from the archives of CIRED participants, Frankfurt, 2011

The next international CIRED conference will be held in June 2023. in Rome (Italy).

CIRED 2023-27th International Conference and Exhibition on ELECTRICITY DISTRIBUTION, Roma (Italy), 12-15 June 2023, https://www.cired2023.org/

CIRED working groups

The activities of the international CIRED also include actions through the work of thematic working groups and advisory groups.

Experts from Bosnia and Herzegovina, who were or are currently active participants in CIRED working groups, are:

1. DC Distribution Networks – WG 2019-1 – Elvisa Bećirović, Elektroprivreda BiH Sarajevo, Bosnia and Herzegovina; final report prepared;
2. Dynamic Network Tariffs – an Opportunity for the Energy Transition – WG 2020-2, Elvisa Bećirović, Elektroprivreda BiH Sarajevo, Bosnia and Herzegovina;
3. Cybersecurity in Smart Grids – WG 2020-3, Đenana Čampara, KDM Analytics, Bosnia and Herzegovina, Jasmin Heljić, JP Elektroprivreda BiH, Bosnia and Herzegovina, Emina Kreštalica, JP Elektroprivreda BiH, Bosnia and Herzegovina;
4. Network planning & system design – WG 2021-2, Šeila Gruhonjić Ferhatbegović, Elektroprivreda BiH Sarajevo.

BH K CIRED members also participate in the work of CIRED advisory groups:

- CIRED Advisory Group – Session 2: Power quality and electromagnetic compatibility, Adnan Bosović.

South East European Regional Council of CIGRE – CIGRE SEERC

Establishment – History of SEERC

CIGRE, as one of the world's oldest international technical organizations, has a great tradition in the region of Central and South-eastern Europe. Within the work program of the 3rd conference of the Montenegrin Committee of CIGRE, held in May 2013 in Pržno, and on the basis of common interest and previous formal cooperation, the national committees of CIGRE of Bosnia and Herzegovina, Croatia, Italy, Macedonia, Montenegro, Romania, Serbia, of Slovenia and Ukraine passed the Decision on the establishment of a new regional CIGRE Committee, which will operate under the name South East European Regional Council of CIGRE - SEERC.

The Regional Council was formed in accordance with the CIGRE Statute, and it was officially recognized as a CIGRE regional body by the CIGRE Administrative Commission at the meeting held in September 2013 in Kazan (Russia).

Figure 10.1 Founding conference of SEERC, Miločer - Montenegro, May 2013

SEERC Today

SEERC is expanding its activities and the exchange of knowledge and information, which provides an opportunity for the development of the future electric power network and market, in order to ensure a safe and reliable supply of electricity for more than 270 million inhabitants of this region. This region has enormous potential for the rapid development of the energy sector, with current installed capacities of over 450,000 MW. The close cooperation of the countries of Southeast Europe within SEERC offers better opportunities for the development of the future electric power network and market.

The SEERC region today consists of 17 national committees (note: the Czech Republic and Slovakia are united in one National Committee):

1. Austria
2. Bosnia and Herzegovina
3. Croatia
4. Czech Republic and Slovak Republic
5. Greece
6. Georgia
7. Hungary
8. Israel
9. Italy
10. Kosovo
11. North Macedonia
12. Montenegro
13. Romania
14. Serbia
15. Slovenia
16. Turkey
17. Ukraine

It is expected that Moldova will join SEERC in the coming period.

Overview of some indicators in the SEERC region:

- The SEERC region covers a geographical area of approximately 2.5 million km^2.
- More than 270 million inhabitants live in the SEERC region today.
- The total installed power in the SEERC region is over 450,000 MW.

Figure 10.2 CIGRE SEERC Region

- The annual production of electricity in the SEERC region is approximately 1,100 TWh.
- The annual consumption of electricity in the SEERC region is approximately 1,000 TWh.
- The total length of transmission lines with a voltage level over 100 kV in the SEERC region is approx. 250,000 km.

Topics of common interest to national committees of the SEERC region are the following:

- Planning and development of large investments, such as running underwater AC and DC cables across the Adriatic and the Mediterranean (cables for connecting Italy, Greece, Montenegro, Malta, Croatia, Albania, isolated wind farms in the open sea, etc.);
- Modernization of the electric power network, implementation of intelligent technologies in power systems, renovation of the existing power system;
- Asset management issues of the energy sector with regard to regional specificities;

– Planning of the electricity market of Southeast Europe, specific regional issues, mutual support and cooperation in the field of new technical standards;
– New European energy orientation towards sustainable development, renewable energy sources, smart grids, assessments of environmental solutions (legal problems, aesthetic solutions, sustainable innovative technological solutions, etc.);
– Dissemination of knowledge from other advanced regions;
– Innovative forums in the region that use the intellectual potential of Southeast Europe.

Organizational Chart of SEERC and Our Members in SEERC Bodies

The work of SEERC is organized through the Management Board - SEERC MB, Technical Advisory Committee - SEERC TAC and Regional Working Groups - SEERC RWGs.

In addition to the three key segments from the SEERC organizational chart, SEERC is working on establishing its NGN and WIE network.

NCs within SEERC that have an established NGN are:

1. Austria
2. Bosnia and Herzegovina
3. Croatia
4. Greece
5. Hungary
6. Italy
7. Romania
8. Slovenia
9. Turkey

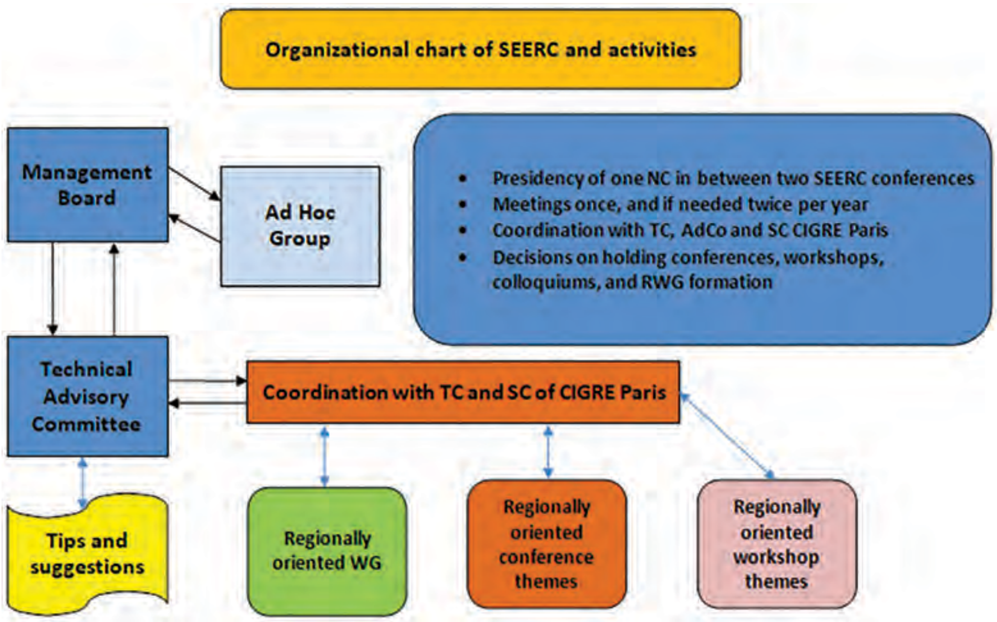


Figure 10.3 SEERC organizational chart and flow of activities within the SEERC region

NCs within SEERC that have an established WIE:

1. Bosnia and Herzegovina
2. Croatia
3. Israel
4. Kosovo
5. Romania
6. Slovenia
7. Turkey

The first member of the SEERC Management Board from BH K CIGRE was the then president of BH K CIGRE Prof. Dr. Rusmir Mahmutćehajić (2013–2016)

The current member of the SEERC Management Board from BH K CIGRE is the president of BH K CIGRE Edhem Bičakčić (2016–)

The current members of the SEERC Technical Advisory Committee are:

1. M.Sc. Sabina Dacić-Lepara,
2. Prof. Dr. Zijad Bajramović and
3. Dr. Ivan Ramljak.

The currently active SEERC working groups, which will soon finish their work, are:

1. RWG01: Regional aspects on creation of NNA for new standard for overhead lines EN 50341;
2. RWG02: Regional perspective of shunt reactor introduction in the transmission system;
3. RWG03: Environmental and technical assessment for submarine cables siting issue in Mediterranean area;
4. RWG04: Technical and economic features of Hydro Pumped storage power plants (HPSPPs) in power systems.

In the work of the working group RWG: History of SEERC Region, which was active during 2020, and whose work resulted in the book *History of CIGRE SEERC Region*, published in 2020, TAC members from Bosnia and Herzegovina participated: M.Sc. Sabina Dacić-Lepara and Prof. Dr. Zijad Bajramović, who are also the authors of the chapter on Bosnia and Herzegovina in this book, in which Bosnia and Herzegovina is presented through the following chapters: History of the electric power sector in Bosnia and Herzegovina; History of BH K CIGRE; Activities and achievements of BH K CIGRE; Profile of the electric power sector and vision of the development of renewable energy sources

Figure 10.4 Kick-off meeting of the RWG History of electric power in the SEERC region, Athens, 23 January 2020

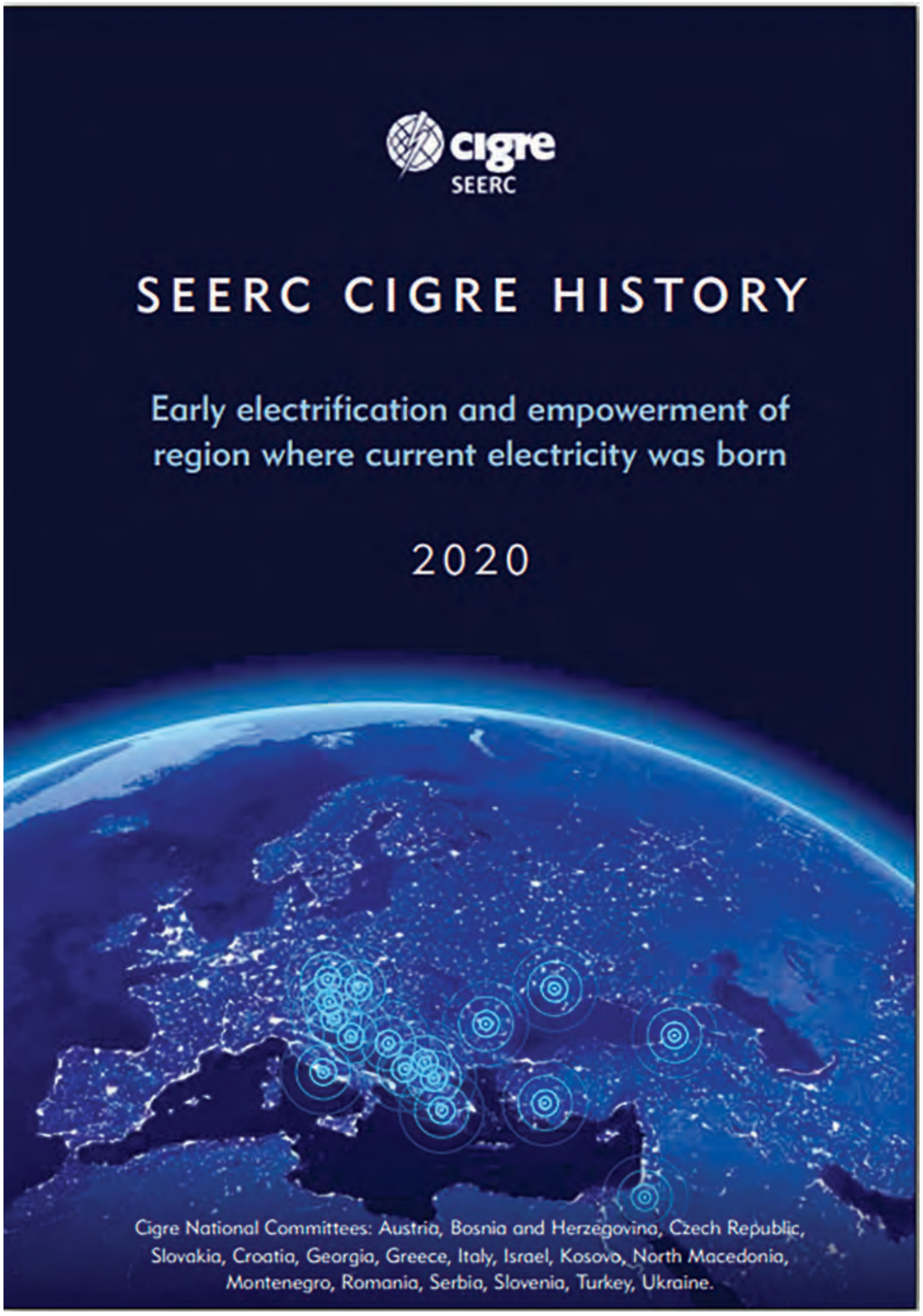


Figure 10.5 Cover of the book SEERC CIGRE HISTORY

Newly formed working groups that started their work from September 2022 are:

1. RWG Distributed Generation;
2. RWG Energy Storage Systems / RWG Green Technologies;
3. RWG E-Vehicles and Impacts on Network;
4. RWG Hydrogen and SMR Studies.

Meetings of the Management Board and Technical Advisory Committee

Management Board (MB) meetings

Since the establishment of SEERC up to present, a total of 11 meetings of the SEERC Management Board have been held, one of which was an unofficial meeting.

Table 9.1 SEERC Management Board meetings

SEERC Management Board meetings	Date of event	Location of event	Participants from BH K CIGRE
1. MB meeting	27.01.2014.	Rome, Italy	Rusmir Mahmutćehajić, Mario Kokoruš
2. MB meeting	11.06.2014.	Belgrade, Serbia	Mario Kokoruš
3. MB meeting	23.06.2015.	Kiev, Ukraine	Rusmir Mahmutćehajić
4. MB meeting	06.06.2016.	Portorož, Slovenia	Rusmir Mahmutćehajić
Unofficial MB meeting	23.08.2016.	Paris, France	Edhem Bičakčić
5. MB meeting	18.10.2017.	Istanbul, Turkey	Edhem Bičakčić
6. MB meeting	11.06.2018	Kiev, Ukraine	Sabina Dacić-Lepara
7. MB meeting	30.08.2018.	Paris, France	Edhem Bičakčić
8. MB meeting	08.07.2019.	Tbilisi, Georgia	Edhem Bičakčić
9. MB meeting	21.09.2020.	online	Edhem Bičakčić, Sabina Dacić-Lepara
10. MB/TAC meeting	01.06.2022.	Vienna, Austria	Edhem Bičakčić, Sabina Dacić-Lepara, Zijad Bajramović
11. MB/TAC meeting	31.08.2022.	Paris, France	Edhem Bičakčić, Sabina Dacić-Lepara, Zijad Bajramović

Figure 10.6 First meeting of the SEERC Management Board, Rome, 27 January 2014


Figure 10.7 Fifth meeting of the SEERC Management Board, Istanbul, October 18, 2017

Figure 10.8 Sixth meeting of the SEERC Management Board, Kyiv, 11 June 2018

Figure 10.9 Eighth meeting of the SEERC Management Board, Tbilisi, July 8, 2019

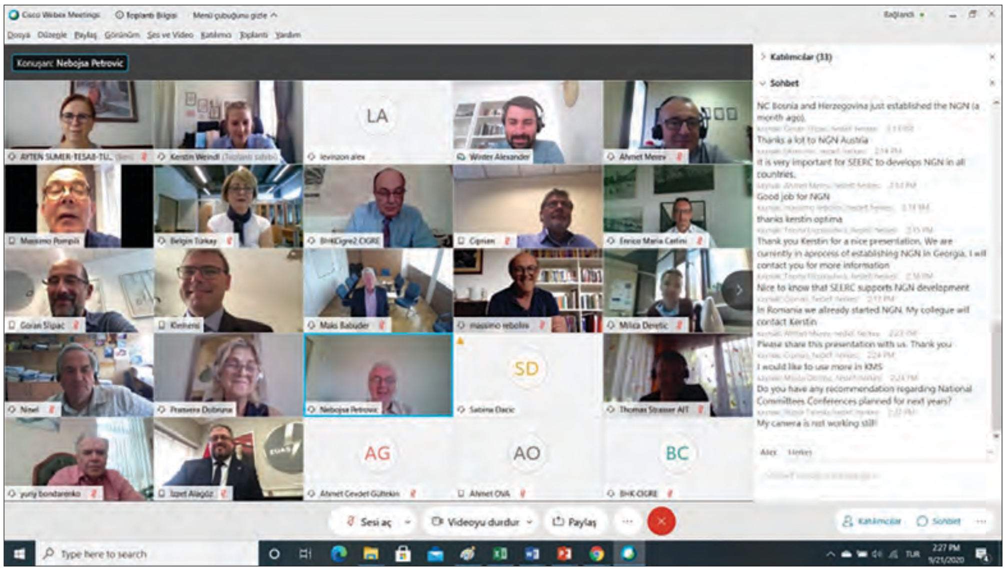


Figure 10.10 Ninth meeting of the SEERC Management Board, online, 21 September 2020

Figure 10.11 Tenth meeting of the Management Board / Technical Advisory Committee of SEERC, Vienna, 1 June 2022

Figure 10.12 Eleventh meeting of the SEERC Management Board / Technical Advisory Committee, Paris, 31 August 2022

Technical Advisory Committee (TAC) meetings

Since the establishment of SEERC up to this day, a total of eight meetings of the SEERC Technical Advisory Committee have been held, one of which was an unofficial meeting.

Table 9.2 Technical Advisory Commitee – TAC meetings

SEERC Technical Advisory Committee meetings	Date of event	Location of event	Participants from BH K CIGRE
1. TAC meeting	25.03.2015.	Vienna, Austria	-
2. TAC meeting	15.01.2016.	Athens, Greece	-
3. TAC meeting	15.03.2017.	Prague, Czech R.	-
4. TAC meeting	25.01.2018.	Rome, Italy	Sabina Dacić-Lepara
Unofficial MB meeting	08.11.2018.	Vienna, Austria	Sabina Dacić-Lepara
5. TAC meeting	28.03.2019.	Split, Croatia	Sabina Dacić-Lepara
6. TAC meeting	23.01.2020.	Athens, Greece	Sabina Dacić-Lepara, Zijad Bajramović
7. TAC meeting	01.06.2022.	Vienna, Austria	Edhem Bičakčić, Sabina Dacić-Lepara, Zijad Bajramović
8. TAC meeting	31.08.2022.	Paris, France	Edhem Bičakčić, Sabina Dacić-Lepara, Zijad Bajramović

Figure 10.13 Fourth meeting of the SEERC Technical Advisory Committee, Rome, 25/26. January 2018

Figure 10.14 Informal meeting of the SEERC Technical Advisory Committee, Vienna, 8 November 2018

Figure 10.15 Sixth meeting of the SEERC Technical Advisory Committee, Athens, 23 January 2020

Figure 10.16 Seventh meeting of the SEERC Technical Advisory Committee, Vienna, 1 June 2022

Figure 10.17 Eighth meeting of the SEERC Technical Advisory Committee, Paris, 31 August 2022

Presidency of SEERC

In accordance with the Rules of the SEERC, each member of the SEERC has the right to preside over the SEERC for a period of two years. The chairmanship is transferred in alphabetical order from one national committee to another. If the member whose turn it is to assume the chairmanship of SEERC is unable to assume the chairmanship of SEERC for any reason, the right of chairmanship is automatically transferred to the next national committee, respecting the rule of alphabetical order. During the next transfer of the right of chairmanship, the national committee, which in the previous mandate, for whatever reason, did not take over the chairmanship, has the right of priority, i.e. can take over the chairmanship of SEERC.

The National Committee, which presides over SEERC, is obliged and responsible for the organization of SEERC conferences, which are held in the country which presides over SEERC at the end of the term of office. At the very end of the Conference, the chairmanship is transferred to the next national committee.

At the virtual meeting of the Management Board, held on September 21, 2020, it was accepted that the NC of Austria will continue to chair SEERC until 2021, and that after Austria, the NC of Turkey will take over the presidency of SEERC from 2021 to 2023. At the same session, it was accepted that after Turkey, the chairmanship of SEERC from 2023 to 2025 will be taken over by the NC of Bosnia and Herzegovina.

Table 9.3 Presidency of SEERC

Presiding NC	Period
NC Slovenia	2014-2016
NC Ukraine	2016-2018
NC Austria	2018-2020/21 (due to disruptions in the work of SEERC and the holding of the SEERC conference caused by the Covid-19 pandemic)
NC Turkey	2021-2022/23
Next presidency	
NC Bosnia and Herzegovina	2023-2025

SEERC Conferences

The SEERC Management Board decided to hold conferences on the most current topics in the power system of SEERC members every two years. The conference is held in the country holding the SEERC presidency, at the end of the two-year presidency. SEERC members gather at conferences to present novelties in the power industry systems of the countries they come from and discuss the regional development and share their knowledge with the aim of overcoming common challenges.

The first such conference was held on June 7 and 8, 2016 in Portorož (Slovenia), organized by the National Committee of CIGRE Slovenia.

Figure 10.18 The first SEERC conference, Portorož, June 7 and 8, 2016

The second SEERC conference on *Energy Transition and Innovations in the Power Sector*, with an emphasis on energy infrastructure, was held in the period 12/13. June 2018 in Kiev (Ukraine), organized by the National Committee of CIGRE Ukraine

Figure 10.19 Second SEERC Conference, Kyiv, June 12 and 13, 2018

The third SEERC conference on the topic *SEERC 2020: Cooperation - Sustainability* - Future was supposed to be held in Vienna from June 16 to 19, 2020, but due to the situation caused by the COVID-19 pandemic, it was postponed to the period from November 24 to 27, 2020.

At the virtual meeting of the Management Board, held on September 21, 2020, it was accepted that the NC of Austria will continue to chair SEERC until 2021, and that after Austria, the NC of Turkey will take over the presidency of SEERC from 2021 to 2023. At the same session, it was accepted that after Turkey, the chairmanship of SEERC from 2023 to 2025 will be taken over by the NC of Bosnia and Herzegovina.

The third SEERC conference, which was already postponed once due to epidemiological reasons to the period from November 24 to 27, had to be postponed again due to epidemiological reasons, and its holding was scheduled for the period from November 29 to December 2, 2021. However, due to additional restrictive measures introduced by the Austrian government on November 17, 2021, the classic conference had to be cancelled at the last moment, and it was held on November 30, 2021, in an online format. Only some papers were presented and the virtual handover of the presidency to the NC of Turkey took place. In addition, it was decided to hold a SEERC colloquium on the topic *Green Deal for SEERC* Region in Vienna, in the period from May 30 to June 2, 2022. The professional papers presented online on November 30, 2021, during this Colloquium, were exhibited in "poster" format.

The fourth SEERC conference will be organized in Turkey in the period from October 11 to 13, 2023. After Turkey, the chairmanship of SEERC, in the period from 2023 to 2025, is assumed by the NC of Bosnia and Herzegovina, whereby the Fifth SEERC Conference will be held in Sarajevo in 2025.

Papers from BiH published at SEERC conferences:

1) SEERC conference, 12/13. June 2018, Kyiv (Ukraine)
   – Adnan Mujezinović, Maja Muftić Dedović, Nedis Dautbašić, Zijad Bajramović, Sabina Dacić-Lepara, Alaudin Alihodžić, *COMPUTATIONAL ANALYSIS OF THE HIGH VOLTAGE INSULATION BUSHING.*

Figure 10.20 SEERC colloquium, Vienna, 30 May – 2 June 2022

2) SEERC conference, November 30, 2021, virtual
- Ajla Merzić, Mustafa Musić, Sabina Dacić-Lepara, Edhem Bičakčić, Zijad Bajramović, *TRANSITION CONCEPTS FOR CONVENTIONALLY STRUCTURED PRODUCTION PORTFOLIOS IN DEVELOPING COUNTRIES - EPBiH CASE STUDY*
- Đenana Čapara, Nikolas Mansourov, Andrea Hrustemović, Adnan Ahmethodžić, Emil Hadžović, Meludin Veledar, *APPLYING AUTOMATED CYBER RISK ASSESSMENT FOR THE SMART GRID*

SEERC colloquium, from May 30 to June 2, 2022
Poster presentation from Bosnia and Herzegovina:
- Ajla Merzić, Mustafa Music, Sabina Dacić-Lepara, Edhem Bičakčić, Zijad Bajramović, *CONCEPTS OF TRANSITION FOR CONVENTIONAL STRUCTURED PRODUCTION PORTFOLIOS IN DEVELOPING COUNTRIES - CASE STUDY EPBiH*
- Šeila Gruhonjić-Ferhatbegović, Zijad Bajramović, *CONNECTION IMPACT ANALYSIS of SMALL HYDROPOWER PLANT on PROTECTION SYSTEM and FAULT LOCATION in DISTRIBUTION NETWORK*

SEERC Colloquium in Sarajevo

As part of the activities led by the Management Board and the Technical Advisory Committee of SEERC, a decision was made to hold a Colloquium on the subject of *The Energy Climate National Strategies by 2030 and challenges in the power sector* in Sarajevo on October 25, 2019. Each SEERC member state was invited to make one presentation, with the focus being on the strategy by 2030 and, if possible, a view by 2050.

The SEERC colloquium was attended by 10 members: Bosnia and Herzegovina, Austria, Italy, Slovenia, Croatia, Serbia, Kosovo, Turkey, Ukraine and Georgia. A delegation from Montenegro was also announced, but cancelled its arrival at the last moment. The colloquium was attended by Philippe Adam, Secretary General of CIGRE Paris. Of the ten member states present, nine presented their national climate strategies (with the exception of Kosovo).

The President of BH K CIGRE presented the situation in Bosnia and Herzegovina in the electricity sector in relation to climate change, challenges in the electricity sector and natural gas.

Figure 10.21 SEERC Colloquium, Sarajevo, October 25, 2019

Figure 10.22 SEERC Colloquium, Sarajevo, October 24, 2019

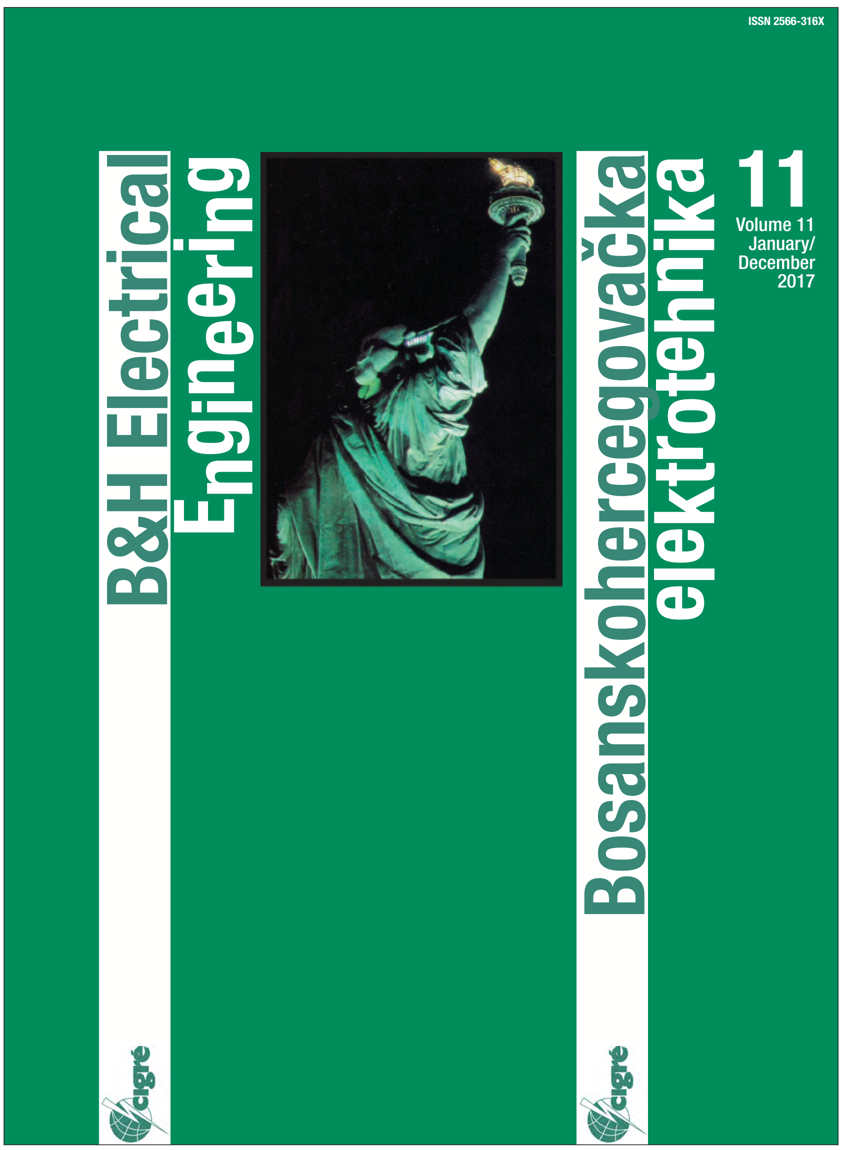
11

BH K CIGRE Publications

30 YEARS cigre BH

Journal
B&H Electrical Engineering

ISSN: 2566-3143 (print)
ISSN: 2566-3151 (online)



The important mission of the Bosnia and Herzegovina CIGRE Committee since its foundation in 1992 until today is the gathering of the living core of the power engineering community, which will promote and transfer engineering knowledge and achievements, which are essential for the development of the social community as a whole. One of the results of the patient review of the tasks, needs and goals of the Bosnia and Herzegovina engineering community is the launch of the journal *B&H Electrical Engineering* at the end of the fourth year since its foundation in 1996. The journal *B&H Electrical Engineering* was originally conceived as a place to present professional and scientific achievements in the field of electrical engineering. The decision to establish the journal *B&H Electrical Engineering* testifies to the strength of an important branch of overall engineering.

The first editor of the journal was Prof. Dr. Rusmir Mahmutćehajić, B.Sc. Electrical Engineering. He remained in the position of editor-in-chief of the journal during the first four editions. At the end of 2010, Prof. Dr. Tatjana Konjić, B.Sc. Electrical Engineering was appointed editor-in-chief.

Papers in the first 9 editions of the journal were published in one of the official languages of Bosnia and Herzegovina or in English. In order to make the journal more recognizable and to promote the authors of the published works, in 2016 the English edition of the journal *B&H Electrical Engineering* was registered.

B&H Electrical Engineering journal is an international, non-commercial open access journal.

The basic goal of the journal is to publish high-quality papers in the field of electrical engineering, computing and informatics. Papers from the fields of ecology, energy efficiency, industrial application, economics and other engineering and social sciences are also published if they are related to the previously mentioned basic areas of the journal. Double blind peer review is mandatory for all papers.

During the many years of its existence, the journal has presented the achievements of domestic and foreign authors from various fields, all for the purpose of expanding the knowledge and perspective of the entire engineering community.

So far, over 180 papers have been published in the journal (Table 11). In addition to regular issues, in 2020, the journal published a special issue titled *Computational, Numerical, and Mathematical Methods in Electrical Engineering*, and in 2021 a special issue titled *Research Trends in Interrupting and Switching in HV and MV Switchgear*.

Table 11: Number of published papers by year of publication

Edition	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Year of issue	1996.	1997.	1998.	2001.	2011.	2012.	2013.	2014.	2015.	2016.	2017.
Number of published papers	12	13	14	7	12	10	10	11	10	11	13

Edition	12.	13.	14. Special Issue	14.	15. Special Issue	15.
Year of issue	2018.	2019.	2020.	2020.	2021.	2021.
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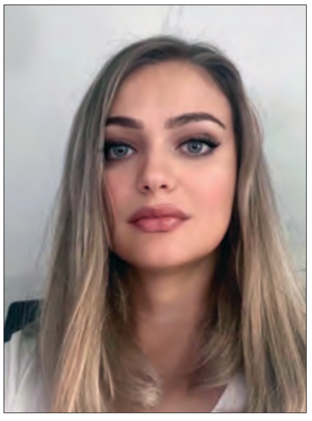

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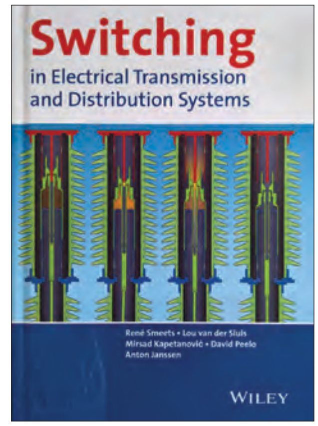
Books

The Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE is the publisher of the following books:

Switching in Electrical Transmission and Distribution Systems, 2015.
Authors: Rene Smeets, Lou van der Sluis, Mirsad Kapetanović, David Peelo, Anton Jenssen



Resonance and ferroresonance in the electrical power system, 2017.
Authors: Salih Čaršimamović, Zijad Bajramović, Adnan Mujezinović, Nedim Turković

Digital Integrated Circuits, 2018.
Authors: Mustafa Music, Abdulah Akšamović

Monograph of 25 years of work of the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE, 2018. Authors: Edhem Bičakčić, Prof. Dr. Zijad Bajramović, Irfan Durmić, Edina Mašnić, Jasmina Jakić, M.Sc. Nikola Rusanov, Emir Aganović, Aida Toromanović	
High voltage tests, 2021. Authors: Zijad Bajramović, Adnan Mujezinović, Milodrag Košarac, Mladen Banjanin, Nedim Turković	

Promotions of the book *Switching in Electrical Transmission and Distribution Systems*, by Rene Smeets, Lou van der Sluis, Mirsad Kapetanović, David Peelo, Anton Jenssen in Paris (2014) and Sarajevo in 2015.

Figure 11.2 a) Promotions of the book *Switching in Electrical Transmission and Distribution Systems*, Paris, 2014

Figure 11.2 b) Promotions of the book *Switching in Electrical Transmission and Distribution Systems*, Paris, 2014

Figure 11.3 a) Promotions of the book *Switching in Electrical Transmission and Distribution Systems*, Sarajevo, 2015

Figure 11.3 b) Promotions of the book *Switching in Electrical Transmission and Distribution Systems*, Sarajevo, 2015

12

Energy Transition – the Path to a New Energy Future

30 YEARS cigre BH

Introduction

Energy transition is today the most commonly used term when it comes to the challenges with climate change, not only in the professional and scientific community, but also in the general public. This is quite understandable because it concerns every individual, social communities, countries, regions, and finally complete humanity. By energy transition, the public mistakenly most often means "decarbonization" of power systems only, that is, the suppression of coal as an energy source until its complete phase out.

What exactly is the energy transition? Energy transition, in the broadest sense, is the search for humanity's response, we hope it is not too late, to the phenomenon of global warming and to the climate changes that are a consequence of that phenomenon.

Today, the imperative is to reduce global warming and mitigate climate change. Therefore, the energy transition is a forced process with the aim of mitigating the consequences of the current way of producing and using energy. If the energy transition process had been started 50-60 years ago, when the impact of greenhouse gases on global warming was recognized, it would still continue, but with milder consequences on the climate on one hand and the energy sector and economy on the other. Was that possible? It was questionable then, but not anymore today. Greenhouse gas emissions affect the phenomenon of global warming and consequently climate change. Emissions of greenhouse gases, especially carbon dioxide, all these decades came primarily from industry, mostly from the energy sector of the most developed countries, transport and agriculture, as a result of the use of fossil fuels. What needs to be done? The answer seems simple. It is necessary to replace production capacities for energy production from fossil fuels with capacities that use other, renewable energy sources: water, wind, sun... However this represents a huge challenge for conventional power systems. Hydropower has long been used to generate electricity. It was used even before fossil fuels. However, other resources, primarily wind and sun, due to their variability, could not be used with the level of technical and technological development at the time.

The development of three key technologies has made possible to use variable sources, such as wind and sun, to produce electricity. These are: the development of power electronics that enabled the conversion of large powers of a variable nature into electricity, adaptation and connection to existing networks, and the development of IT technologies that enabled mutual communication and management of variable sources in the power system, the development of software tools that enabled modelling and analysis of networks with integrated variable sources close to the real state, and their impact on distribution and transmission networks.

Thanks to the development of these technologies, today is possible to install production capacities of large power (wind warms and photovoltaic power plants) and integrate them into power systems. Given that the hydro potential in developed countries has been fully utilized, the key resources for the production of electricity that will replace fossil fuels in the process of energy transition are wind and sun.

Challenges for the Energy Transition

The energy transition is a process that will last for the next few decades. Some recognize it as the fourth industrial revolution. The energy transition faces many challenges. There is almost no area that does not directly or indirectly impacted by energy transition or is not affected by the energy transition. Each of them brings with it a series of challenges and risks. Only the key ones, which dominantly affect the process of energy transition, will be mentioned here. The continuity and, ultimately, the success of the energy transition will depend on a successful response to these challenges.

Increase in electricity consumption

A reliable supply of electricity is essential for the prosperity of our societies and is indispensable for the digital era of which we are a part. Safe and reliable electricity supply is of the utmost importance for all countries and is a key condition that must be met during the complete energy transition process. Although electricity accounts only a fifth of the total final energy consumption today, its share is growing. It is predicted that by 2050, the share of electricity in the total final consumption will increase from the current 20% to 40%, some predict even 50%. The key contribution to this increase will be the use of electricity in traffic, given that the process of energy transition includes traffic as one of the significant emitters of greenhouse gases and influential factors in the process of global warming and climate change. Also, the growth of the IT sector, above all the development of new powerful and fast computers, will contribute to the increase in electricity consumption in the future.

Some analyses suggest that electricity will play an increasing role in heating and cooling, with the goal of pushing fossil fuels out of use for these purposes. Therefore, in the process of energy transition, it will not only be necessary to replace fossil fuel-based production capacities with renewable sources, but additional ones will also need to be built in order to meet the increased demand for electricity due to the electrification of traffic, digitalization of the economy, heating and cooling, which was not the case until now.

Increasing participation of variable sources in the production portfolio

During the energy transition, the structure of energy systems will undergo dramatic changes. It will change from a conventional power system with a relatively small number of large production capacities, thermal power plants on fossil fuels, nuclear power plants and hydroelectric power plants, to a gradually increasing integration of variable production capacities, primarily wind power plants and photovoltaic power plants of different capacities. The final goal of the energy transition is the complete phase out of production capacities based on fossil fuels, primarily coal, and their replacement by production capacities based on renewable sources. In such a diversified production portfolio, the variable production capacities, wind farms and photovoltaic plants, will dominate.

With the increase in the participation of variable production capacities in power systems, the need for the flexibility of power systems, and for balancing power, i.e. the construction of balancing capacities, will grow, in order to preserve the reliable and safe operation of power systems. According to the IEA report for 2019, variable renewable sources, wind farms and photovoltaic plants, produced 85% of electricity produced by coal in Europe. This means that in order to suppress coal from the production of electricity, the installed capacities based on variable renewable sources should be tripled. Additional capacities for balancing power from variable renewable sources should be added to this. On a global scale, this ratio is much less favourable. Only 28% of electricity was produced from variable renewable sources compared to that produced from coal.

This is one of the biggest challenges of the energy transition. Solutions will be sought in the establishment and wide integration of balance markets and in the storage of surplus energy. Today, gas power plants and suitable hydro power plants are used as balance production capacities. Due to the relatively small participation of variable sources in energy systems, balancing is still not a pronounced problem for most countries, with the exception of a few of the most developed European countries.

The production price of electricity from photovoltaic power plants and wind power plants will be lower than that produced from fossil fuels, and the final price will be dominantly influenced by the price of balancing energy. One of the possible solutions, as a transitional solution, could be the exemption of balance energy from gas thermal power plants from paying taxes for carbon dioxide emissions. This approach would further encourage the construction of production capacities based on variable renewable resources.

Accelerated transition to clean energy is already bringing a major structural change to power systems around the world. Variable renewable production is continuously growing. The trend will continue and accelerate further. Photovoltaic power plants and wind farms are becoming one of the cheapest sources of electricity and contribute to mitigating climate change. In the IEA sustainable development scenario, the share of variable renewable sources in total production should reach 45% by 2040.

Such rapid growth of variable renewable sources will contribute to the suppression of fossil fuels for the production of electricity, primarily coal, but will also require a rapid increase in the flexibility of power systems. In the future, in parallel with the expansion of solar energy and wind, this will require the development of new additional resources for flexibility, especially in emerging and developing economies that face strong increase in the demand for electricity. Maintaining reliability in the face of greater supply variability and demand will require, increasingly, timely investments in networks and flexible resources – including the demand side, and distributed and storage resources to ensure that energy systems are diversified, sufficient and flexible at all times.

Disruptions in energy markets

During the process of energy transition, there will inevitably be disruptions in energy markets, caused by the monopolistic behaviour of those who dispose with the resources. The question is whether and to what extent these disturbances will affect the energy transition process. Bearing in mind that the key condition during the energy transition is an unquestionably reliable and safe supply of energy to the citizens, disruptions in the energy markets will temporarily slow down the energy transition, sometimes in some countries even temporarily stop it. However, every such stoppage, no matter what it is caused by, will be an additional impulse to speed up the process of energy transition. The reason is simple. Deposits of energy resources (fossil fuels) are distributed as they are distributed and that is more or less known. Some countries have these resources in abundance while others do not have them at all. The sun and wind, as an energy resource, are available to everyone, almost every country, region, social community, company and individual. The development of technologies has made it possible for all of them to produce electricity for their own needs and for the market and thus become independent from the import of expensive energy sources, and even become energy independent. The philosophy of energy transition is contained in this. To produce energy where the conditions exist for it, to produce it from available renewable resources in an environmentally acceptable manner and to produce it in a reliable and safe manner.

New concepts of energy systems

The energy transition is a process that will last much longer than the planned period for the decarbonization of the energy sector. The integration of distributed production capacities based on renewable energy sources is already changing the structure of power systems and the character of power networks.

Conventional power systems with centralized production and one-way power flows in networks from source to consumer are becoming hybrid power systems with retained centralized production and distributed production along transmission and distribution networks, and networks from passive with one-way power flows become active networks with two-way power flows. Management of such systems and networks is becoming increasingly demanding and complex. Increasing involvement of production capacities based on renewable sources, especially variable ones, integrated into distribution networks, will require increasing flexibility and decentralization of electric power systems and components for electric energy storage.

Networks where production and consumption, along with storage of excess electricity, can be approximately balanced, will be rounded up into interconnected small systems, microgrids. The size of these microgrids will be different, from those at the household level to those at the regional level. Why not predict that microgrids at the level of households, institutions, etc., all those who dominantly use devices, which consume DC power, will be DC networks. Such networks will be cheaper (without inverters) and simpler to manage

Management of such complex, hybrid power systems will not be possible without complete digitization of the system, based on new solutions, probability algorithms and artificial intelligence. Deterministic algorithms will not be able to meet the needs for the speed of management of all components in the system.

To this process of decentralization and digitization of power systems, through the energy transition, some correctly add the process of democratization. This implies the right of everyone who has the conditions to produce electricity for their own needs and for the market.

Conditions for a Successful Energy Transition

The energy transition must be a transparent process

Energy transition is a process that includes all states, all social communities, all entities in the power sector and every individual. Public support is very important for the successful implementation of the energy transition. That is why it is necessary for all participants to conduct the energy transition process transparently. A transparent process of energy transition will gradually prepare the public for a new setup towards energy in general and, thanks to new, smart technologies, involve them as active participants in the process.

It is also crucial that the young generation, pre-school, school age and students are included in the process of energy transition, through the designed campaign, plans and programs, because they will be the key carriers of the transition and consumers of its results.

Timely and successful establishment of the regulatory framework

The challenge for policy makers and system planners is to update policies, regulation and market design features to ensure that systems remain secure during the transition.

The experience of numerous countries has shown that variable renewable sources can be reliably integrated into power systems. However, in the future, new additional resources for system flexibility must be developed, in parallel with the expansion of variable sources. It is also necessary to develop protection mechanisms against cyber attacks on future digitized power systems and protection against the consequences of climate change, which can lead to breakdowns and destruction of power systems.

Investing in new production capacities based on renewable energy sources and in networks

The energy transition will be a very expensive process. Investments will be directed to the following key areas: construction of new production capacities based on renewable sources; production capacities to ensure balancing power; transition of coal regions; development of networks and investment in the development of new technical and technological solutions that will enable sustainability, reliability and safe operation of new structures of energy systems. This will be a big challenge for poor economies, especially those that rely on coal-based energy production, which can lead to a slowdown or even a stopage in the energy transition in those countries.

Rich economies should bear the brunt of the energy transition for at least two reasons. They gained wealth from energy from fossil fuels, primarily coal, and thereby dominantly contributed to the impact on climate change with today's consequences, and today, in the initial phase of the energy transition, dispose with new technologies on which the transition relies, i.e. energy production in an environmentally acceptable way.

In particular, the socially sensitive component of the energy transition is the transition of coal regions. It is necessary to have answers on how to prepare regions where generations have worked on coal exploitation for new economic activities, including the use of areas where exploitation has ended and thus close down coal exploitation and close mines For a successful and fair transition of coal regions and the conservation of mines , the implementation of the experiences of rich economies that have successfully gone through this process is of great importance.

The contribution of rich economies to the energy transition in poor and developing countries should be in concrete investments through grants, favourable loans and the transfer of knowledge, experience and technology. In this way, the gap between the developed and the underdeveloped would be reduced, and the energy transition would be a chance for weak, not only rich economies.

Competence development, innovation and competitiveness

The energy transition will be a long-term process. Many wonder if it is possible to successfully end this process with current technical and technological achievements. Research, innovation and competitiveness should continuously ensure the prerequisites for reaching the goals of the energy transition: decarbonization of the energy sector through the implementation of new, environmentally acceptable technologies; increasing energy efficiency through innovating existing and developing new, more energy efficient devices; integration of the electricity market, etc.

The energy transition does not only mean the gradual introduction of new technologies into the energy system with the aim of complete decarbonization, but also the complete transformation of the energy sector, and society as a whole, so that it can take responsibility, lead processes and have answers to all the challenges that the energy transition brings. The energy transition will last at least the next 30 years. The key bearers will be the generations who are now attending primary and secondary schools and enrolling in university studies. It is very important to establish an environment in which these personnel will be profiled. Through curricula in schools and universities, it is necessary to create prerequisites for their training and qualification to ensure they can handle the processes and respond to the challenges of the energy transition. The success of the energy transition will largely depend on the creation of a social environment for understanding and supporting the transition processes. Also, the success of the energy transition will largely depend on the availability, organization, training and motivation of human resources, staff who will be directly involved in the transition process. In this regard, the most important activity will be the establishment of new and strengthening of existing scientific research and research and development capacities, defining their role in the process of energy transition, interconnection and targeted inclusion in projects at the local and international level, the output of which directly and indirectly contribute to the achievement of goals of the energy transition. Innovations, new technical-technological solutions, and even new inventions are expected from these centres of excellence that will directly contribute to the success of the energy transition. It is very important to identify and initiate incentive mechanisms that will contribute, through various research and research and development institutions and industry, to the successful development of the energy transition.

Energy Transition in Bosnia and Herzegovina

By signing the key documents of the Paris Agreement and the Sofia Declaration, Bosnia and Herzegovina (BiH) accepted the transition of the energy sector with the goal of "net decarbonization" by 2050.

Although the key goals of the energy sector reform are given in the EC guidelines, the EU Framework Strategy gives all members of the energy community the possibility of their own approach in developing a strategic plan for the transition of the energy sector, which will take into account the comparative advantages, disadvantages and risks of each country individually.

The energy transition in BiH will be a special challenge considering that 60% to 65% of electricity, depending on hydrological conditions, is produced from coal. Also, interconnections with neighbouring power systems are insufficient, the electricity market is not developed, and the capacities of networks, especially distribution ones, are insufficient for the integration of distributed production from renewable sources.

Because of all this, the energy transition in Bosnia and Herzegovina will require large investments. They are estimated at more than 3 billion euros by 2030 alone. Bosnia and Herzegovina does not have a single gas-fired thermal power plant, nor is it certain that, due to the lack of conditions, it will have one until 2030.

Because of all this, the transition of the energy sector in Bosnia and Herzegovina should be conducted within the following framework:

- in the process of transition, use coal as transition fuel,
- work on the intensive construction of renewable sources (wind power plants, photovoltaic power plants, hydroelectric power plants, biomass power plants) and thus suppress the production of electricity from coal,
- maintain energy independence during the transition and
- in the process of transition, maintain reliable and safe operation of the power system.

It should be borne in mind that Bosnia and Herzegovina has certain comparative advantages when it comes to renewable energy sources. Insolation in BiH is on average 30% to 40% higher than insolation in Central and Western

Europe. The greatest insolation is in the area of Herzegovina, western Bosnia, northern and north-eastern Bosnia and ranges from 1250 kWh/m2/year to 1600 kWh/m2/year. Also, BiH has great potential in wind energy, especially in the area of Herzegovina, central and western Bosnia, where average annual wind speeds are higher than 7 m/s, unused hydro potential, and large amounts of waste wood biomass.

As a member of the Energy Community, Bosnia and Herzegovina has an obligation to implement the energy transition. A key obstacle, due to the complex decision-making mechanism (state, two entities), may be untimely adoption and updating of the regulatory framework. For the intensive and successful construction of new production capacities based on renewable sources and the development of networks, it is necessary to simplify the procedures for obtaining the necessary permits and bring these activities down to lower decision-making levels (cantons and municipalities). Also, one of the key conditions for the successful implementation of the energy transition is the provision of sufficient financial resources. Bosnia and Herzegovina is a developing country and is not financially able to carry out the energy transition independently. Without the support of international financial institutions through grants and favourable loans and the transfer of knowledge and experience, it will not be possible to successfully make a fair transition of coal regions and build more than 4000 MW in renewable sources and balancing capacities by 2050.

Prof.Dr. Mustafa Musić, Bsc.e.e.

Museum of Science and Technology in Sarajevo

Idea and Vision

The Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE is launching activities for the establishment of a technical museum in Sarajevo, wanting to permanently preserve and present the rich technical heritage of Bosnia and Herzegovina in a future cultural institution of national interest. At the beginning of the third millennium, characterized by the accelerated development of new city techniques and technologies, Sarajevo wants to take a strong step forward, as it did 130 years ago with the beginning of electrification, which from this distance can be compared to the current concept of smart cities in which information and communication technology, and various physical devices are networked to optimize the efficiency of city services.

The idea of establishing a technical museum originated in the Elektroprivreda BiH in 1993. It was started by engineers who, by their very nature, always express a desire to encourage progress in the technical-technological sense, but also to preserve the rich technical heritage that we have inherited.

Figure 13.1 Conceptual design of the facade of the technical museum

The establishment of a technical museum represents an important cultural-educational and scientific-historical project for the capital of our country and BiH as a whole.

Preservation of autochthonous values and rich heritage is especially important for small countries such as Bosnia and Herzegovina. Museums are institutions whose main task is to collect, preserve and show heritage to current and future generations, which is a unique way of communicating with heritage. It is interesting to note that Bosnia and Herzegovina is the only country in Europe where a technical museum has not been established.

In the continuation of our activities in the realization of this undertaking, we are taking the existing large scientific and technical museums in the world as a model, deciding that it will be a museum of a general type, which means that it will follow the history and development of several technical areas, such as power engineering, traffic and communal infrastructure.

When it is in operation, it will significantly contribute to raising scientific and technical culture, popularizing technique and modern technical solutions. Because of all this, the Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems - CIGRE wants to turn this idea and noble mission into reality, expecting that all those who will support us to fully realize it will join us in this.

Figure 13.2 Prototype of the first railway steam locomotive at the technical museum

History and Evidence

The facts are irrefutable that electric power, electric tram and water supply have been functioning in this area for more than a century, and the evidence of this has not been collected and systematized in one place. These evidences and traces of historical facts from this area, from case to case, can be found all over Bosnia and Herzegovina and beyond its borders.

Figure 13.3 Tram "Washingtonian", GRAS (Made in Washington. In use since November 29, 1960)

For example, the electrical industry in this area recorded its first activity back in 1888, and that year is considered the year of the beginning of the electrification of Bosnia and Herzegovina. Over the past 130 years, a powerful electric power system has developed. The beginning of electrification coincides with the epoch-making discoveries of Nikola Tesla, which paved the way for polyphase systems and created the possibility to use energy resources where they exist, and electricity where it is needed. This enabled faster development of industry, economy and humanity.

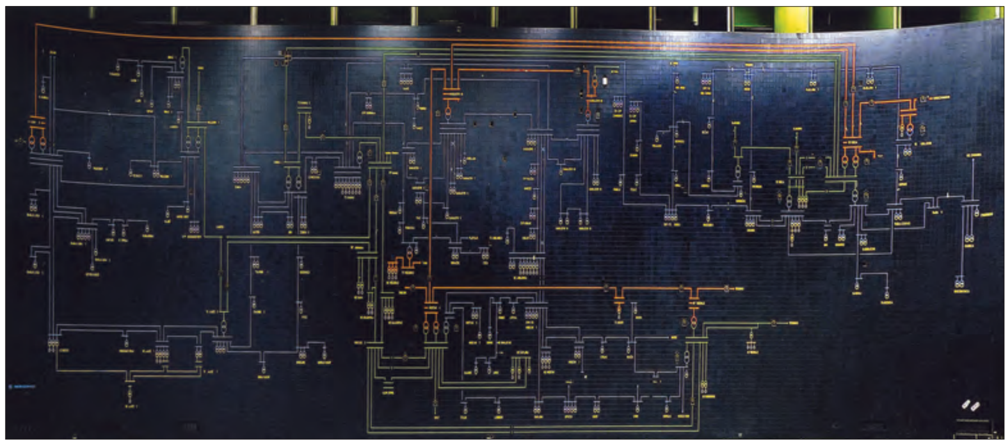


Figure 13.4 Synoptic panel

Figure 13.5 Tram with electric drive GRAS from 1895 (Manufacturer SIEMENS – SOHUKERT)

The first electric lighting in Bosnia and Herzegovina in 1888 in Zenica and the construction of the first Public Power Plant in 1895 in Sarajevo (220kW) mark the beginning of commercial electrification and mark two historically significant moments in the production of electricity in our area. The fact that the first power plant in the world was built in 1881 speaks volumes for how much people from this area had a sense of development and future.

Since the installation of the first steam engine of 120 HP in the Zenica Mine, significant capacities for the production, transmission and distribution of electricity in Bosnia and Herzegovina have been built.

Along with electric lighting, on May 1, 1895, in Sarajevo, before it happened in most large European cities, the first electric tram started its circular run, replacing the horse-drawn carriage one. The vehicles that were used were produced by the Siemens-Sohukert company and were the first trams built in its facilities.

Museum Building

The Technical Museum in Sarajevo would be located in the building of the first electrical power plant located in the western part of the city center in Kotromanićeva Street, in the area between Hiseta Street (north side) and the right bank of the Miljacka River (south side). The power station was built in 1895, 13 years after the construction of the first power station in New York.

The space is owned by the company IRIS computers (it was a part of the world-renowned company Energoinvest), where the first BiH computer was produced at the end of the 20th century. According to the regulatory plan of the Centre, it was established that the building is intended for a museum. Thanks to available documentation and preserved architectural elements on the building, its revitalization can largely rely on quality sources.

The facility was originally built for the needs of the power plant by the German company Siemens und Halske in 1895. At that time, this facility raised the reputation of Sarajevo as one of the advanced cities that followed the achievements of the industrial revolution and progress. It was a steam electric power plant that used water from the Miljacka river, and was heated by burning solid fuel, mainly coal. As part of this energy-industrial complex, there was also a narrow-gauge railway that was also used by the Tobacco Factory (founded in 1880).

Figure 13.6 The building of the first power station, Sarajevo

As a rule, museums in the world are founded in a space that in the past was related to any technical activity (electricity production, factory complex, etc.), so Sarajevo would follow that tradition.

The annex of the museum would be the facility of the Hrid Hydroelectric Power Plant (190kW) built on the Prača-Bistrica pipeline, which was put into operation in 1917.

In the neighbouring areas are the following technical museums with the dates of establishment:

a. Nikola Tesla Museum, Belgrade, founded in 1952;
b. Technical Museum in Zagreb, founded in 1954;
c. Belgrade Museum of Science and Technology, founded in 1989.

Collections and Space

Based on the prepared Study on the socio-economic justification for the establishment of this museum, it would initially have at least four collections: electrical energy, means of transport, water supply and sewerage and gas technology.

A prototype of the first electric tram and railway steam locomotive would be placed in front of the building.

About 200 exhibits, written materials, photo documentation, film material from the field of power engineering, city traffic, water supply and technical equipment used for the XIV Winter Olympic Games have already been collected for display in the museum space.

According to the project assignment which is already completed, the reconstruction of the building and the arrangement of the interior space, as well as all the accompanying equipment, should respect the museum-gallery standards of the highest level. Under the roof of the museum there will be a space for audio and visual presentation, a depot, a conservation-preparation workshop, etc. The intention is to establish a very popular in the world, digital museum system, so the Sarajevo museum would be accessible from anywhere on the planet.

Figure 13.7 Design concept of the interior of the technical museum

Figure 13.8 Recorder, range 0-36 MW, Manufactured by SIEMENS, 1956

Figure 13.9 Dynamo generator Type EG 650. (AEG production before the First World War)

Figure 13.10 Instrument panel in front of the turbine for monitoring the operation of the 32 MW turbine (production 1956)

Figure 13.11 Transformer oil filtering machine, GALILEO MODEL 26 A512, in use since the 1960s

Smart City

There are 23 museums operating in Sarajevo, the exhibits of which speak about the interesting history of the city and the culture of the people who live there. The remains of the Neolithic Butmir civilization, traces of Illyrians, Romans and Slavs testify to the long population of these areas. A significant part of the material evidence, which they left behind, as well as the generations after them, is protected and systematized in museums or in other ways. This justifies the initiative to establish a technical museum so that technical development and culture can be followed in the sequence of past times.

Although the number of existing museums in Bosnia and Herzegovina and Sarajevo may seem impressive, the fact is that in our country, especially in Sarajevo, there are fewer of them compared to some European cities, even though their foundations of civilization were laid much later. Only with the opening of the technical museum, the capital of Bosnia and Herzegovina will have the opportunity to valorise its technical heritage and culture in a modern way and to show and prove that it stands side by side with the smart cities of Europe and the rest of the world. It is possible that after reading this brochure, someone may ask themselves where the connection between the museum city and the smart city comes from in this context. Here is the answer:

Figure 13.12 Generator exciter 32 MW (production 1956 SIEMENS)

Figure 13.13 Transformer 35/04 kV (produced in 1956 by RADE KONČAR)

Smart cities are the new industry of the 21st century. The development of useful solutions based on real data from city life is a new potential of global commercialization. The developed system of a smart city refers directly to the developed level of handling technology among the local population, as well as to the prerequisite for this - quality education of the population about the current needs of modern life. In short, a smart city is the main indicator of the successful development of the city environment and its population in all aspects. If we accept the museum as an educational institution, which it is, then there should be no dilemmas regarding this.

Next Steps

The Bosnia and Herzegovina Committee of the International Council on Large Electrical Systems CIGRE will strongly promote this idea and publicly seek collaborators (individuals and collectives) who can be involved in the realization of the museum project at all gatherings it organizes or participates in.

For now, we know that among them will be the Bosnian-Herzegovinian-American Academy of Arts and Sciences BHAAAS, a non-profit and non-political American organization that gathers highly established experts from the most reputable American educational institutions and companies, and which counts about 230 regular, corresponding or honorary members. This is an internationally established institution, whose mission is the expansion and development of science and art, the free sharing of ideas among the BiH diaspora, and the connection and cooperation with BiH scientists and artists for the purpose of building bridges with the homeland.

We will recommend the adoption of a decision on the establishment of a museum to the competent government institutions and the Elektroprivreda BiH, which at one time was particularly interested in the realization of this project. Among other things, this contract would determine the level of the founding stake, the founder's share, the method of providing materials related to the museum's activities, the financing of the museum's work, the method of its organization, etc.

The Bosnia-Herzegovina Committee of the International Council on Large Electrical Systems CIGRE will encourage every initiative of an individual, institution or collective, expressed in the interest of realizing this project.

Figure 13.14 Electricity production on the Drina in Goražde (1992–1995)

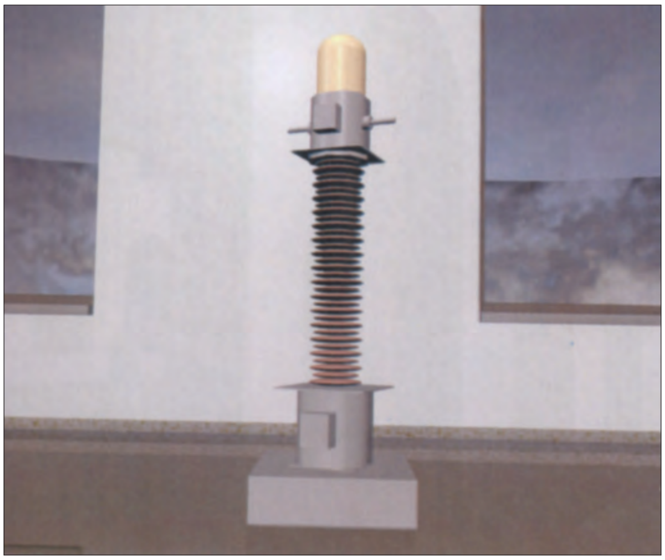


Figure 13.15 Current transformer - simulation of the interior arrangement of the technical museum in Sarajevo

Figure 13.16 Turbine rotor (MHE Pršljenica/Vesela village – Bugojno production in 1937)

Figure 13.17 “Tomruci” interior of a wooden water pipe

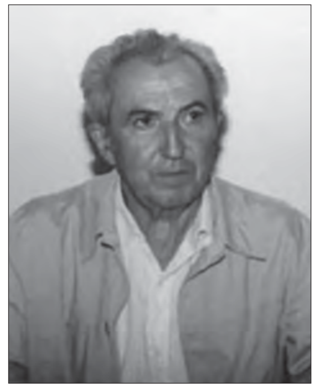
In Memoriam

Remembering the members of the
Bosnian and Herzegovinian CIGRE committee

Celebrating 30 years of the existence of the Bosnia and Herzegovina CIGRE Committee is an opportunity to especially remember our dear colleagues, founders and long-term members, who did a lot for our Committee in difficult times, and, unfortunately, are no longer with us.

Nikola Antić
(1940–2015)

Emerik Blum
(1911–1984)



Prof. Franjo Božuta
(1931–2019)

Prof.
Srećko Draženović
(1931–1989)

Avdo Đumrukčić
(1917–1994)

Aćif Hadrović
(1934–2019)

Prof. Dr. Ejup Hot
(1938–2012)

Mr. Fatih Imamović
(1944–2005)

Bajro Isaković
(1948–2000)

Prof. Dr.
Ibrahim Kamenica
(1922–2001)

Zaim
Karamehmedović
(1941–2019)

Prof.
Branko Knežević
(1926–1999)

Jusuf Krvavac
(1941–2019)

Mr. Mensur Lačević
(1942–2001)

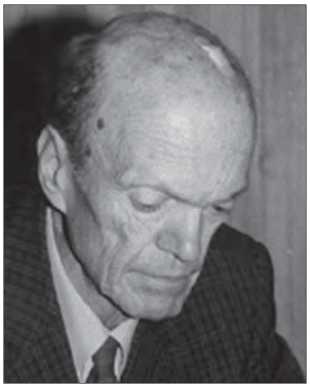
Prof. Dr.
Vlado Madžarević
(1953–2021)

Prof. Dane Maljković
(1927–2016)

Prof. Dr. Jovo Mandić
(1930–2021)

Akademik
Božidar Matić
(1937–2016)

Prof. Dr.
Salih Sadović
(1947–2016)



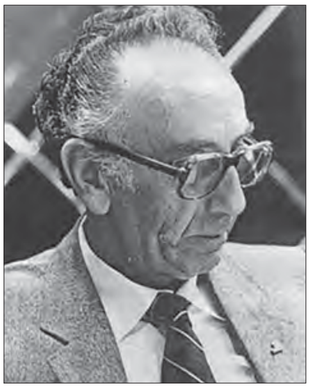
Prof. Dr. Sead Softić
(1924–2005)

Prof. Dr.
Kemo Sokolija
(1948–2015)

Milivoje Tomić
(1951–2006)

Hakija Turajlić
(1936–1993)

Prof. Dr.
Milan Zečević
(1930–2018)



Akademik
Svetozar Zimonjić
(1928–1999)

Unfortunately, for some members, until the publication of this Monograph, we were unable to collect photos and data:

– Prof. Dr. Vefik Karabdić
– Zoran Dragnić
– Prof. Fuad Cerić

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Patrons and Sponsors of BH K CIGRE

Special Thanks

Our experts and scientists have selflessly encouraged the exchange of knowledge and experience in the field of energy in order to ensure safe and reliable energy supply. Hundreds of written reports, dozens of organized, conferences, colloquiums, round tables and other gatherings speak about it. A significant number of papers were written by our experts at international conferences organized by CIGRE. BH K CIGRE is indeed recognized as a leading professional organization, which with its engagement has contributed to the improvement of the operation of our energy system. Now the period of energy transition has begun, in which energy systems will undergo dramatic changes. As a member of the Energy Community, Bosnia and Herzegovina has the task of implementing the energy transition. Our task as experts is to respond to new challenges and maintain security of supply to consumers, but in completely new circumstances. Our BH K CIGRE has truly become an area for promoting and discussing the future of the energy system, but also a place for finding possible solutions for everyday problems and new challenges that await us in the field of energy. All of our previous activities required significant financial resources that we could not secure without the sincere support of patrons, special members, sponsors and collective members. Without their support, BH K CIGRE would not be able to function. That is why on this occasion, on behalf of BH K CIGRE, I express my **SPECIAL THANKS** to them because they recognized us as a true partner and contributed to our work and achievements, as evidenced by this Monograph. Below is a list of companies and enterprises that supported BH K CIGRE directly or through certain events. I am convinced that the support of our patrons, collective members and sponsors will continue even more intensively in the future, to the satisfaction of all concerned. Cooperation is the basis of our common development and progress.

A BIG THANK YOU to all patrons, special members, sponsors, collective members and everyone who supported the work of our BH K CIGRE.

Edhem Bičakčić, President of BH K CIGRE

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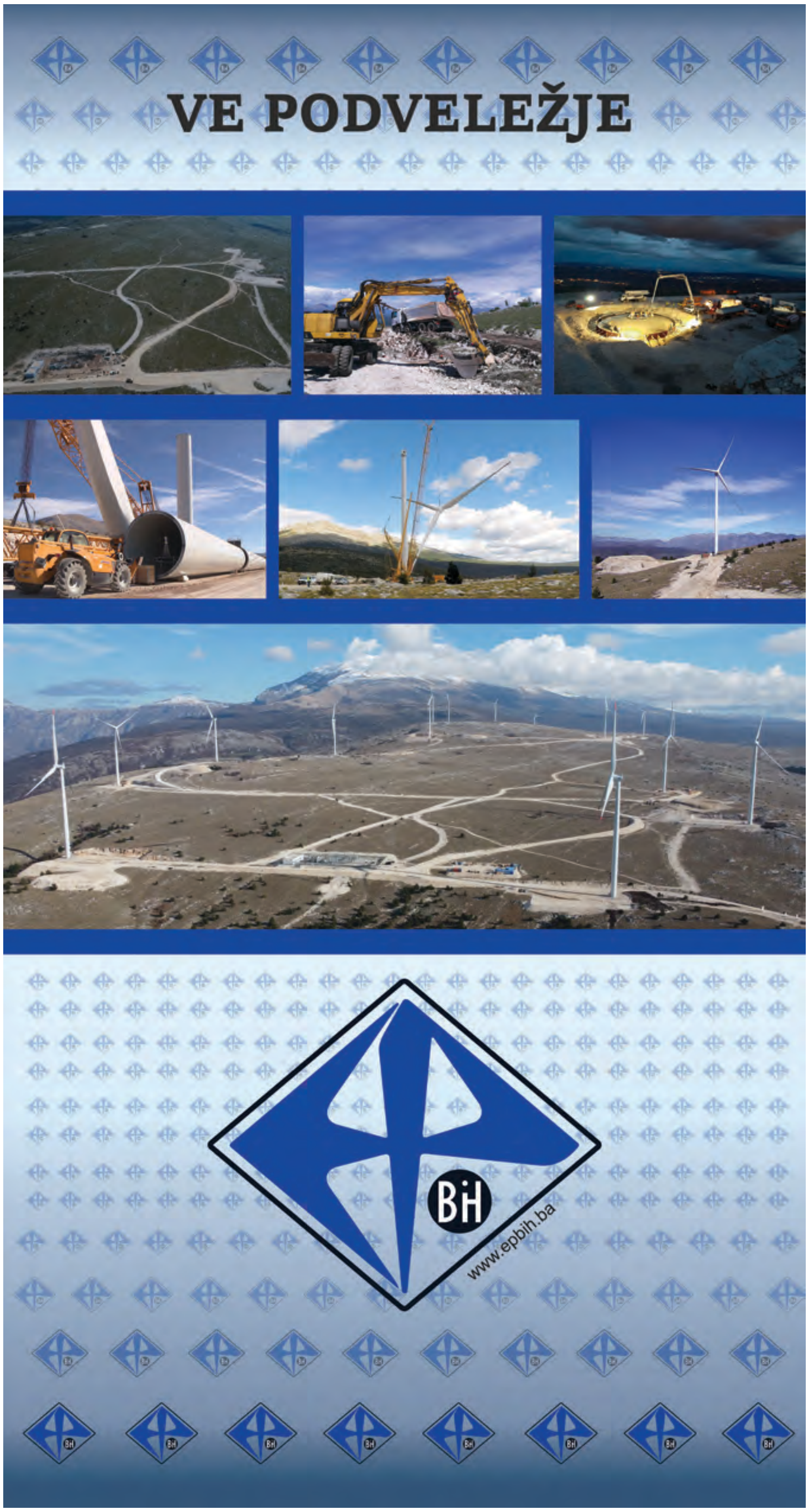
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NOSBiH
НОСБиХ

Nezavisni operator sistema u Bosni i Hercegovini
Независни оператор система у Босни и Херцеговини
Neovisni operator sustava u Bosni i Hercegovini
Independent System Operator in Bosnia and Herzegovina

Nezavisni operator sistema u Bosni i Hercegovini (NOSBiH) upravlja sistemom prijenosa električne energije u BiH u svrhu kontinuiranog snabdijevanja električnom energijom po definiranim standardima kvaliteta za dobrobit građana BiH.

NOSBiH je neprofitna kompanija BiH u vlasništvu entiteta RS i FBiH koja svoju djelatnost obavlja na cijelom teritoriju BiH. Rad NOSBiH-a regulira Državna regulatorna komisija za električnu energiju – DERK.

KLJUČNE FUNKCIJE NOSBiH-a:

- Upravljanje radom svih visokonaponskih prijenosnih uređaja u Bosni i Hercegovini naponskog nivoa 110 kV ili više u realnom vremenu
- Upravljanje balansnim tržištem električne energije u BiH
- Utvrđivanje Indikativnog plana razvoja proizvodnje, te pregled, odobravanje i izravna revizija Dugoročnog plana razvoja prijenosne mreže
- Godišnje, mjesečne i dnevne aukcije te unutardnevne dodjele prava na korištenje prekograničnih prijenosnih kapaciteta na granicama BiH sa Crnom Gorom, Hrvatskom i Srbijom

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Literature

1. “Documents of JUKO CIGRE”, Archive of BH K CIGRE;

2. “Documents and photos from conferences, various gatherings and meetings organized by BHK CIGRE”, Archive of BH K CIGRE;

3. Kresimir Bakic, “SEERC CIGRE HISTORY – Early electrification and empowerment of region where current electricity was born”, June 2020;

4. “Monograph Elektroprenos - Elektroprijenos BiH”, Elektroprenos - Elektroprijenos BiH and Grafid d. Fr. o., Banja Luka, 2016;

5. “Fifty years of activity of CIGRÉ in Croatia 1951 - 2001/Ten years of the Croatian CIGRÉ Committee 1991 – 2001”, Croatian Committee CIGRÉ, Zagreb, May 2001, ISBN 953-6408-44-9;

6. “Papers from the conferences of JUKO CIGRE”, Archive of BH K CIGRE;

7. “Technical Museum in Sarajevo - Brochure”, BH K CIGRE, Sarajevo, 2018;

8. “The History of CIGRE, A key player in the development of electric power systems since 1921”, CIGRE Paris, 2011;

9. “25 years of the Bosnia and Herzegovina Committee of the International Council on Large Electrical systems”, Monograph, Sarajevo 2018;

10. “40 years of work JUKO CIGRÉ”, JUKO CIGRÉ, Zagreb, 1991;

11. “50 years of the Faculty of Electrical Engineering, University of Sarajevo”, Sarajevo, 2011;

12. “60 years of CIGRÉ work: An anthology of texts from contributions, monographs and documents”, Serbian National Committee of the International Council on Large Electricity Networks - CIGRÉ Serbia, Belgrade, May 2011, ISBN 978-86-82317-70-8;

13. “100 years of electricity in Bosnia and Herzegovina”, JP Elektroprivreda BiH, Sarajevo, 1988;

14. https://www.derk.ba/;

15. https://www.nosbih.ba/bs/;

16. https://www.elprenos.ba;

17. https://www.energoinvest.ba/index-news-bos.php?newsid=208;

18. https://www.irce-ad.com/.