PLANNING ADVANTAGES, CREATING CHALLENGES

In IBE we see our mission as providing consulting, design and engineering services in the areas of energy, industry, infrastructure, public sector and environmental protection, taking into account the highest quality standards in such matter that demanding expectations of our clients are met, guaranteed business success realized and motivational working conditions for our employees created.

The success of our company is based on our staff’s intellectual capital and over 60 years of experience and tradition. Together we create common values which include a belief in assuring high quality of our services and an acceptance of personal responsibility for the realization of our commitments. Work is organized into interdisciplinary groups, which contributes to better results and ensures the knowledge transfer onto younger co-workers.

IBE operates as an independent design engineering and consulting company, working for the interest of our clients, public interest and in accordance with the professional criteria. We only play one part in the projects and we avoid the conflict of interest. The professional and business independence of our work is guaranteed also by the parent company IBE Holding, d.d., which is organized as a partnership system and owned by a wider circle of our employees.

IBE has always and will continue to strive for advantages which our consulting and project solutions bring to our clients and through their realization towards a creation of challenges for a better future.

mag. Uroš Mikoš, General Manager
COMPANY IDENTITY CARD

Company name: IBE d.d.
Registered Office: Hajdrihova ulica 4, SI-1001 Ljubljana, Slovenia
Year established: 1949
Telephone: +386 1 477 61 00
Fax: +386 1 251 05 27
E-mail: info@ibe.si
Website: www.ibe.si, www.ibe.eu
General Manager: mag. Uroš Mikoš
Registration Number: 5075696000
Tax Number: SI79938655
Bank account: SI56 0292 3001 0728 534 (NLB), SI56 2420 3900 0030 128 (Raiffeisen Bank)
Registration Court: District Court of Ljubljana
Entry number: 1/00551/00
Capital stock: 664,425,06 EUR
Activity code: 71.129

Ownership: System of internal ownership by a large number of employees (partnerised company)

Certificates: Quality Assurance System in accordance with the ISO 9001

Personnel structure frame: 200 employees

3 Doctors of Science (civil engineering, mechanical engineering),

13 Masters of Science (electrical engineering, mechanical engineering, economics, information technology, nuclear physics),

70 employees with university degree (civil engineering, mechanical engineering, architecture, landscape architecture, geodesy, economics, law, computer science and information technology, industrial engineering),

35 employees with higher and post-secondary education degree (civil engineering, electrical engineering, mechanical engineering, communal engineering, agricultural engineering, information technology, organization and management, business sciences, economics),

75 employees with secondary education degree (civil engineering, electrical engineering, mechanical engineering, geodesy, economics, electrical engineering, energy engineering, agriculture, grammar school)

Annual turnover: €15,000,000

Membership: NACES - National Association of Consulting Engineers of Slovenia
FIDIC - Fédération Internationale des Ingénieurs-Conseils
EFCA - European Federation of Engineering Consultancy Associations
CIGRE - Conseil International des Grands Réseaux Électriques
ICOLD - International Commission on Large Dams
WEC - World Energy Council

Certificates:

Quality Assurance System in accordance with the ISO 9001

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Branch Office Maribor

Branch Office Krško
In order to be able to place complete proposals and provide high quality services our experts are required to master an extremely large field of comprehensive know-how. They are engaged in all levels of the complete investment process ranging from research, feasibility studies, design documentation, supervision, engineering and final commissioning. By performing these activities IBE can act on the investor’s behalf or on the contractor’s behalf, depending on the requirements of the project. Each of the above fields includes numerous minor projects, which are mandatory in accomplishing the demanding task of project finalization.

**PROJECT ENGINEERING**

A) Project documentation
- Conceptual designs,
- Basic designs,
- Designs for obtaining construction permits,
- Detailed designs,
- As-built designs,
- Design documentation, made on the basis of the Krško Nuclear Power Plant procedures,
- Design documentation for foreign countries on the basis of their legislation.

B) Detailed reports and other documentation related to construction
- Mandatory reports (fire safety studies, safety at work studies, construction waste management plans, feasibility studies of alternative energy sources, etc.),
- Non-mandatory technological reports, in particular,
- Geodetic plans and other geodetic services,
- Reports for entry into official registers,
- Other documentation related to construction, such as:
  - Tender documents,
  - Operating and maintenance instructions,
  - Construction site organization plans,
  - Functional specifications,
  - Terms of Reference,
  - Up-to-date Facility Documentation.

C) Technical consulting services
- Services related to acquiring project conditions, consents, permits,
- Technical and design supervision,
- Review, assessment and comparison of tenders,
- Review and certification of supplier’s documentation,
- Project management.

D) Project documentation revision
- Preparation of reports of individual auditors,
- Preparation of a joint audit report,
- Interpretation of reports.
CONSTRUCTION SUPERVISION
→ Supervision of all professions within the scope required by the Construction Act.

CONSULTANCY
→ Studies, scientific reports,
→ Preliminary designs,
→ Research and analyses,
→ Investment documentation:
  → Reconnaissance studies,
  → Prefeasibility studies,
  → Feasibility studies,
  → Project implementation studies,
→ Evaluations, reviews,
→ Spatial documentation,
→ Environmental protection documentation,
→ Business consulting,
→ Consulting Engineering in the name of Investor,
→ Expert supervision (beyond the scope defined by the Construction Act),
→ Staff training,
→ Geodetic services.

CONTRACT ENGINEERING
→ Services within the project designing scope,
→ Services within the consultancy scope,
→ Organization of preparation of various types of documentation and services,
→ Execution of deliveries,
→ Execution of construction and assembly works,
→ Testing and commissioning,
→ Hand-over of the facility to the client.
The establishment of IBE was closely related to the marketing area of energy. Adaptation to technological challenges over the decades of development, acquiring new skills and know-how and passing them to younger generations stood as pre-requisites for the implementation of a comprehensive professional support in the construction or refurbishment of energy facilities, such as: hydro power plants on the Drava, Sava and Soča rivers; hydro power plants Rama (Bosnia and Herzegovina), Perućica (Montenegro), Kožner (Kosovo); thermal power plants Šoštanj, Trbovlje, Brestanica and Thermal Power Station Toplarna Ljubljana; Krško Nuclear Power Plant; high-voltage networks of all voltage levels up to 400 kV with transformer stations; management and automation of Slovenia’s electric power system.

Multidisciplinarity and teamwork enable us to provide our clients with a full range of services, ranging from pre-investment activities, planning and siting to activities within the construction stage and final hand-over of a facility.
When the company IBE was established in 1949, its initial intention was to design hydro power plants, which is also attested by the then name of the company - Hidroelektroprojekt. Even today, after 60 years in business, we can proudly say that the area of hydro power and hydraulic engineering remains one of the fundamental market areas of the company. This area includes hydro power and water management plants, such as hydro power plants, dams (flood control reservoirs and dams within irrigation and water supply systems) and other water facilities.

Hydro power plants as a reliable and renewable source of cost-effective electrical energy are extremely important in every energy system. Hydro power plants are composed of a string of facilities which are highly demanding civil engineering works: dams, accumulation basins, derivations with the required equipment (channels, intake tunnels and pipelines, surge tanks, auxiliary and regulation facilities) and machine houses where the process of transforming the mechanical energy of water into electrical energy takes place. The machine house includes installed turbines, generators and related electrical and machine equipment, which is used for the supervision and management of the operation of aggregates. A very important part of the hydro power plant equipment is also a switchyard with transformers and an overhead power line, which connects the power plant with the grid. In addition to the basic function, i.e. power generation, hydro power plants are also used for water regime regulation and secondary regulation of frequency and power in the electricity system. At any given moment, accumulations of hydro power plants represent an important reserve for the electricity system, which increases its stability and has a positive impact on the quality of the electricity supply.

Renovation of structures
In addition to the construction of new hydro power plants, our further challenge is renovation or reconstruction of existing structures with the aim of extending their service life, increasing production capacities as well as improving the safety and reliability of operation. Renovation of hydro power plants particularly refers to the replacement of key installations (aggregates, hydro-mechanical equipment, high-voltage switchyard, etc.). In terms of renovation, our clients usually also decide to replace and upgrade the auxiliary equipment and perform small-scale construction remediation, the purpose of which is to improve the condition of the construction part of structures and adapt them for the installation of new equipment. The engineering concept of all renovation phases is crucial for the renovation planning process, as it ensures the lowest possible drop in production.

Complex structures
The high complexity of hydro power projects requires the cooperation of a large number of experts from various fields: geologists; seismologists; statistics experts; construction specialists for concrete, technology and construction organization; hydrologists and hydraulics experts; machines specialists for individual parts (turbines, cooling, ventilation); electricity specialists for generators, transformers, switchyards, management and control; as well as other specialists. Even though hydro power plants significantly affect the physical environment, they simultaneously represent the most magnificent structures built by man that will be present in our living environment for decades. Hence, in the design phase as well as in the preparation of investment documentation, various technical experts are joined by natural science and social science experts.

Knowledge across generations
Due to the described multidisciplinarity, the obvious demand for teamwork and quality project management, and because of the nature of work, which takes place in the office and outdoors, as well as because of other specific features of the sphere of hydro power and hydraulic engineering, IBE has organized groups which are specialized in such plants, in particular. A combination of en-
ngineering and technical staff with a level of know-how ranging from veterans to beginners has always enabled permanent training and the continuous transfer of experience to new generations. The staffing level of hydro power groups enables independent processing of whole structures. This provides our clients from Slovenia and abroad with a comprehensive range of consultancy and project engineering services, which are required on the path from a concept all the way to the commissioning of newly-constructed or renovated structures.

The above elements within all our projects serve as a guarantee for excelling in the set project goals within the given time frame and cost limits. It is pretty clear that due to their complexity, the development of hydro power plants is a huge challenge even from the aspect of time, because it can take as much as five years and often even a decade or several decades, for the idea to become an operational structure.
Within the sphere of thermal power, we place a lot of emphasis on conceptualization of new and reconstruction of existing thermal power structures, such as thermal power plants, heating plants, nuclear or gas power plants and industrial energy installations. Such work requires a complex approach from the aspect of various industries: machine engineering, electrical engineering, civil engineering, statics, architecture, geology, geo-mechanics, fire safety, landscaping. IBE’s advantage is that it can offer and implement projects with its own staff in the following areas:

- Nuclear power plants,
- Gas-steam power plants,
- Fossil fuel structures,
- Optimization of the cold end of thermal power plants,
- Pumping stations,
- Cooling systems, cooling towers.

Energy supply is very important in industrial installations, particularly in energy-intensive industries. This often has a key influence on the competitiveness of an end product. Industrial energetics requires a lot of how-know in the optimal conversions of various types of energy, often in combination with power generation, or in waste heat recovery or waste heat re-use. This area includes:

- Development of energy engineering on the location of production facilities,
- Concepts of individual installations,
- Boiler replacement,
- Dynamic and static analysis of steam lines,
- Water preparation,
- Cooling systems; cooling towers,
- Pumping stations,
- Condensate treatment,
- Waste water treatment,
- Energy and environmental rehabilitation of existing power plants.

The thermal energetics team also prepares energy analyses, energy supply development plans and local energy concepts of municipalities. Knowing the details of individual energy sources, technologies, concepts, trends, and having decades of experience in this area has provided us with the ability to conceive quality, professional and realistically-oriented proposals regarding development of the power supply for industry, inhabited areas, regions:

- Local energy concepts of municipalities,
- Heating studies for complex areas,
- Energy sector development plans,
- Remote heating systems,
- Location studies,
- Concepts of structures,
- Concepts of combustion technologies,
- Prolonged service life analysis,
- Environmental rehabilitation,
- Renewable energy sources,
- Expert evaluations for foreign financial institutions.

Thermal power processes, where electricity and thermal energy are obtained from fossil fuels, are undoubtedly a very reliable energy source. Therefore, thermal power facilities represent one of the most important energy pillars in almost all places around the world. With appropriate planning and selection of modern technological concepts it is possible to achieve more cost-effective and ecologically acceptable construction and operation of thermal power facilities.
In order to ensure a reliable supply of liquid fuels to the country, it is necessary to maintain energy product stocks for a certain period of time, in accordance with EU rules and regulations. Hence, in recent years we have significantly increased the scope of work relating to the storage of oil derivatives with all required infrastructure for filling and emptying tanks. Such projects are also implemented on a “turnkey” basis. This set of activities includes:

→ Oil derivative reservoirs,
→ Railway and truck decanting stations,
→ Heating oil pipelines,
→ Petroleum oil pipelines,
→ Pumping stations,
→ Active fire safety,
→ Stable extinguishing devices,
→ Fire pump stations.
NUCLEAR AND RADIATION FACILITIES

Nuclear and radiation facilities are structures where sources of radiation are managed; or, in other words, radiation sources are installed in them, whereby special regulations in the area of ionizing radiation protection and nuclear safety apply. These regulations govern the issue of nuclear and radiation safety for all periods of facilities: from siting, project design and implementation; to normal operation; and finally dismantling and shutting down. From the aspect of the development of project solutions, the regulations mentioned above are used particularly as supplements to the existing construction, environmental and spatial regulations.

In addition to the usual services related to the design and investment documentation and the implementation of construction supervision, IBE’s design and consultancy services in the area of nuclear and radiation facilities also include the following contents:

- Creation of project bases, including definition of project events for all states of the facility;
- Classification of facilities, systems and devices into classes with regard to their significance for nuclear and radiation safety;
- Project designing of structures, systems and devices relevant to nuclear safety, in accordance with specific standards, which supplement or replace general prescribed standards;
- Preparation of expert studies, reports and other documentation regarding the assessment of nuclear and radiation safety, physical security, radioactive waste and spent nuclear fuel management, and other areas typical for nuclear and radiation facilities;
- Planning and implementation of observations of conditions and monitoring the consequences of the aging of facilities and devices;
- Designing of detailed and other documentation in accordance with client’s procedures and giving expert opinions, which are a mandatory component of applications in the process of obtaining permits, in accordance with the authorization of the Slovenian Nuclear Safety Administration.

The work carried out by IBE in the area of nuclear and radiation facilities also includes all project design professions, and specialists from all areas. Works are executed by people with appropriate qualifications or people acquainted with well-asserted guide-lines, standards, references and operating experience in this area, and with the know-how certified by the client. For the purposes of implementing counselling and project design activities in the radiologically controlled area of the Krško Nuclear Power Plant, the Slovenian Nuclear Safety Administration awarded the company IBE with the Radiation Activity Licence.

The services are implemented in accordance with a special addendum to the Quality Manual and written procedures, as well as in accordance with the client’s quality management system. We are proud to be able to use our professional skills, experience and other competences to be actively present on challenging projects in practically all existing, decomposed and planned nuclear and radiation facilities in Slovenia. Our activities on individual facilities comprise the following, in particular:

- Krško Nuclear Power Plant:
  -notification of project documentation; designing of project and technical documentation for the purposes of modifications and modernizations; monitoring the conditions and aging processes of structures; giving expert opinions and preparing investment documentation; supply of equipment and implementation of works on individual functional systems;
→ Second Krško Nuclear Power Plant unit: creation of project bases, concepts and investment documentation; creation of components of a special safety report;

→ Žirovski Vrh Uranium mine: decommissioning programme organization; project documentation for the purposes of dismantling the facility; design supervision; rehabilitation project and safety reports for landfill sites Jazbec and Boršt;

→ Central radioactive waste storage facility in Brinje: making of investment and technical documentation for modernization purposes; design supervision;

→ Temporary storage area of low-level and intermediate-level radioactive waste in Zavratec: making of rehabilitation programme and implementation of rehabilitation;

→ Low-level and intermediate-level radioactive waste repository in the location of Vrbina, Krško: cooperation in the selection of location; preparation of fundamental technological studies; foundations for siting; project and investment documentation up to the basic design stage and expert analyses and studies;

→ Radioactive waste and spent nuclear fuel repository: preparation of general technical and economic studies.
Power transmission and distribution devices serve as a link between electricity generation and consumers, and are a crucial and indispensable part of the electric power system. Power transmission devices, whose function is to transport large quantities of electric power over huge distances, include overhead power lines, cable conduits, distribution transformer stations and switchyards. Typical voltage levels for power transmission in Slovenia, and also in the wider central European area and the Balkans, are 400, 220 and 110 kV. IBE has been strongly active in the area of power transmission and distribution since its establishment. Our main activities are directed into project engineering of power lines, cable conduits and transmission and distribution transformer stations and switchyards of all voltage levels. But we are also active in other aspects of investment processes — ranging from consulting activities, the designing of investment documentation and studies, to “turnkey” implementation.

Distribution transformer stations and high-voltage cables

In the area of transmission transformer stations, IBE has long-standing experience in planning air-insulated (AIS) and gas-insulated switchgears (GIS) of all voltage levels, whereby we follow the latest trends of development of all types of systems and subsystems, including modern control and protection systems. All this is reflected in the high functionality and reliability of constructed facilities, clear and safe disposition solutions that are easy to maintain, and steel constructions that are easy to produce and maintain.

In the construction of buildings such as gas-insulated switchgears, a great deal of attention is directed to quality architectural solutions with an appealing external image of the buildings, whereby the aspiration for cost-competitive and functional installations is still at the forefront.

The area of distribution transformer stations particularly comprises stations with a voltage level of 110/20 kV. Because such structures are located in the vicinity of cities, younger generation structures are mostly produced using the gas-insulated technology, while completions of construction works and renovations of older generation structures are produced using air-insulated technology. In this respect, we make good use of the experience acquired in the construction of transmission facilities, while also transferring favourable solutions to the area of distribution.

In addition to designing various types of documentation for the new distribution transformer stations of all voltage levels, IBE also designs the reconstruction documentation for the existing facilities, and for other purposes or needs expressed by the investors in transmission and distribution systems.

A special area within power transmission and distribution is the increasing segment of project engineering of high-voltage cable conduits from 110 kV onwards. IBE’s very first experience in this area came as much as forty years ago, and dates back to the then most commonly used oil-filled cable technology. Within the last twenty years the use of cable line technology has been rapidly growing, both in urban areas as well as for the purpose of connection to gas-insulated switchgears which are in the direct vicinity of larger settlements. In addition to having experience in laying cable lines in regions with various requirements, IBE also has the latest software for the optimum selection of cables at its disposal, which is important with regard to the amount of investment.

Further, in planning transformer stations IBE also uses a wide range of specialized software packages, ranging from power technology software, equipment dimensioning software, grounding, making of diagrams and connections, to softwares for planning building structures, steel structures and electricity and machine installations.

IBE’s segment of distribution transformer stations, substations and high-voltage cable lines is planned
by two highly-qualified groups in the electrical engineering department and a group in the civil engineering, architecture and surveying department, which work closely together and complement one another, where necessary. They often work hand in hand with experts from other engineering industries, such as mechanical engineering, architecture, etc.

### Overhead power lines

An important segment of the power network which is constantly undergoing development, refurbishment and modernization is overhead power lines of all voltage levels. The planning of overhead power lines at IBE is performed by qualified experts from the electrical engineering and civil engineering, architecture and surveying departments.

Design engineers of overhead power lines must also make a comprehensive project and study documentation required by the investor, both for new constructions as well as for reconstructions of existing facilities. In their work, engineers are faced with challenges of modern technology on a daily basis, and also with the challenges of cooperation in the search for the most appropriate routes for siting overhead power lines. This, of course, can only be achieved with a method that observes high standards of contemporary engineering work, including the use of the state-of-the-art 3D software and the application of LiDAR technology for measuring and recording elevation data.
Project engineering of wiring facilities, including overhead power lines, is an area where tight cooperation with experts from various industries is extremely important, as they co-decide on the most appropriate occupation of space in a way that will satisfy the environmental, residential and other standards of a modern society. Hence, siting of power lines in a way that will ensure all their fundamental functions with the simultaneous agreement of all affected institutions and citizens, in addition to meeting economically acceptable conditions, remains one of the most important challenges for overhead power line planners.

**Control and protection systems**

Control and protection systems enable the reliable and flexible control of power generation and transmission, and are of key importance for managing the complete electrical energy and technological process. It has to be noted that this is the only technological process where the product is created and utilized almost simultaneously, which requires a special professional approach, a high-level of know-how and state-of-the-art equipment.

IBE has long-standing experience in the area of planning and implementing management and security systems, both with respect to the equipment installed in electricity generation, transmission and distribution facilities on a local level, as well as on the level of control and supervision centres.

We have been successfully cooperating with domestic and foreign investors in all stages of planning and implementation, ranging from conceptual designs, tender documentation and detailed design to as-built documentation, which enables our clients to run smooth operation and maintenance of devices and complete systems.
In the 1960s our experts successfully applied their experience in energy segment to the area of industry. Initially, the company was active in the area of industrial energetics; however, very soon new business opportunities arose in the area of wood processing, and in the chemical industry. After this we moved into other industries, such as the pharmaceutical, food and automobile industries. Expertise and competitiveness are tools we use to master the latest technologies and successfully operate in foreign markets as well.

**Sub-fields:**
- Automobile industry
- Metal processing industry
- Logistics and transport
- Pharmaceutical industry
- Food industry
- Chemical, rubber and other processing industry
- Wood and paper processing industry
- Power plants within the industrial sphere
The very beginning of our activities, and our first major projects in the area of industry, date back to the 1960s when, parallel to the development of industrialization in this part of Europe, our company also became engaged in this rapidly growing marketing area. Today, industry represents one of the most important segments of IBE’s activity. A common feature of all new structures in the area of industry is that they highly depend on market orientation of clients and are based on very different and often state-of-the-art technologies. In designing such structures, the primary duty of a design engineer is to be well aware of and consistently observe all requirements and specifics of implemented technologies as well as other relevant core factors. Close cooperation with the operators of technological solutions is a basic pre-requisite for successful design of any industrial structure. Having this in mind, we are equipped with the knowledge to build a facility that will actually serve its purpose and enable the realization of client’s business goals.
Forced to adapt to market challenges on an everyday basis, companies in the field of industry must constantly develop new products that will be interesting on a global scale. Hence, the investment cycle in the industry is distinctly short in comparison to other market segments, and this is directly reflected in the short deadlines available for investment development, project engineering and construction. This high investment dynamic, which is always based on new technologies, essentially expresses the key desire of a client “to succeed professionally in a global market” and must be cost controlled from the very beginning, which also represents the basic framework of a design phase.

Approximately a third of the employed experts at IBE are engaged in projects in the area of industry. Within departments and branch offices there are organized project groups that are, among other things, also focused on an ongoing flow of know-how and the development of individual professions and specializations, which are urgently important in the realization of multi-disciplinary projects in the area of industry. The heterogeneity of implemented technologies and other project requirements dictates specific design approaches to various types of industries. And, to sum it up, IBE prides itself on effective team work and know-how in a whole set of very different areas of industry.
For a number of years IBE has been engaged in the highway and railway programme of the Republic of Slovenia. We design mechanical and electrical systems in tunnels, toll stations and crossings of highways with power transmission lines, while in the sphere of railway networks we design and construct traction substations and control systems. In particular, the design of main gas pipelines and gas compressor stations represents an important market segment of IBE in the area of infrastructure. We are also engaged in studies covering hot water district heating systems and design engineering of hot water, sewage and gas distribution grids. We successfully apply our know-how to comprehensive design engineering of the combined municipal infrastructure of wider urban areas.

In addition to design engineering, our work also includes the so-called supply engineering based on a “turnkey” approach, which further complements our core service.
The issue of new construction and reconstruction of railway and road infrastructure is a key area within the economic policy of every country. Related structures are challenging not only from the aspect of siting, but also because of their technological complexity, which is subject to various regulations and standards. The projects are multidisciplinary and require close cooperation of specialized companies from various fields. In the area of railway and road infrastructure IBE specialize in design engineering and consulting in the following areas of expertise:

- Electrical and mechanical installations and equipment in tunnels, galleries and covered entrenchments,
- Railway power supply systems,
- New constructions, transpositions and protection of new and existing lines of municipal infrastructure.

IBE started planning electrical and mechanical installations in road tunnels in the early 1990s. From that period onwards we have been engaged in designing practically all similar structures in Slovenia and also obtained references abroad. In order to achieve the highest possible level of traffic security in modern tunnels, galleries and covered entrenchments, our experts observe the constant changes and improvements to regulations and standards which govern this area. Project solutions and installed electrical and mechanical equipment in tunnels must meet very strict project requirements, while tunnels are becoming more and more complex and sophisticated structures, where practically nothing is left to chance.

Modern tunnels enable a completely automatic operation of all installed systems, and the same applies to remote control from the supervising control centre. In designing tunnels, and depending on their type, risk level, length and complexity of traffic, we usually deal with the following systems:

- Basic and backup power supply of tunnels (20 kV, 0,4 kV, Diesel, UPS),
- Basic and fire-fighting ventilation,
- Lighting (elementary, emergency, evacuation),
- Hydrant network,
- Fire extinguishing system,
- Portable and fixed traffic signs,
- Automatic and manual fire alarm systems,
- Emergency call system,
- Manual alarm systems,
- Intruder detection systems and access control,
- Video surveillance,
- Automatic video-detection of hazardous situations,
- Sound system,
- Radio communication,
- Visibility and CO concentration control,
- Longitudinal air movement speed control,
- Control and surveillance systems and transmission of signals.

Thanks to contemporary project solutions and strict observance of stringent standards, we are proud to note that new tunnels in Slovenia (Trojane, Jasovnik, Šentvid, Dekani, Kastelec, etc.) are some of the most modern and safest in the world.

Railway infrastructure supply systems
To ensure the uninterrupted flow of railway traffic, a sufficient and reliable power supply source must be provided. The nature of railway traffic - cargo traffic, in particular - requires the provision of high power demand, in particular in sections where the track is challenged by major differences in altitude. For that reason project solutions are locally specific and adjusted to the installation and capacities of
power transmission lines. In the design and implementation of railway traction supply systems in Slovenia our experts must bear in mind that DC power consumption is 3 kV.

IBE’s work in the area of electric traction supply stations includes: creation of design documentation; providing technical consulting; construction of stations, which includes implementation of construction works; supply and assembly of equipment; and commissioning. We also implement remote control of stations and control centres.

Regulation of crossings and parallel placement of road and railway network with regard to other municipal infrastructure

A specific feature of projects dealing with railway and road structures, which are long line structures by their nature, is the need for the complete treatment of other municipal infrastructure which crosses or runs along road and railway corridors. Here we come across a very wide spectrum of technical structures, from overhead power lines to gas pipelines, hot water systems, sewer lines and fibre-optic communication lines, which must undergo appropriate engineering processes. The design of municipal infrastructure which crosses or runs along road and railway infrastructure can only be completed when the remaining parts of the project documentation are mainly done, which is very time consuming and must be carefully planned ahead. A further challenge for project designers is the internal harmonization of individual systems, where special attention must be given to close cooperation with the owners and managers of various types of municipal infrastructure, and compliance with their requirements and development plans.
Of all fossil fuels natural gas is the most environmentally friendly. When compared with coal and petroleum oil, it contains a negligible amount of sulphur and low values of other harmful substances released by the combustion process. Natural gas combustion produces approximately a third less CO2 than coal combustion, and about a quarter less than fuel oil combustion.

<table>
<thead>
<tr>
<th>Energy Product</th>
<th>CO₂</th>
<th>SO₂</th>
<th>NOₓ</th>
<th>C₅H₁₂</th>
<th>CO</th>
<th>prah</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating gas oil</td>
<td>74,000</td>
<td>120</td>
<td>40</td>
<td>6</td>
<td>45</td>
<td>5</td>
</tr>
<tr>
<td>LPG (liquefied petroleum gas)</td>
<td>55,000</td>
<td>3</td>
<td>100</td>
<td>6</td>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>Wood</td>
<td>0</td>
<td>11</td>
<td>85</td>
<td>85</td>
<td>2,400</td>
<td>35</td>
</tr>
<tr>
<td>Lignite</td>
<td>97,000</td>
<td>1,500</td>
<td>170</td>
<td>910</td>
<td>5,100</td>
<td>320</td>
</tr>
<tr>
<td>Natural gas</td>
<td>57,000</td>
<td>0</td>
<td>30</td>
<td>6</td>
<td>35</td>
<td>0</td>
</tr>
</tbody>
</table>
Carbon dioxide is one of the main causes of the greenhouse effect and warming of the atmosphere, so the international community is attempting to significantly reduce carbon dioxide emissions. For that reason, in addition to measures related to efficient energy use and the use of renewable energy sources, there is an upwards trend in the number of projects where the primary source of energy is natural gas. This particularly refers to gas-steam power plants, co-generation installations in industries and public institutions, and the use of natural gas in general consumption.

For the above reasons the design of gas networks is an important marketing area for IBE. We have also seen a higher range of services performed by IBE in the area of the design, construction and expansion of Slovenian gas pipeline infrastructure, both gas transmission pipelines and natural gas distribution networks.

The company IBE designs gas transmission pipelines, distribution networks and all associated structures (compressor stations, measuring and pressure reduction stations, block stations, etc.) under the auspices of the mechanical engineering and technology department. For the purpose of every concrete project related to gas pipelines we compose a project team of experts from the field of mechanical engineering, which also usually includes specialists from other professions: civil engineers and electrical engineers in particular.

The quality of our work is also attested by the successful completion of such challenging projects as: gas transmission pipelines Cerčak-Kidričevo, Rogaška Slatina-Trojane-Vodice, Šentrupert-Šoštanj, Kalce-Jelšane, Kalce-Vodice; compressor stations Kidričevo and Ajdovščina; and city gas pipeline grids Rogaška Slatina, Kranj, Kamnik, Škofja Loka, Novo mesto, Ljubljana, Ptuj, etc.
Continuous growth and development, competitiveness and openness to new challenges are important factors which have contributed to IBE’s reputation as a company with extensive experience. The fact that we respect the purpose diversity of individual public facilities is also reflected in our references, which include a number of representative and architecturally notable public buildings. In designing public buildings special attention is given to the efficient use of energy and alternative energy sources, whereby we apply our extensive know-how in the area of energy and environmental protection.
The concept of public and commercial buildings includes, above all, buildings which have a wider public or business purpose, and are mostly intended for a wider circle of people. In this respect our work is directed to designing various structures, such as:

- Buildings in the area of culture, education, science and sports (museums, galleries, libraries, kindergartens, schools, faculties, institutes, sports facilities, etc.);
- Buildings in the area of health care and social work (health care centres, hospitals, nursing homes, etc.);
- Buildings in the area of defence, police, customs service, public administration (road and marine international border crossings, buildings for the purposes of national institutions, buildings for special purposes, etc.).
→ Buildings in the area of economy, which particularly have a business purpose (administrative and office buildings, trade centres, hotels, etc.);
→ Residential buildings;
→ Combined business and residential buildings.

Similarly to the area of industry, in public and commercial buildings we must also get to know the basic concepts and technologies of all the activities which will take place in a future building. In designing larger complexes we often come across a combination of various types of the above mentioned buildings and associated infrastructure. For that reason, industrial complexes often include more than just production, storage and other technological facilities, but also commercial buildings with administrative, office, conference, restaurant, exhibition and other non-industrial premises.

In addition to such modern buildings having a diverse purpose, there’s one further factor that needs to be noted in relation to their design: i.e. the high requirements regarding energy efficiency and the search for alternative energy sources. Considering the fact that in the developed world more than 40% of all energy is consumed in the heating and cooling of buildings, such requirements are clearly well-grounded. This guideline is also reflected in district legislation, which is frequently changed and restricted, giving project designers new challenges to overcome. In the near future, the EU plans to build only zero-energy or almost zero-energy buildings, which is something that already needs to be considered today.

Professional interdisciplinarity and experience in the areas of industry, infrastructure and energy engineering often help us overcome even the most demanding technological challenges in the area of the design and construction of public and commercial buildings. Modern public facilities long ago surpassed traditional simplicity, and are often extremely complex both in the architectural and construction sense, as well as in terms of installation. Likewise, the basic conditions for achieving appropriate quality are high-quality team work and active cooperation with individual specialists and architects.

IBE is proud of its reference list of challenging public and business facilities from various areas, as it reflects a high level of qualification, which will undoubtedly be useful in designing future eye-catching and high-quality structures.
IBE deals with environmental protection in two interlinked work areas. The first one refers to consulting services, or the preparation of starting points on environmental protection with regard to the administrative procedure, and the preparation of comprehensive reports on the impact of investment projects on the environment. The second area refers to design engineering, which is based on versatile knowledge of technologies for the purpose of realizing various projects, and on compliance with contemporary environmental protection legislation. We are aware that a harmonious economic development with respect to the environment can only be achieved when the balance between our needs and nature’s capabilities is respected.
EFFICIENT USE AND RENEWABLE ENERGY SOURCES

At the very start of any building design phase we strive to reduce the predicted energy consumption of a building to the optimum value, or within a range acceptable not only in terms of low energy product consumption, but also from the aspect of construction costs and subsequent maintenance costs. Active provision of minimum energy consumption is a particularly current issue, and is also formally required by the regulations, which are often changed, particularly towards the near-zero-energy buildings.

Use of alternative and particularly renewable energy sources represents the basic concept that is applied in the building design phase, with the purpose of meeting energy demands of buildings that are optimized in advance. Renewable energy sources include the following:

- Wind power;
- Geothermal energy;
- Wave energy;
- Tidal energy;
- Biomass energy;
- Biogas energy.

The efficiency and economic viability of the exploitation of individual renewable energy sources depends on the very nature and ability of an energy source, the accessibility of the source in a specific location, the natural and social conditions of exploitation, and numerous other factors.

**Hydro power**

Ever since 1949, when IBE was established for the purpose of designing hydropower facilities, the company’s activity has been closely connected with renewable energy sources. Even today the design of hydro power plants, whose features place them at the very top of renewable energy sources with regard to their efficiency and economic viability, represents one of the fundamental market areas of company’s business.

Interestingly enough, in addition to larger hydro power plants, small hydro power plants (SHPP) also represent an important source of green power in Slovenia. So far over 400 SHPPs have been constructed in Slovenia, with a total power of over 85 MW. Since the 1990s onwards, an important investment cycle has been present in Slovenia: i.e. new SHPP constructions and reconstructions of existing SHPPs.

Since the start of SHPP construction programmes in Slovenia, IBE has been actively involved in the design and implementation of other engineering services for a variety of clients. Likewise, we are also cooperating in SHPP projects abroad. We also cover engineering services for new constructions and for SHPP reconstructions. The sphere of large hydro power plants requires coordinated operation of all professions, and the same applies to small hydro power plants. The latter are also designated as protected natural environments, which makes the natural science aspect even more important, as it includes the compliance with all regulatory and technical norms for an environmentally-friendly project implementation. Further, another important aspect is cost management, because SHPP projects depend greatly on requirements relating to the protection of natural environment. SHPP facilities must coexist with the natural environment, and the presence of SHPP should not affect the quality of natural habitats where such power plants are constructed. SHPP projects have some particular features which distinguish them from big hydro power plants: i.e. higher exposure to natural phenomena (erosion, slides, high water, wood and rock detritus, etc.), access difficulties, which results in more complicated maintenance, challenging provision of continuous availability of small hydro power plants, etc. Technical solutions for SHPP must respond to all the above issues, so that
after the completed new construction or renovation project SHPP will successfully operate throughout its predicted service life.

**Solar energy**
The development of technology and the drop in price of the implementation of related project solutions has resulted in a growing trend of solar energy utilization. With regard to its use, solar radiation energy can be divided into:

- Solar radiation heat accumulated in the construction and surface of buildings (i.e. passive solar energy);
- Solar radiation heat collected by means of collectors used for heating water that is stored in reservoirs for subsequent use (i.e. active solar energy);
- Electric power from systems heated by concentrated solar radiation (i.e. solar thermal electricity);
- Electric power generated by means of photovoltaic cells or photovoltaics.

In addition to exploiting passive solar energy, which represents one of the basic elements in building physics, more and more attention in the design phase is also directed to other forms of solar energy utilization. In particular, this refers to photovoltaics. In this respect we can boast successful references in the area of planning solar power stations, and also their complete “turnkey” implementation.

**Cogeneration**
And finally, in designing electricity and thermal energy generation we often come across technological solutions of cogeneration (coproduction), where our goal, next to electricity generation, is to take advantage of surplus energy released in the primary technological process to the greatest extent possible. IBE has been involved in the design and implementation of numerous projects where energy obtained by cogeneration often, particularly in larger urban centres, represents an equal competitor to energies obtained from renewable sources, and is successfully used particularly for remote heating and even cooling of buildings.
**ENVIRONMENTAL PROTECTION AND WASTE TREATMENT**

IBE is aware that the state of the environment is a consequence of numerous influences, which are particularly displayed through human activities, such as the construction of various buildings. For that reason any spatial or other land use planning must be thoroughly investigated from the aspect of environmental impacts. Active care for the environment or improvement of the state of the environment is realized through all formal and informal stages of the design and construction of a specific facility. We are searching for effective answers and environmentally friendly solutions regarding emission of substances and energy to the environment (water, air, soil), and waste, which is a subsequent result of any project.

Environmental protection planning

In the area of environmental protection we prepare various types of studies and reports within the design phase, and also project solutions for the rehabilitation of existing impacts on the environment. In the early phase of preparation of individual investments we consider the environmental aspect within prefeasibility studies, which facilitates the project decision-making process.

An environmental report is a component part of the comprehensive assessment procedure of environmental impacts, which is prescribed by the Environmental Protection Act, and is prepared for various urban designs (national spatial plans, municipal spatial plans, etc.). It comprises information on the plan, state of the environment in the area of plan implementation, environmental goals of the plan and impact evaluation criteria for the plan implementation, determined effects of the plan and their assessment. It also proposes measures for mitigating effects and methods of state monitoring during the plan implementation.

The elaboration of environmental impact statement is an integral part of the assessment of environmental impacts, which is also prescribed by the Environmental Protection Act. Environmental impact statement is made on the basis of solutions from project documentation, and comprises data on the type and features of intervention, alternative solutions, the existing state of the environment, impacts of land use and measures for their mitigation or elimination. Environmental protection consent, which is obtained by estimating environmental impact, is the basis for obtaining a construction permit.

The preparation of reports requires an interdisciplinary approach: knowledge on the type of intervention and components of the environment and interactions - environmental impacts. An essential component of reports refers to appropriate mitigation measures, which reduce or even eliminate predicted environmental impacts.

**Landscape restoration**

For the majority of buildings interventions for which we make project documentation, we also make landscape architecture designs. When placing structures into the environment the effect of such activities on landscape features is also important; hence we observe and plan the regional aspect from the very beginning of the project. The landscape architecture design, or landscape restoration on the basis of analyses of the existing and predicted state, is a special mitigation measure, which ensures not only that the implemented project will not be too distracting in a given environment, but that it will also accentuate its positive features, which increases its acceptability in the public.

**Waste treatment and treatment plants**

Establishment of waste management regional centres is on the agenda of the Slovenian municipal waste management system. The basis for
Efficient waste management system operation is separate municipal waste collection. Waste collected this way is brought to regional centres, which implement mechanical waste treatment and in bigger centres also mechanical biological waste treatment. In Slovenia several similar centres are already active, while a number of larger centres are also planned.

In the process of waste treatment, fractions appropriate for re-use (material waste recovery) are separated from the mixture. Further, a specific quantity of material appropriate for energy recovery is obtained, while substances which have no useful value are eliminated in the process, and are disposed of at the final landfill site.

A comprehensive waste management concept cannot be realized without thermal waste processing, which opens doors to numerous possibilities for energy use of such technological procedures. In addition, fuel obtained from waste can be used as a domestic energy source, which therefore partly replaces the use of fossil fuels and thus directly impacts the reduction of greenhouse gas emissions from domestic waste landfill sites. Lastly, landfill sites where remains of waste are deposited create landfill gas, which can also be successfully used for energy purposes.

IBE cooperates in all design phases of various similar structures, from waste management centres to energy waste utilization facilities and also landfill sites.

Flue gas treatment plants

In contemporary thermal energy and industry structures we cannot even picture the utilization of fossil fuels, biomass, refuse derived oil for the generation of electricity and heat in combustion processes without the use of appropriate flue gas treatment plants. Technological procedures and the concept of such structures depend on many factors, such as the type of fuel, applied combustion technology and features of the location used for constructing a plant.

Flue gases, which are created in the combustion process, contain various harmful substances, mostly dust particles, sulphur oxides and nitrogen oxides, and also other toxic substances to a somewhat lesser extent. Valid regulations restrict emissions of such gases to the environment, while stringent regulations in the area of emissions as a rule cannot be met without highly-efficient flue gas treatment plants.

Our company has long-standing experience in designing such structures. Therefore, because we are well acquainted with contemporary technologies, we can successfully cooperate in all phases of decision-making processes and preparation of design documentation, which has been proved so many times before and is attested by our reference projects in this area.
**IBE d.d.**
Hajdrihova ulica 4  
SI-1001 Ljubljana  
Slovenia

Phone: +386 1 477 61 00  
Fax: +386 1 251 05 27  
Home page: [http://www.ibe.si](http://www.ibe.si)  
E-mail: info@ibe.si

**Head Secretariat**  
Phone: +386 1 477 61 68

**Electrical Engineering Department**  
Phone: +386 1 477 62 73

**Mechanical Engineering Department**  
Phone: +386 1 477 63 04

**Civil Engineering, Architectural and Surveying Department**  
Phone: +386 1 477 62 22

**Legal, HRM and Service Office**  
Phone: +386 1 477 61 61  
E-mail: pks@ibe.si

**Commercial Office**  
Phone: +386 1 477 61 25  
E-mail: ks@ibe.si

**Accounting and Financial Office**  
Phone: +386 1 477 61 17

**Informatics and IT**  
Phone: +386 1 477 61 64

---

**BRANCH OFFICES**

**IBE d.d.**  
**Branch Office Krško**  
Cesta krških žrtev 129  
SI-8270 Krško  
Slovenia  
Phone: +386 1 477 63 90  
Fax: +386 7 492 29 52

**IBE d.d.**  
**Branch Office Maribor**  
Ulica heroja Bračiča 6  
SI-2000 Maribor  
Slovenia  
Phone: +386 1 477 63 60  
Fax: +386 2 252 15 49

---

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