ÚJV Řež, a. s.

Division ENERGOPROJEKT PRAHA

DIVISION PROFILE

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Division ENERGOPROJEKT PRAHA

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ÚJV Řež, a. s.

The Nuclear Research Institution (NRI) in Řež provides a broad range of services including in particular applied research, design and engineering in energy, industry and health care. With its history of over 60 years, the NRI has been at the top of technological sites in the Czech Republic as well as in Europe. Its background of experienced experts and specialized technical infrastructure allows to deal successfully with complex projects in all of our areas of interest nationally as well as internationally.

Our services focus in particular on supporting the safe and effective operation of energy sources, especially nuclear, fuel cycle chemistry and complex services of management of radioactive and other waste as well as on design and related engineering. In nuclear medicine we develop, produce and distribute radiopharmaceuticals and build as well as operate Positron Emission Tomography (PET) centres.

Applied research, development, modern technology and innovation are a major part of our work, in particular in the field of use of nuclear energy and ionizing radiation. We possess advanced technology and experimental infrastructure, many of our facilities are unique in the context of the Czech Republic as well as Europe.

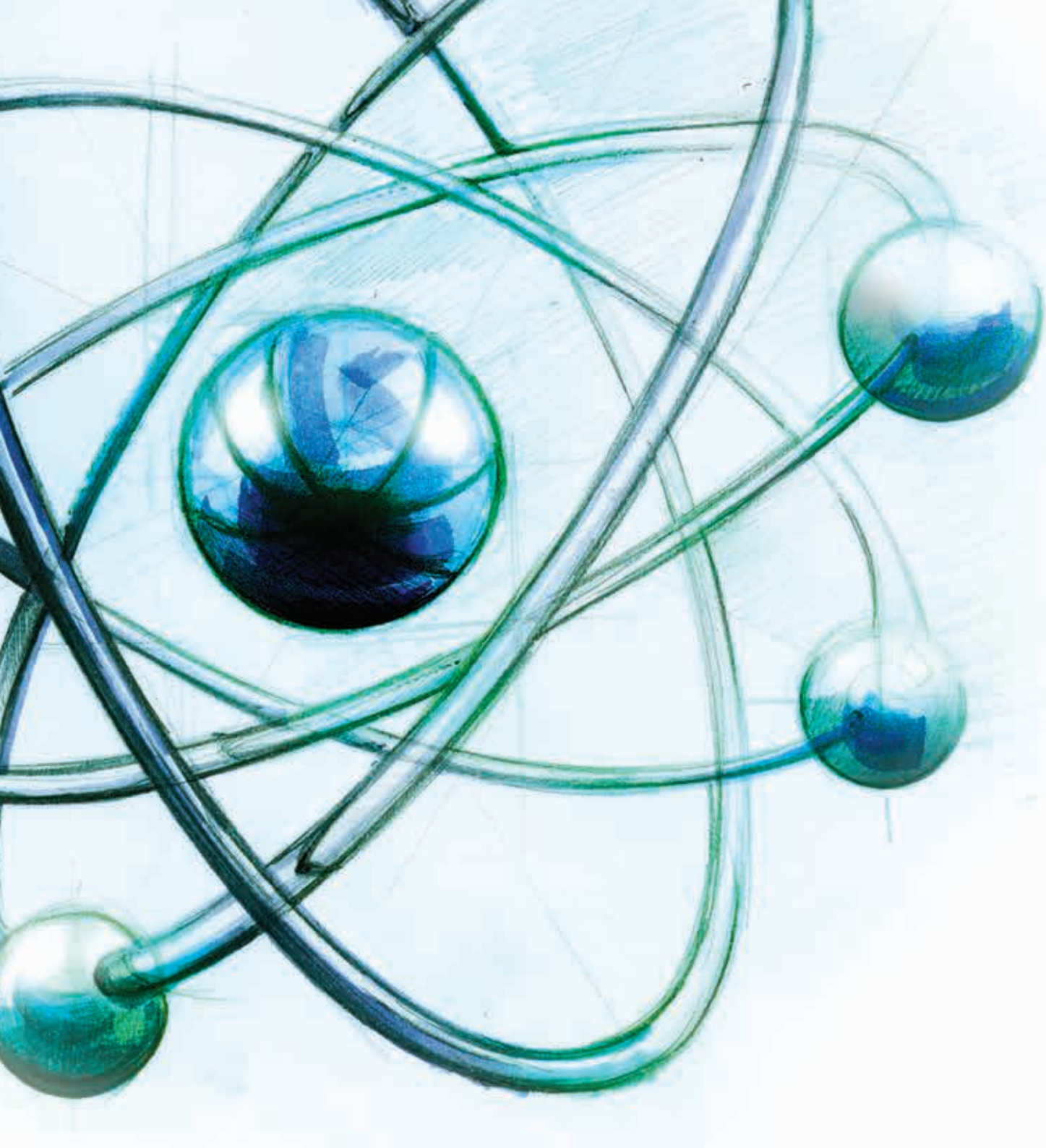
We are a recognized and respected member of thirty international organizations and associations and are involved in a number of technological platforms within domestic and international structures.

The Nuclear Research Institution provides nuclear safety services to power plant operators, EPC suppliers and public institutions worldwide. Our detailed knowledge of the pressurised water reactor technology stems from our function of the chief designer at the construction preparation stage for nuclear power plants. At present the Nuclear Research Institution provides technical support for the operation of 12 pressurised water reactor units (VVER) in the Czech Republic and Slovakia. The NRI is behind all major improvements and modifications of nuclear power plants in the Czech Republic and Slovakia, incorporation of corrective actions resulting from the outcomes of load testing in the power plants of Dukovany, Temelín and Mochovce after the Fukushima Nuclear Power Plant accident. These include increase in NPP power, replacement of the I&C system using the original Russian technology with the US system, full refurbishment of the I&C system in the nuclear power plant during standard refuelling, etc. The NRI is also engaged in the preparation of new VVER projects in third countries by supporting the future operators or the nuclear regulatory authority. At present the NRI acts as the chief designer in the construction of units 3 and 4 of the Mochovce Nuclear Power Plant in Slovakia.

The NRI provides complex design, engineering and consultancy services for conventional power plants (coal, gas, light fuel oil) involving the development of technical concepts. The NRI offers these services as part of preparation of new power plants, upgrades and refurbishments of old power plants to meet the current requirements on reducing emission limits and increasing the efficiency of electricity generation.

ÚJV Řež, a.s. has five production divisions:

- Nuclear Safety and Reliability
- Integrity and Technical Engineering
- Radioactive Waste and Decommissioning
- ENERGOPROJEKT PRAHA
- Radiopharmaceuticals



UJV Group

The products and services portfolio of ÚJV Řež is strategically complemented by subsidiaries which form the UJV Group, along with ÚJV Řež, a. s.
These subsidiaries provide engineering services, research and development and specialized activities in energy and industry:

- Research Centre Řež;
- Research and Testing Institute Plzeň;
- ŠKODA PRAHA.

Key objectives of the UJV Group:

- Provide engineering, design, analytical and scientific support for the operation and new construction of energy-generating and nuclear installations domestically and internationally.
- Provide complex system services in scientific research, in particular in the use of nuclear energy and sources of ionizing radiation.
- Be an expert authority and advocate of nuclear energy and the use of ionizing radiation.

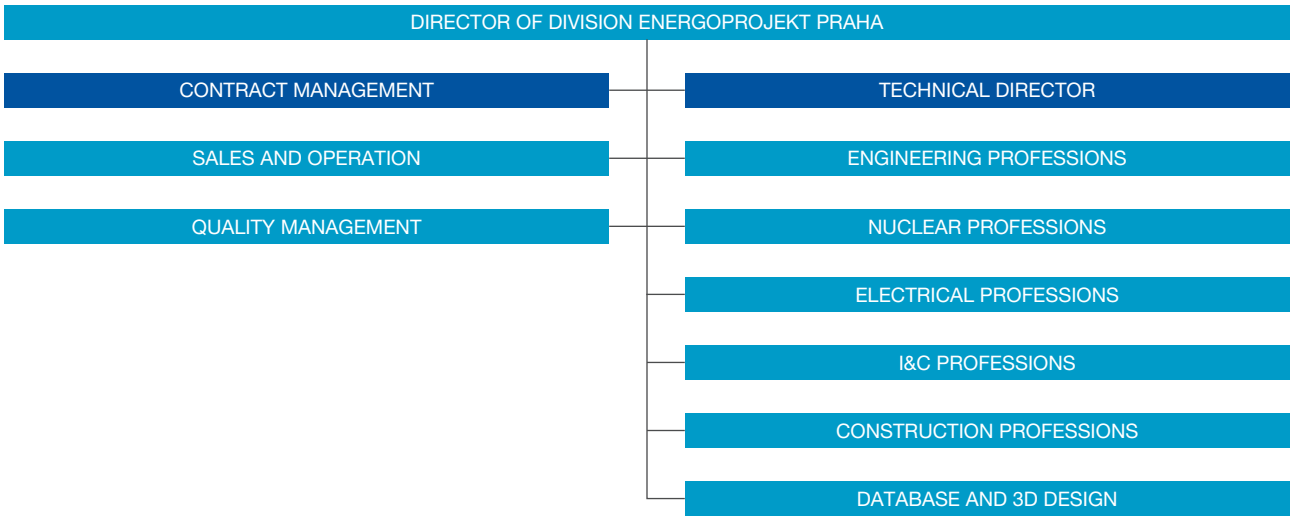
UJV Group
PEOPLE | INNOVATION | TECHNOLOGY

Division ENERGOPROJEKT PRAHA

HISTORY

- 1949 – establishment of the ENERGOPROJEKT PRAHA organization to ensure a design concept of power plants and their design documentation
- Since its founding, ENERGOPROJEKT PRAHA has had a dominant position in the Czech and Slovak energy sector (in electrical engineering and heat production) as the general designer of energy-generating installations.
- 1992 – Privatization of ENERGOPROJEKT
- ENERGOPROJEKT PRAHA, a. s. is the key successor of the former state-owned enterprise and the owner of know-how in the energy sector
- 2002 – ENERGOPROJEKT PRAHA became part of Ústav jaderného výzkumu Řež a.s. (Nuclear Research Institution in Řež) as its division called ENERGOPROJEKT PRAHA.
- 2017 – The subsidiary EGP INVEST, spol. s r.o. became part of the Division ENERGOPROJEKT PRAHA

PROFESSIONAL AND ORGANIZATIONAL CHART OF THE DIVISION



ACTIVITIES AND SERVICES

The Division ENERGOPROJEKT PRAHA offers design and engineering services in capital construction in the nuclear and other energy sectors, aiming at the preparation and implementation of new energy sources and at the operational support of existing power plants and heating plants in the Czech Republic as well as abroad.

To perform design and engineering operations the Division owns the applicable licenses and certificates from international companies. It employs a team of authorized people for individual professional areas.

The Division ENERGOPROJEKT PRAHA provides, as the chief designer, complex preparatory, pre-design and design activities at all building preparation stages for the construction of energy sources, including technical coordination and specialized services, in the form of turnkey design and engineering services or in the form of preparation of individual design stages in a standard structure based on specific customer requirements and project conditions.

Another important area of the Division's activities is the provision of engineering consultancy services (technical consultancy and expert activities) and programming services.

Design and related engineering activities

These highly professional and qualified activities are provided for all stages of the investment process:

- Preparatory design stage – Concept Study, Feasibility Study, volume, build-up, etc.
- Concept Designs
- Documentation for the award procedure (tender documentation)
- Documentation for zoning and planning decision and building permit
- EIA Documentation (Environmental Impact Assessment)
- IPPC documentation (Integrated Pollution Prevention and Control)
- Basic Design
- Detail Design
- Designer's supervision
- Technical supervision and consultancy
- Construction management activities
- As-Built Documentation
- Support for operation of existing nuclear and conventional power plants and heating plants

Complex engineering consultancy services

- Consultancy activities for investors
- Owner's engineer services for investors
- Technical support for nuclear supervisory bodies

DESIGN AND RELATING ENGINEERING ACTIVITIES FOR THE CONSTRUCTION OF NEW ENERGY SOURCES

STUDY

Feasibility Studies and Concept Studies

Preparation of studies for the preparation of construction of energy-generating units in the Czech Republic and abroad for power plants as a whole as well as for planned refurbishments, renewals, modifications or extension of operation. The scope and level of detail of the preparation of studies are adjusted to specific project conditions, available documentation and the purpose of documentation at the given stage of design implementation.

The study is usually used as the basis for:

- Project-related decisions of the investor or the supplier of the unit
- Selection of the design option
- Preparation of the Building Plan or the Business Plan
- Preparation of the documentation for the zoning and planning procedure
- Preparation of EIA Documentation

Basic types of studies offered

- Concept Study – initial draft technical concept based on the customer‘s requirements
- Preliminary Feasibility Study – prepared from available design documentation in the agreed scope as the basis for initial plan evaluation
- Feasibility Study – prepared to a greater level of detail based on specific project conditions, is used for the selection of options and evaluation of feasibility of the plan
- Volume study – architectural and urban project design, including volumetric evaluation and an estimate of financial costs
- Build-up study – concept of use of the area with an approximate location of objects, including built-up area, heights and other construction parameters

The feasibility of the plan is evaluated from the following main points of view:

- Technical feasibility
- Economic return
- Timetable for preparation and implementation
- Assurance of preparation or organization, project implementation and operation of the source

The Feasibility Study includes specifications for the necessary site surveys (engineering and geological, hydrogeological, hydrological, raw materials, pedological, etc.).

The volume and built-up studies are the basis for zoning and planning documentation and for the preparation of follow-up levels of building preparation.

Related engineering activities

- Consulting the design with the competent public authorities and suppliers of key equipment

CONCEPT DESIGN

Preparation of Concept Designs for energy-related projects in the Czech Republic and abroad. The Concept Design is the basis for:

- Preparation of Tender Documentation for the selection of suppliers of technology and civil objects
- Preparation of EIA Documentation
- Preparation of design documentation for the building permit
- Definition of the scope of supply with reference to specific project conditions
- Determination of technical and qualitative requirements on equipment
- Closer specification of building costs

Design activities

Preparation of the Concept Design containing the basic concept of the technical design in all professions.

The Concept Design is a summarized technical, economic and architectural building design as a whole. It specifies the final building structure into operating units and civil objects and determines the function, scope and effects of the construction. The Concept Design is usually prepared for the selected technical design option. The scope and detail of preparation of the Concept Design documentation are always agreed with the customer in relation to the conditions and possibilities of the specific project.

Related engineering activities

- Specification of technical requirements for the building
- Consulting the design with the competent public authorities and suppliers of key equipment

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) DOCUMENTATION

Environmental impact assessment documentation, including expert opinions on the environmental impact of buildings and technology. An employee of the Division ENERGOPROJEKT PRAHA is a holder of an authorization from the Ministry of the Environment of the Czech Republic for the preparation of documentation and an opinion.

Professional activities

- Preparation of the Notice of Intent
- Preparation of the EIA Documentation for energy-related buildings, water management structures, nuclear installations, sludge-deposition sites and dumps
- Preparation of expert opinions to determine the environmental impact of energy-related buildings, water management structures, nuclear installations, sludge-deposition sites and dumps

Related engineering activities

- Support of the notifier while discussing the plan with the public authorities concerned and the public

DOCUMENTATION FOR ZONING AND PLANNING PROCEDURE AND BUILDING PROCEDURE

Preparation of the Detail Design documentation on the defined territory in accordance with the laws and regulations applicable on the specific site (country). In addition to other documents, this documentation is usually submitted to state authorities for the issue of the zoning permit and the building permit. In addition to the preparation of the specified documentation, this work also includes related services to the following extent:

- Discussion of the documentation with the public authorities concerned, incl. their statements
- Negotiations with future suppliers
- Other activities as required by the investor to obtain the necessary permits

Design activities

- Preparation of the documentation for the zoning and planning decision (zoning permit)
- Preparation of design documentation for the building permit in accordance with the regulations applicable in the specific country.

Related engineering activities

- Communication with the public authorities concerned (consultations, support for the builder to obtain opinions and statements).
- Preparation and filing of an application for a zoning and planning decision and the building permit (notification), incl. provision of the necessary documentation.

IPPC DOCUMENTATION

The Division ENERGOPROJEKT PRAHA holds a certificate of professional competence from the Ministry of the Environment of the Czech Republic in accordance with the Act on Integrated Prevention and Limitation of Pollution and the Integrated Register of Pollution for the following categories:

Equipment in Energy

Equipment in Waste Management

Professional activities

- Preparation of the IPPC Application

Related engineering activities

- Discussion of the application with the parties to the procedure

BASIC DESIGN

Documentation for energy units at the Basic Design level for projects in the Czech Republic and abroad. Basic Design is a summarized technical, economic, architectural and graphical design of the whole project and is the basic documentation in terms of coordination of the project as a whole. It is usually prepared on the basis of documents from the suppliers of key equipment. In a simplified form the Basic Design can also be prepared without documentation from suppliers.

The Basic Design is used as the basis for:

- Specifications for the preparation of professional documentation at the Detail Design level
- Coordination of the Detail Designs for technological units together
- Coordination of technological units with a civil engineering design
- Change procedure
- Performance of designer‘s supervision
- Tender Documentation for the selection of suppliers

The Basic Design defines:

- Fundamental technical concept of the work
- Scope of supply of technological units, including the function of individual installations (schemes)
- Civil engineering design
- Technical and qualitative requirements on the installation

Design activities

Preparation of the Basic Design, i.e. specification of the basic concept and assurance of coordination of the technical design for the project in all professions.

The Basic Design is prepared in a structure for individual functional technological units or technological systems and technological subsystems and civil objects. The scope and level of detail of preparation of the Basic Design documentation are adjusted to the conditions of the specific project and the purpose of use of the documentation.

Related engineering activities

- Provision of documentation for the preparation of Basic Design documentation
- Consultations with suppliers of technological units and key installations

DETAIL DESIGN

Preparation of documentation for technological subsystems and civil engineering at the Detail Design level and coordination of the Detail Design for projects in the Czech Republic and abroad. The scope and level of details of preparation of the Detail Design is adjusted to match the type and importance of the building, the building technical design, purpose and use. The Detail Design is prepared separately for individual objects and for technological installations or their parts.

The Detail Design documentation is defined:

- Building design and its components
- Selection of components to match the client's wishes and the designer's recommendations
- Detailed location of the installation, links between individual installations, design for potential collisions, etc.
- Design for fire protection, safety and health protection

Design activities

- Preparation of the Detail Design documentation for individual technological units in all professions
- Preparation of the Detail Design for the civil engineering (civil objects)

Related engineering activities

- Management (coordination) of preparation of the Detail Design documentation as a whole
- Participation of designers in the project
- Design and coordination of changes during construction (change procedure)

AS-BUILT DOCUMENTATION

Preparation of the As-built Documentation for the ÚJV EGP project offers:

- As part of construction, or after the completion of construction – in all professions, at the Detail Design level, based on documentation from the suppliers of installations and construction to the extent of the nature of the project, purpose of use and environmental effects of the project.
- For existing energy and industrial plants (incl. complex technological and piping systems and production lines), where there is no as-built documentation – in all professions, using 3D laser scanner, which allows work in hard-to-access areas.

TENDER DOCUMENTATION

Preparation of complete Tender Documentation or its technical part based on the selected supplier model. Tender Documentation is prepared on the basis of the technical designs and specifications given in the design.

Preparation of the Tender Documentation as part of a competition/public contract for:

- Implementing the project as a whole
- Delivery of machinery and equipment, including installation
- Implementation of construction work
- Implementation of design work and engineering activities or other services and activities (opinions, consultancy, professional help)

Related engineering activities

- Assessment and approval of the Tender Documentation incl. assurance of compliance with other documentation sets (Concept Design, Building Permit Documentation, etc.) and project documents (statements and opinions of authorities advocating public interests)
- Assessment of technical parts of tenders from individual tenderers
- Technical support of the tendering authority during negotiations with tenderers and during contract preparation
- Explanations of the Tender Documentation to the tenderers

DESIGNER'S SUPERVISION

As part of designer's supervision, the Division ENERGOPROJEKT PRAHA provides activities to verify compliance with the technical design specified in the Basic Design and in follow-up activities of other building stakeholders.

Key activities provided as part of designer's supervision in individual project preparation and implementation stages:

Detail Design documentation preparation stage

- Verification of compliance of the Detail Design with the approved Basic Design
- Monitoring of compliance with building permit conditions in the Basic Design

Supplier Documentation preparation stage

- Assuring compliance of the Supplier Documentation with the design in the Building Permit Documentation
- Verification of compliance of the Supplier Documentation with the Detail Design.

Project implementation stage

- Participation in site handover to suppliers
- Monitoring of compliance with the technical concept specified in the Basic Design
- Change procedure (e.g. assessment of suppliers' change proposals vs. the Detail Design vs. discussions with the investor and potential public authorities)
- Participation in project handover and takeover, including complex testing

Stages after project completion

- Participation in inspections during trial operation and occupancy approval
- Cooperation on the final project evaluation

SUPPORT FOR OPERATION OF EXISTING ENERGY SOURCES

OPTIMIZATION, UPGRADE AND GREENING OF ENERGY SOURCES AND INSTALLATIONS

Preparation of studies and documentation for optimization, upgrade and greening of energy-related plants.

Optimization of operation of energy sources is provided in particular to increase the efficiency of energy generation, reduction of losses and operating costs, and change of operation, where applicable. It usually includes:

- Analysis of operation based on the measured data and design parameters, evaluation of measures to increase operational effectiveness
- Preparation of the computational model and evaluation of impacts of the monitored change on efficiency
- Assessment of impacts of change implementation on the equipment concerned
- Optimization of parameters of main electrical equipment, optimization and proposal of wiring diagrams, etc.

Greening of energy sources burning solid fuels (especially coal) is achieved to reduce the negative environmental impacts of the sources. This especially involves reduction of emissions into the air to values specified in the valid legislation of the specific country.

Upgrade of energy sources is usually a complex design that addresses in particular extension of life cycle and increase of safety of the machine's operation and includes greening and operational optimization.

Upgrade of energy sources usually includes:

- Extension of life cycle
- Increase of operational safety
- Increase of the machine's performance parameters
- Increase of electricity and heat generation efficiency and optimization of operation and operating costs
- Reduction of emissions of pollutants and waste generation
- Increase of machine operation comfort

Design activities

- Feasibility Study
- Design Documentation for the zoning and planning procedure and the building permit
- Documentation up to the Basic Design level
- Tender Documentation for the selection of suppliers
- Performance of designer‘s supervision

Related engineering activities

- Identification and analysis of the actual condition of the installation
- Technical support during the award procedure

SUPPORT FOR OPERATION OF EXISTING ENERGY SOURCES – NUCLEAR ENERGY

Analysis and optimization of operation of units VVER 440 and 1000

- Analyses of normal, abnormal and emergency transients and operating conditions of the unit
- Safety analyses and analyses of operating conditions of the unit
- Preparation of design documentation for operating modes and unit manoeuvrability and ability to provide supporting services for the grid
- Draft test programmes for unit simulators and their evaluation
- Preparation of thermohydraulic documentation for the calculation of strengths and life cycles of the nuclear power plant's systems
- Preparation of the Basic Design, Detail Design for experimental research loop projects (CO_2, He, supercritical CO_2 and supercritical water loops) and hot cells
- Analysis and proposals of adjustments to existing operation – increased efficiency
- Optimization of installation parameters for new operating conditions

Safety analyses

- Analysis of use of existing and new systems and installations for the management of beyond design basis accidents
- Analysis of functions of safety system divisions, including calculation of dynamic and static burden on emergency Diesel generators
- Complex analyses of failure modes and consequences (FMEA, FMECA)

Safety analysis reports and license documentation for nuclear power plants

- All stages of safety documentation including tender, preliminary, pre-operational and final (operating) safety reports structured in accordance with US NRC RG1.70 or IAEA GS-G-4.1

Increase of performance

- Preparation of studies, tender and licensing documentation and design documentation of all stages

Projects to increase safety and life cycle of nuclear units

- Projects to increase safety on the basis of stress test results after the Fukushima Nuclear Power Plant accident – overall reinforcement and strengthening of in-depth protection of the nuclear power plant to cope better with the consequences of extreme external impacts, earthquakes, power outages and heat removal
- Procedures for ageing management and creating conditions for long-term operation (LTO)

Nuclear fuel

- Transport neutron-physical calculations of the composition of fuel assemblies
- Calculations of transients in the core
- Handling of fresh and used nuclear fuel, equipment for handling fuel
- Design for storage of spent nuclear fuel – spent nuclear fuel storage, transport of fuel between individual objects of the nuclear power plant, casks for spent fuel and their location in the spent nuclear fuel storage

Handling of radioactive waste

- Preparation of design documentation for the handling of radioactive waste from its generation to its processing into a form acceptable for a repository
- Design for the decommissioning of a nuclear installation and preparation of an estimate of costs of decommissioning of nuclear installations

Special analysis of the building design

- Static and dynamic analyses of concrete and steel structures
- Proposal and analysis of dynamically loaded structures
- Monitoring and analyses of reinforced concrete and prestressed reactor envelope
- Determination of the load for analyses, for example extreme values of meteorological effects, threat due to fall of an airplane, etc.

PREPARATION FOR CONSTRUCTION AND START-UP OF A NEW NUCLEAR POWER PLANT

Activities as part of preparation for the construction of a new nuclear power plant covering the whole range of documentation and related studies, in particular:

- Preparation of the business plan and project plan for the investor
- Selection of location and its assessment
- Cooperation with the investor to select the most suitable technical design, cooperation to prepare the Tender Documentation Incorporation of documentation for permitting project placement and for obtaining the building permit, cooperation during negotiations
- Preparation of Licensing Documentation based on the Atomic Act, cooperation during negotiations
- Preparation of related studies and technical assistance

Activities to start up a new nuclear power plant

- Preparation of the Nuclear Power Plant Commissioning Documentation
- Cooperation with the investor to prepare the start-up programme
- Cooperation with communication with state supervision authorities during start-up

Other offered activities

- Independent inspection of design and safety documentation at the stage of plan, design preparation
- Monitoring and assessment of documentation for builders and suppliers
- Cooperation with the operator and state supervision authorities

COMPLEX ENGINEERING AND CONSULTANCY SERVICES

Consultancy activities for investors and suppliers

- Consultancy services for investors in the field of conventional and nuclear energy are offered by the Division ENERGOPROJEKT PRAHA to a very flexible extent specified on the basis of the nature of the project and the customer's requirements.
- As a consultant, the Division ENERGOPROJEKT PRAHA offers complex consultancy from the stage of business plan preparation and selection of a suitable location for the energy source, including preparation for the evaluation of project feasibility and technical documentation for negotiations with banks on the possibilities of funding.
- At the project implementation stage, the scope of consultancy services respects the customer's requirements. In their complex form the consultancy services constitute the scope of Owner's Engineer activities.

Owner's engineer services for investors

- It is a complex of services to prepare pre-investment (preparatory) studies and feasibility studies for construction projects, for design, contracts management and project management, teams of designers maintained by the customer, including other specific competences – functions of construction management, supervisor, etc.

Technical support for nuclear supervisory bodies

- As part of the Nuclear Research Institution, the Division ENERGOPROJEKT PRAHA provides consultancy services for state nuclear supervision authorities with respect to the assessment of documentation attached to the application for a license for construction of a nuclear power plant. Technical support includes preparation of an information system to support the assessor of the safety analysis report and related documentation.

Expert activities for the International Atomic Energy Agency (IAEA)

- The Division and its leading experts have been involved in IAEA's activities and their educational programmes in the long term.
- It prepares and arranges internships and trainings for specialists from developing countries, e.g. based on an IAEA fellowship training.
- The experts of ÚJV EGP participate in the Consultancy Meeting on the Technical Document (TECDOC), National Workshops (Training), etc.

DATABASE DESIGN AND PROGRAMMING SERVICES

Database design

- Preparation of design documentation and As-built Documentation in an environment of linked database systems, i.e. detailed model of the system, including a depiction of links and arrangement of database objects in 2D and 3 graphics.
- Preparation of clouds of points from laser scanning, including introduction of data into PDMS and E3D. Preparation of a 3D model and export of the As-built Documentation.

The Division ENERGOPROJEKT PRAHA uses database systems

- AXSYS.Engine for creating multi-professional intelligent schemes
- PDMS and E3D for creating 3D models and the subsequent generation of Microsoft Access documentation for creating applications to support designing and sharing of information
- SQL database (ORACLE or PostgreSQL) to support designing and development of information systems
- The main benefit of the system is the possibility of early detection of potential discrepancies in the designs from individual authors, so they are removed before the project implementation stage.
- The database system guarantees integrity of information in all documents and provides the possibility of continuous monitoring of the design. The structure and form can be adjusted to specific requirements.

The database allows to

- Monitor links necessary e.g. for planning maintenance, repairs, deployment of reserves, etc.
- Create an interface for other applications (calculations, simulations, etc.) and provide the required reports with input data or display outputs in the documentation or in a 3D model

The Division ENERGOPROJEKT PRAHA developed its own SW, database systems and applications

- GAMED – for the preparation of technical documentation in the database environment – allows to exchange data via web interfaces and ensures all-profession coordination
- GADUS – for data presentation – makes accessible the data models via the Internet and provides information and intelligent documentation in 2D and 3D views
- COMA – for the evaluation of collisions – web application used to identify and evaluate collisions among suppliers. The application supports 3D project coordination
- RDB – database of comments – web application used to create comments on the provided documents
- LBAT – web application to support the evaluation of license documentation of the nuclear power plant

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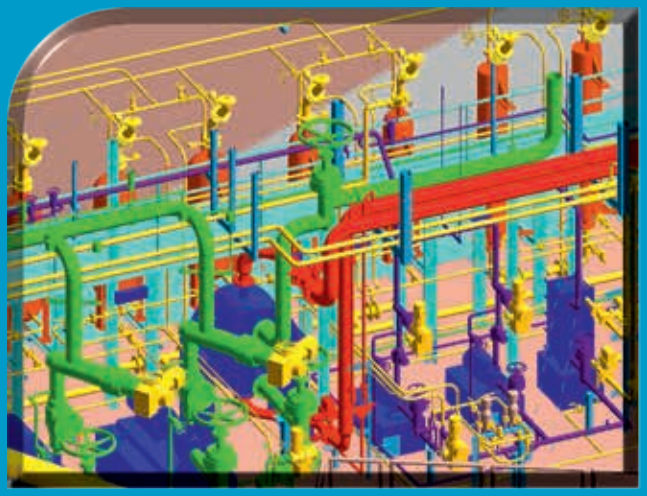

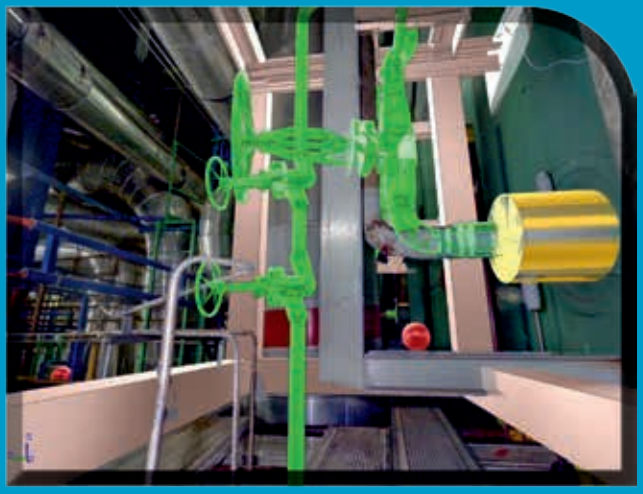

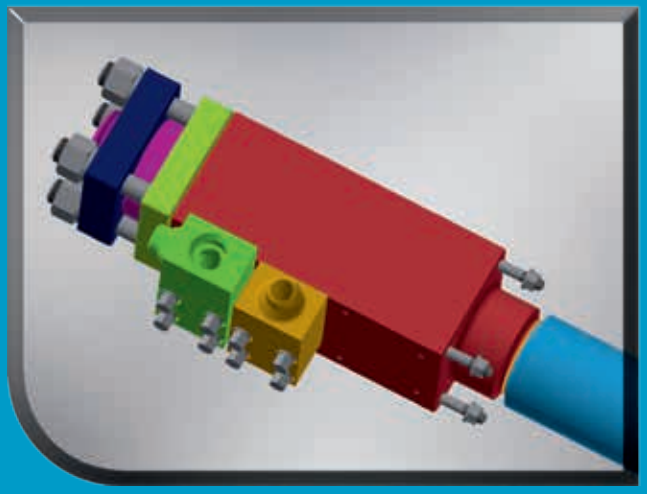

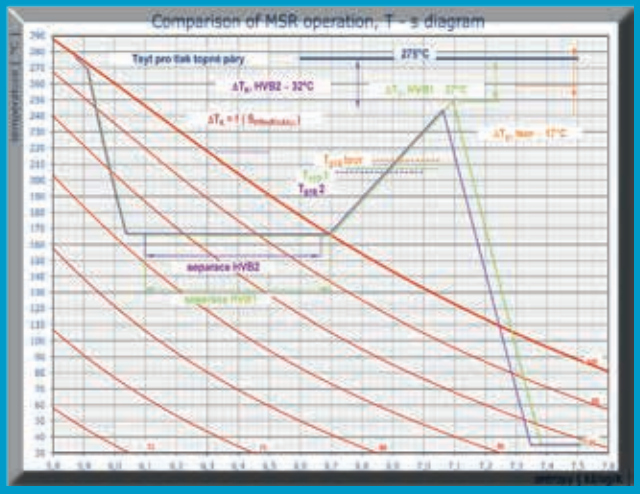

OFFER OF SPECIALIZED SERVICES OF INDIVIDUAL PROFESSIONS

ENGINEERING PROFESSIONS

Thermal calculations for circulation

- Calculations of thermal circulation
- Optimization and analyses of heat schemes
- Use of special SW

Hydraulic calculations for piping networks

- Optimization of network operation
- Monitoring of hydraulic conditions of networks in non-stationary states
- Double-stage flow

Optimization of unit operation

- Preparation of loading diagrams of power plant units
- Verification and optimization of unit loading parameters
- Optimization of installation parameters for new operating conditions
- Optimization of chemical modes for water and steam-condensate circuits

Strength calculations for piping networks

- Thermal loads on the pipes
- Seismic effects on the pipes
- Steam and water surge

Use of special SW:

- GATE CYCLE – preparation of models for thermal calculations and analyses of circuits in conventional thermal power plants and heating plants, secondary circuits in nuclear power plants
- THERMO FLOW – design and calculations of cycles with combustion turbines and their optimization using a programme
- CAEPIPE – strength analyses of pipe networks based on the finite element method using special pipe components. Static analyses for linear and non-linear properties of pipe route components
- PDMS – Modelling of internal and external pipe systems in power plants, heating plants and industrial objects in 3D models

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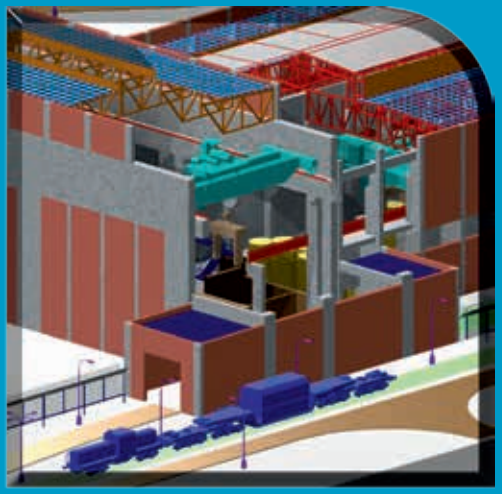

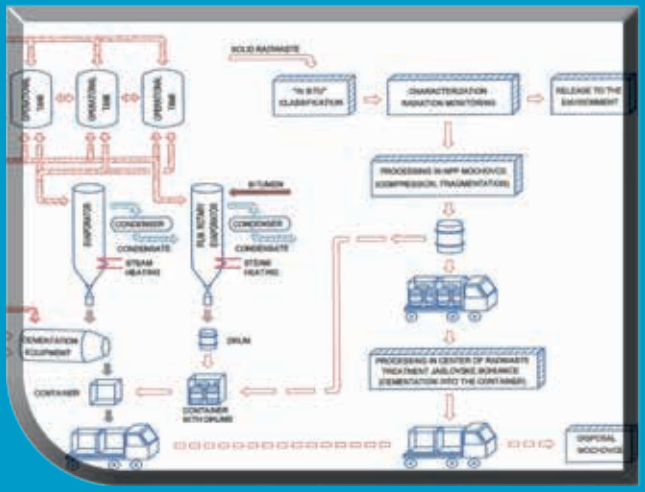

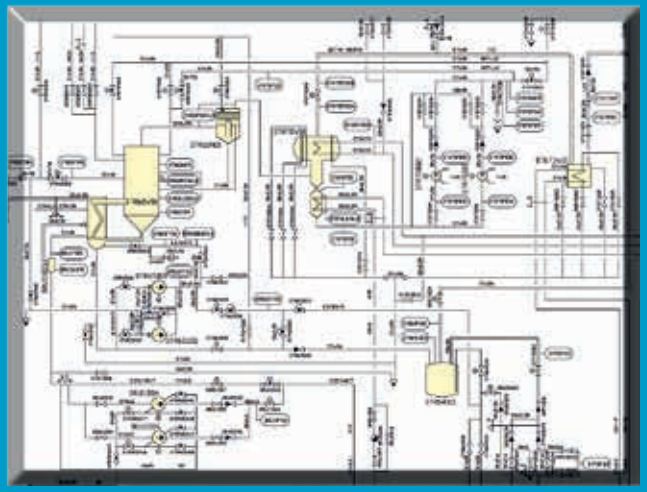

NUCLEAR ENGINEERING PROFESSIONS

Analyses of transients and unit operating modes

- Analyses of normal and abnormal unit transients
- Verification and setting of set points for reactor control and limitation systems
- Verification of selectiveness of reactor protection, reactor control and limitation systems
- Assessment of fulfilment of acceptability criteria for normal and abnormal transients.

Thermal calculations of circuits, optimization and analyses of thermal schemes

- Calculations of thermomechanical parameters of the reactor coolant and mass and energy balance of loops of primary circuits in nuclear units

Hydraulic and thermal hydraulic calculations

- Calculations of stationary states and stationary states with heat transfer
- Calculations of non-stationary states (transients) and non-stationary states with heat transfer

Radiation protection optimization

- Support for application of the ALARA principle in design and license documentation

Calculations of radiological effects of the propagation of radionuclides in the environment

- Radiological effects of normal operation and radiation accidents

Calculations of shielding

- Calculations for the dimensioning of building structures in objects with sources of ionizing radiation
- Calculations of dose rates and doses of ionizing radiation in an environment with sources of ionizing radiation

Use of special SW:

- VISIPLAN – programme tool for calculating shielding.
- PRIMUSIIB – thermal calculations of circuits
- SIPRO – analyses of pressurized water reactor units in normal/abnormal transients
- FLOWMASTER – computational models of piping and pipe networks
- NORMAL – computational code to assess the effects of normal operation of the nuclear power plant
- HAVAR – computational code to assess the effects of accident states of the nuclear power plant

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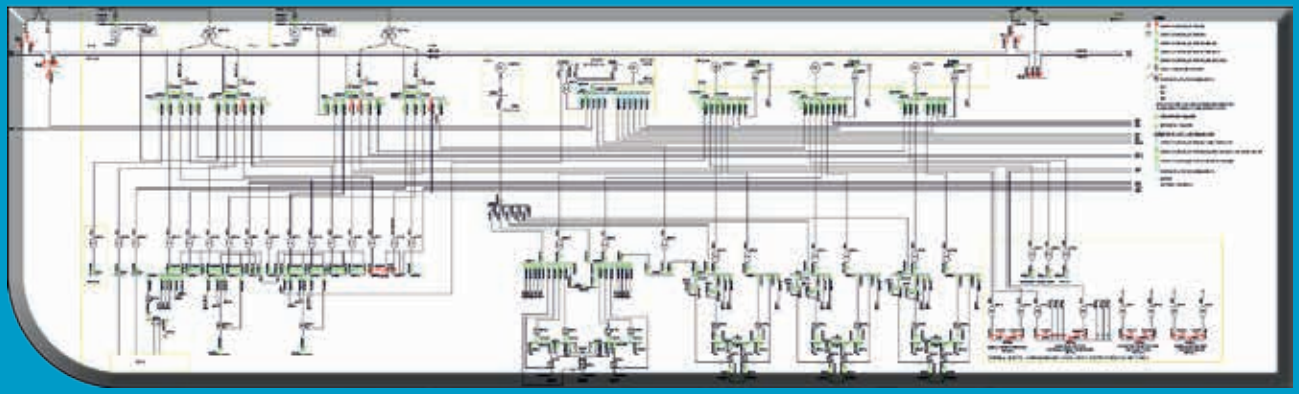

ELECTRICAL PROFESSIONS

Electrical calculations

- Static stability of the generator – operating diagram of the generator
- Dynamic stability of the generator (failures in the external network, transition to nuclear island operation, transition to station service load)
- Unit manoeuvrability (resistance of the installation to voltage and frequency changes in the network)
- OPC – simulation of interruption of one or two phases in the network or in the power plant's station service load
- Performance balance and calculation of load in different operating modes
- Calculations of voltage conditions in stabilized and transient conditions (start-up and self-start of engines)
- Calculations of maximum and minimum short-circuit currents (and specific values for dimensioning equipment, proper function of protection systems)
- Dimensioning of electrical equipment: Diesel generators (stabilized, dynamic), rectifiers, inverters, switchboards,…
- Dimensioning of storage batteries (discharging time)

Specialized projects, studies, analyses

- Concept and proposal of schemes in the field of power output, station service load distribution (incl. partial refurbishment)
- Complete documentation of new and retrofitted switchboards (up to the detail design level)
- Power output automatics (central unit automatics, power output automatics)
- Automatics in station service load distribution (reserve and back-up, undervoltage shutdown,…)
- Type (line) schemes for switchboard output and input control
- Concept of electrical protection systems (power output, reserve supply, 10 and 6 kV distribution, AC and DC station service load distribution)
- Design and setting of electrical protection systems (inner protection logics, selectiveness, sufficient sensitivity,…)
- Concept, design and monitoring of cables in coordination with the protection systems used

Use of special SW:

- MODES – simulation of stabilized and transient processes
- EPLAN – simulation of stabilized and transient processes
- EMTP-RV – simulation of electromagnetic transient processes
- AXSYS.Engine – switchboard documentation, see database designing

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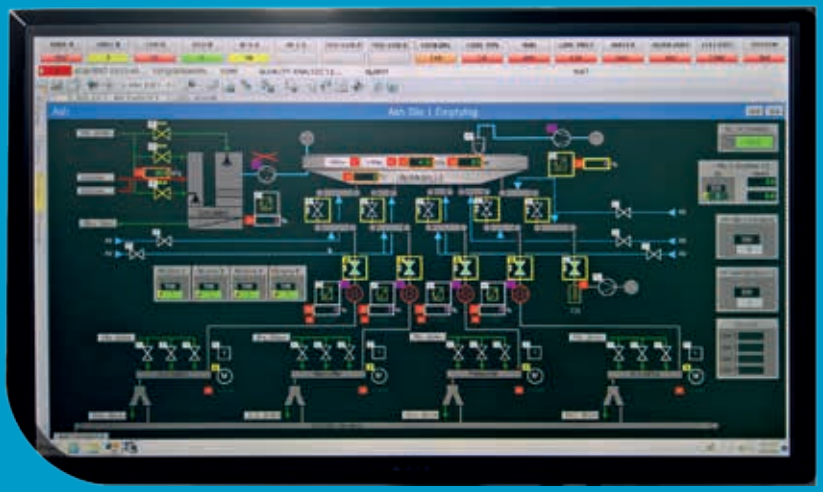

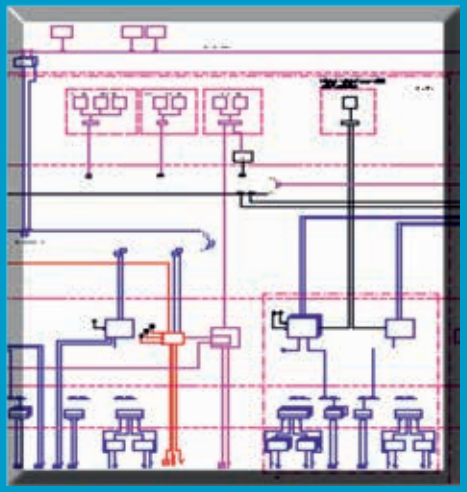

I&C PROFESSIONS

Complete design of the instrumentation & control system

- Concept of the instrumentation & control system – connection, operating equipment, evaluation and processing of data, interfaces
- Verification and monitoring of validity (V&V), placement, human-machine interface (HMI) – design of engineering principles for respecting the human factor
- Standardized preparation of functional descriptions, functional control schemes, modules, units for type designs – simplification for SW designers
- Design database of a summary of direct connections of actuators, measurements, process identification (PID), graphical algorithms
- Cyber security – analysis of the properties of existing systems, draft measures

Complete design of physical safety systems

- Design of systems and equipment – based on category, field and scope
- Fence, sensors, cameras of the CCTV system, cables, lighting, data transmission, proposed locations, HMI connection of control rooms with supervisory, local and police authorities

Complete design of fire alarm systems

- Cables, telecommunication and data networks – secured transmission of information
- Specification of detection sensors, fire exchange – control room, equipment, locations and proposal of auxiliary systems, environment, mobile equipment, equipment for maintenance

Complete design of data and telecommunication systems

- Telephone exchange
- Data network of the information and office system
- Radio (cable) system
- Telecommunication dispatching equipment
- Hour equipment
- Radio network and early warning systems (VYRVAR)
- CCTV systems for supervision over the condition of equipment and the site

Use of special SW

- MATLAB/SIMULINK – dynamic models of technological models and I&C
- ELCAD/AUCOPLAN, design database system – direct connection of measurement – graphical algorithms – actuators

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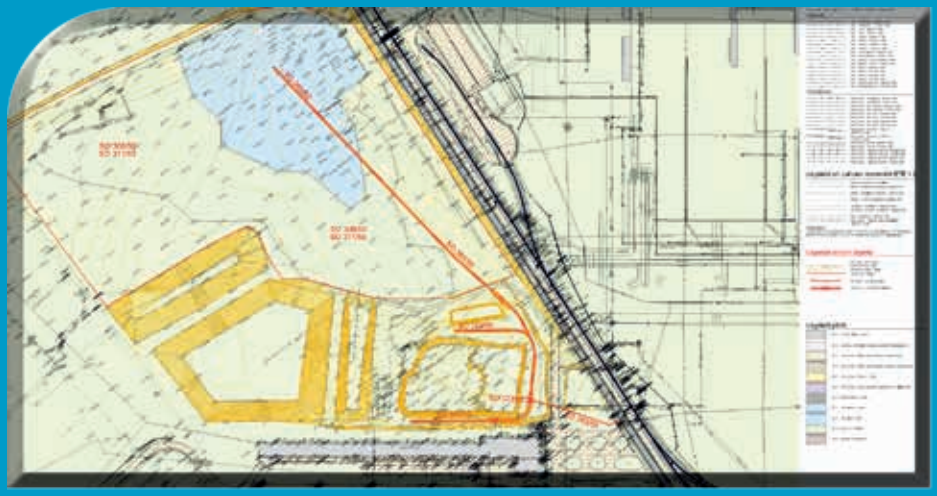

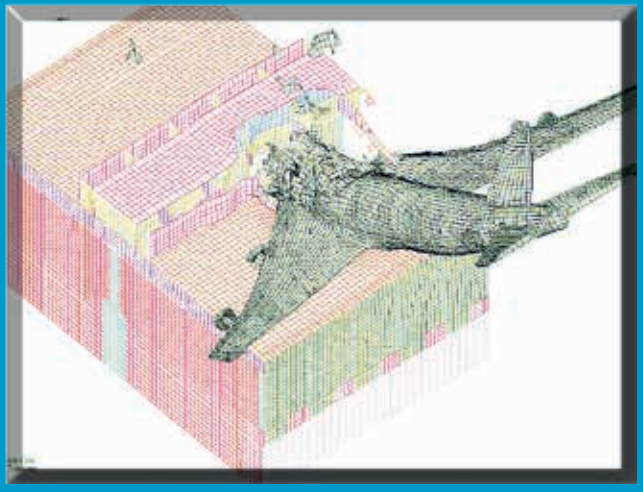

BUILDING PROFESSIONS AND SPECIAL WORK

Concrete structures and special calculations

- Complex projects with reinforced concrete structures for all design documentation levels
- Calculations for building structures exposed to the effects of extraordinary loads and extreme effects (seismic effects, extreme temperature, extreme wind and tornado, load due to the impact of flying objects, fall of an airplane, effects of fire and explosion pressure waves)
- Static and dynamic calculations for building structures
- Analyses of residual life cycle of structures, ageing management programmes

Civil structures, architecture, technical design of buildings, fire safety design, bills of quantities, calculations, OHS plans, construction organization plans, build-up plans and provision of physical protection

- Building architectural part – modelling of structures of civil objects in PDMS-3D, preparation of the building part of physical security designs based on classified information up to the “Secret” category on a certified site

Steel and non-standard structures

- Designs of support structures for civil objects (especially power plants, heating plants, industrial objects)
- Static and dynamic calculations for steel structures
- Designing special steel structures and structures of stainless steel

Transport structures

- In-house roads, lower-class roads
- Sidings

Hydrotechnical structures

- Small water reservoirs, retention and settling tanks, earth dams
- Water management concepts, including balances and schemes

Ameliorative structures

- Drainage and irrigation structures, anti-erosion protection and landscaping, revitalization of water courses

Sanitary structures

- Chemical water treatment plants, waste water purification plants, water mains and sewers, water storage

Use of special SW:

- Autodesk REVIT – Building Information Model (BIM)
- AutoCAD Civil 3D – Digital terrain model
- SCIA ENGINEER, FIN. – steel structures
- ABAQUS, NISA, STARDYNE. – static and dynamic calculations, finite element method

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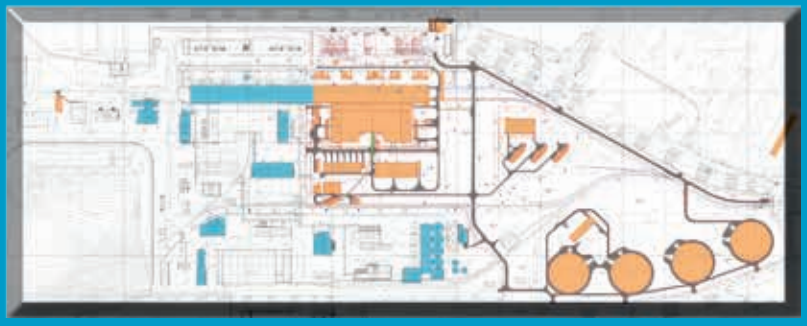

NUCLEAR ENERGY – SELECTION OF KEY REFERENCES

MOCHOVCE NUCLEAR POWER PLANT – UNITS 1, 2 – SLOVAK REPUBLIC

Investor: Slovenské elektrárne, a. s.

Key parameters and equipment

Nuclear reactor type	pressurized water VVER 440/V213
Electrical power	2x 440 MWe (expected increase to 500 MWe)

Prepared documentation and provided services (from building preparation to the present)

- Cooperation on projects specifying an increased technical and safety level of the power plant
- Initial design of the upgraded solution with enhanced safety properties and features and the possibility of increasing power to 500 MW per unit
- Part of detail designs
- Safety analyses, check of verification of Safety Documentation, License Documentation
- Designer's supervision over compliance with the requirements of the Basic Design, implementation of design changes in the Basic Design. Extensive amendment to the Basic Design which incorporated safety measures from stress tests after the Fukushima Nuclear Power Plant accident. It includes stricter requirements from extreme external and internal effects on the resistance of building structures and technological part and the possibility of a present severe accident in all units.
- Feasibility Study and location of the nuclear power plant
- Concept Design – finalization to match the seismic conditions of the Mochovce site
- Basic Design of the technological and building parts (also including safety measures based on the conclusions of missions performing safety audits)
- Part of detail designs
- Safety documentation
- License documentation
- Technical support to increase the power to the 500 MW level per unit
- Technical support for renewal and upgrade of the installation

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

from 2016	Update of KVP JE EMO1,2 and preparation of an input inventory database for decommissioning
from 2016	Liquid radioactive waste repository at the level of seismic exposure, incl. AD
from 2016	Seismic re-evaluation – Super-emergency voltage (DSV)
2014	Seismic re-evaluation – Operation building
2010–2013	Simulator

MOCHOVCE NUCLEAR POWER PLANT – UNITS 3, 4 – SLOVAK REPUBLIC

Investor: Slovenské elektrárne, a. s.

Key parameters and equipment

Nuclear reactor type	pressurized water VVER 440/V213
Electrical power	2x 440 MWe (expected increase to 500 MWe)

Prepared documentation and provided services (from building preparation to the present)

- Cooperation on projects specifying an increased technical and safety level of the power plant
- Initial design of the upgraded solution with enhanced safety properties and features and the possibility of increasing power to 500 MW per unit
- Part of detail designs
- Safety analyses, check of verification of Safety Documentation, License Documentation
- Designer‘s supervision over compliance with the requirements of the Basic Design, implementation of design changes in the Basic Design
- Extensive amendment to the Basic Design which incorporated safety measures from stress tests after the Fukushima Nuclear Power Plant accident. It includes especially stricter requirements from extreme external and internal effects on the resistance of building structures and technological part and the possibility of a present severe accident in all units.

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

from 2009	Performance of Designer‘s Supervision during the construction of EMO3,4
from 2009	Detail Design
from 2010	PS 12 Radiation monitoring in MTB – machine part of DPS 12.01
from 2014	Engineering activities for EFD (Engineering Field Disposition) coordination
from 2015	Evaluation of changes in the loading of elements, search for materials in design documentation
from 2016	Incorporation of the 3D model of the building part
from 2016	Engineering activities in the preparation of technical documentation, delivery, installation, testing and commissioning PS06
from 2016	Support team of specialists for the project of EMO3,4 completion

DUKOVANY NUCLEAR POWER PLANT, CZECH REPUBLIC (COMMISSIONING: 1985–1987)

Investor:	ČEZ, a. s.

Key parameters and equipment

Nuclear reactor type	pressurized water VVER 440/V213
Electrical power	4x 440 MWe

Prepared documentation and provided services (from building preparation to the present)

1970	Feasibility Study and location of the nuclear power plant
1972–1974	Concept Design
1975–1981	Basic Design for the technological and building parts
1976–1987	Coordination of detail designs and preparation of their building part
1975–present	Safety Documentation and clarification of safety design basis and Licensing Documentation
1999–present	Instrumentation & control system replacement project
2000–present	Replacement and upgrade of other installations including programmes for long-term operation (LTO)
2006–2012	Project of increase of nuclear power plant performance to the 500 MW level per unit
2012–2016	Design Concept for the implementation of measures from stress tests (emergency power supply for civil protection shelters and physical security systems) after the Fukushima Nuclear Power Plant accident, detail designs for some measures
2017–present	Conversion of EDU operating schemes from the AutoCAD platform to the AXSYS.Engine platform

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2017	Reconstruction of DBD (Design Basis Documentation)
2016	Refurbishment of delivery pipes I and III of the ESW system of central pumping station II.
2014	Reinforcement of object SO 800/1-02 Reactor building MTB II, units 3 and 4, for extreme effects
2014	Reinforcement of object SO 800/1-01 Reactor building MTB I, units 1 and 2, for extreme effects
2013–2015	Reinforcement of object SO 490/1-01 Turbine building MTB I, units 1 and 2, for extreme effects
2010–2011	Refurbishment of the PPE storage building into a Czech Police intervention building
2009–2010	Increase of seismic resistance of selected non-supporting building structures in intermediate rooms
2009	Revitalization of equipment of physical security systems
2008–2015	I&C renewal
2008–2012	Increase of seismic resistance of support structures of MTB I and MTB II
2007–2009	Restriction of full loss of coolant during LOCA
2006	Replacement of EPS Tesla and sensors in the electrical-cable duct
2006–2008	Assurance of occupancy of MCR and ECR – ventilation systems
2002	Refurbishment of the main change room
1999	Refurbishment of drinking and fire water pipes
1997–1999	Full-scale main control room simulator
1993–1994	Interim spent fuel storage facility Nukem

TEMELÍN NUCLEAR POWER PLANT, CZECH REPUBLIC (COMMISSIONING: 2000-2002)

Investor:	ČEZ, a. s.

Key parameters and equipment

Nuclear reactor type	pressurized water VVER 1,000/V320
Electrical power	2x 1,000 MWe

Prepared documentation and provided services (from building preparation to the present)

2012–2016	Beyond design basis accident study, e.g. type SBO
2012–2016	Design Concept for the implementation of measures from stress tests after the Fukushima Nuclear Power Plant accident, detail designs for some measures
2010–2012	Project of increase of nuclear power plant performance to the 1,040 MW level per unit
2009	Safety philosophy of nuclear power plants in the Czech Republic
2000–present	Replacement and upgrade of other installations including programmes for long-term operation (LTO)
2000–2002	Replacement of the instrumentation & control system to the Westinghouse system
1987–1999	Coordination of detail designs and their preparation for the building parts
1983–1986	Basic Design for the technological and building parts
1983–present	Safety Documentation
1983	Soviet technical design
1978–1981	Study for a set of buildings

SPENT NUCLEAR FUEL STORAGE FACILITIES

Investor:	ČEZ, a. s.

DUKOVANY (COMMISSIONING: 2006)

Key parameters and equipment

Storage method	dry storage
Storage capacity	1,340 tons of uranium
Number of stored casks	133
Cask type	Castor 440/84, steel, 2 covers, for transport and storage
Transport of casks to the storage	special wagon on the siding
Length/width/height of the storage building	approx. 108 m x 35 m x 20 m
Expected life cycle	60 years

Prepared documentation and provided services (from building preparation to the present for the EDU site)

2005–2006	Licensing documentation
2001–2004	Safety Documentation including analyses of on-site and off-site risks, e.g. fall of an airplane
2000–2004	Tender documentation for the selection of supplier of casks and supplier of the storage facility
2000–2002	Basic Design for the technological and building parts
1999–2000	Concept Design
1997–1998	Feasibility Study and placement (placement on the site of the nuclear power plant selected)

TEMELÍN (COMMISSIONING: 2010)

Key parameters and equipment

Storage method	dry storage
Storage capacity	1,370 tons of uranium
Number of stored casks	152
Cask type	Castor 1000/19, steel, 2 covers, for transport and storage
Transport of casks to the storage	special wagon on the siding
Length/width/height of the storage building	approx. 98 m x 66 m x 26 m
Expected life cycle	60 years

Prepared documentation and provided services (from building preparation to the present for the ETE site)

2009–2010	Licensing documentation
2006–2008	Basic Design for the technological and building parts
2005–2008	Safety Documentation including analyses of on-site and off-site risks, e.g. fall of an airplane
2004–2008	Tender documentation for the selection of supplier of casks and supplier of the storage facility
2003–2005	Concept Design
2001–2002	Feasibility Study and placement (placement on the site of the nuclear power plant selected)

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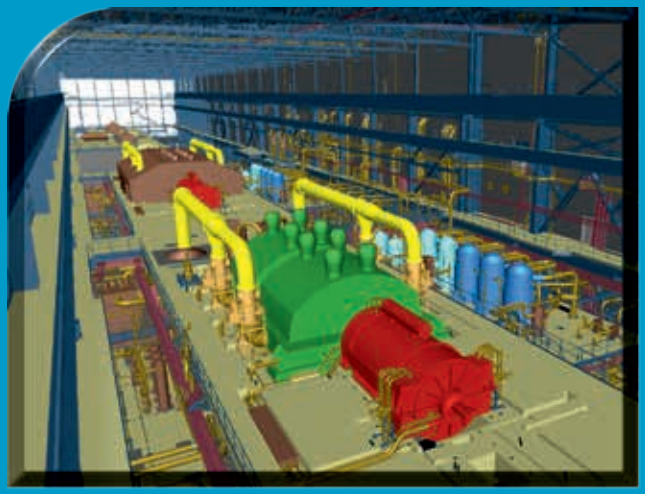

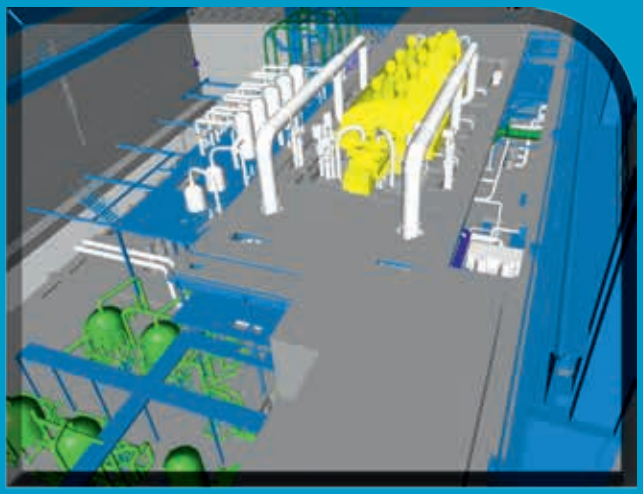

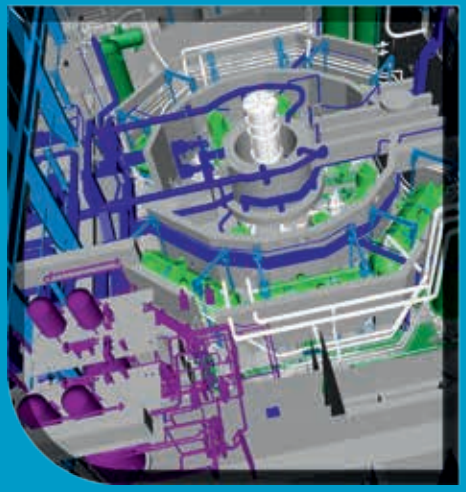

JASLOVSKÉ BOHUNICE NUCLEAR POWER PLANT, V2 – SLOVAK REPUBLIC (COMMISSIONING: 1980–1981)

Investor: Slovenské elektrárne, a. s.

Key parameters and equipment

Nuclear reactor type	pressurized water VVER 440/V213
Electrical power	2x 440 MWe

Prepared documentation and provided services (from building preparation to the present)

- Feasibility Study and location of the nuclear power plant
- Concept Design
- Basic Design for the technological and building parts
- Part of detail designs
- Safety documentation
- License documentation
- Project of increase of nuclear power plant performance to the 500 MW level per unit
- Technical support for renewal and replacement of the installation

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2014–2017	C8-Intergal RAW storage on the Bohunice site
2008–2011	Refurbishment of the peripheral shell of the administration building
2008–2010	Refurbishment of the site physical security system

PLANNING AND PREPARATION OF CONSTRUCTION OF NEW NUCLEAR UNITS IN THE CZECH REPUBLIC AND SLOVAKIA

Temelín Nuclear Power Plant – new units 3, 4

- Feasibility Study for new units 3, 4 (technical materials for the choice of units, proposed locations of units and connection to the grid and other infrastructures)
- Design of interactions with existing units on the same site (ETE 1, 2)
- Technical cooperation on the preparation of the Tender Documentation for the selection of supplier
- Cooperation on the preparation of the Safety Documentation

Dukovany Nuclear Power Plant – new unit 5, possible 6

- Feasibility Study for new units (analyses of technical, safety and operating properties of nuclear units in the power range of 1,200–1,700 MWe, technical materials for the selection of units, proposed locations of units and connection to the grid and other infrastructure, with a special emphasis on cooling water provision)
- Design of interactions with existing units on the same site (EDU 1, 2, 3, 4)
- Cooperation on studies dealing with the connection of new EDU units into the grid with reference to the energy concept and development of networks in the Czech Republic
- Coordination of performed research work on the planned site (detailed hydrological and hydrogeological surveys, detailed engineering and geological survey)
- Preparation and coordination of supporting technical reports used as the basis for EIA documentation

Jaslovské Bohunice Nuclear Power Plant – new unit, Slovakia

- Feasibility Study for new units in variants 1x 1,200 MWe, 2x 1,200 MWe to 2x 1,700 MWe (analyses of technical, safety and operating properties of nuclear units in the power range of 1,200 –1,700 MWe, technical materials for the selection of units, proposed locations of units and connection to the grid and other infrastructure, with a special emphasis on cooling water provision and management of difficult conditions if the project is located in a seismic zone)
- Design of interactions with existing units on the same site (EBO 3, 4)
- Technical support for the preparation of EIA Documentation, including support studies – NNS water management concept, zoning study for the electrical station, etc.

PLANNING AND PREPARATION OF CONSTRUCTION OF NEW NUCLEAR UNITS ABROAD

AKKUYU NUCLEAR POWER PLANT – 4 NEW UNITS, TURKEY

Customer: Turkish State Supervision Authority for Nuclear Safety (TAEK)

Key parameters and equipment

Nuclear reactor type	pressurized water VVER 1200/TYPE V-509
Electrical power per unit	4x 1,255 MW

Provided services

- Technical support for Turkish state supervision over nuclear safety in assessing the preliminary safety analysis report and other documentation submitted by the investor with the application for building permit for unit 1 of the Akkuyu Nuclear Power Plant
- Extensive training programme for the selected type of nuclear power plants and approach to the evaluation of the applicant's documentation on licensing for power plant construction
- Development and implementation of a special SW tool developed by the Division ENERGOPROJEKT PRAHA for the purposes of evaluation of safety documentation of nuclear power plants (LBAT). LBAT includes an extensive database:
  - of requirements specified in applicable regulations (Turkish regulations, IAEA standards and regulations of the project's country of origin) for the nuclear power plant project in Turkey
  - of acceptance criteria to assess compliance with the requirements in the nuclear power plant's documentation
  - of instructions for the application of acceptance criteria to evaluate the preliminary safety analysis report and related documentation
- The database is prepared so that it allows adaptation to other projects

HANHIKIVI NUCLEAR POWER PLANT – NEW UNIT, FINLAND

Customer: Fennovoima (investor)

- Provision of technical support to Fennovoima, investor of the Hanhikivi Nuclear Power Plant (PWR unit with a power of 1,200 MW) to prepare construction
- Assessment of documentation in terms of requirements for nuclear power plants by state supervision over nuclear safety in Finland (STUK) and documentation of the draft preliminary safety analysis report prepared by the power plant contractor.

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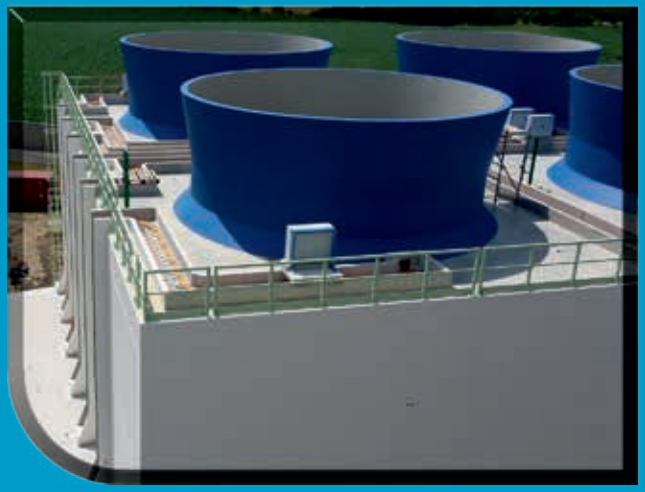

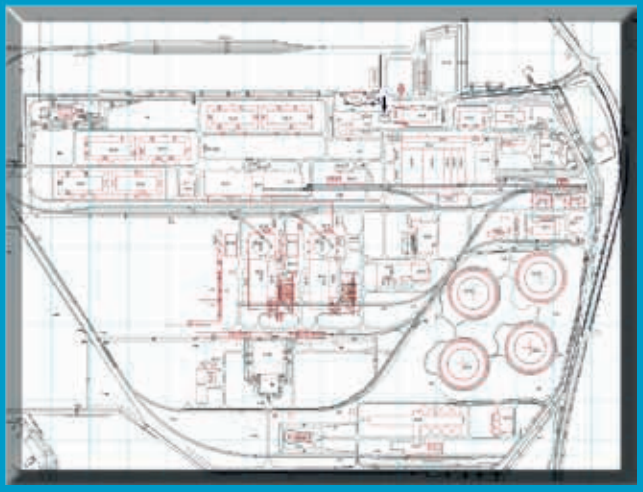

RADIOACTIVE WASTE MANAGEMENT PROJECTS

RESEARCH SUPPORT FOR THE PROJECT DESIGN OF DEEP STORAGE IN THE CZECH REPUBLIC

Investor: SÚRAO

Project of Preparation of Deep Repository for Spent Nuclear Fuel and Highly Radioactive Waste for the Czech Republic

Purpose long-term safe storage of radioactive waste

Scope of design work of the Division ENERGOPROJEKT PRAHA

from 2016	Complex study of the deep repository, incl. all links to the surface and underground sites,
from 2016	Coordination of activities involving thermo-technical calculations for storage casks and the storage time limit,
from 2016	Optimization of the reference deep repository project,
from 2016	Feasibility Study for individual potential locations
from 2016	Coordination, management and cooperation on other activities and studies in e.g. monitoring, radiation protection, etc.

DESIGN AND ENGINEERING ACTIVITIES OF THE DIVISION ENERGOPROJEKT PRAHA IN DEEP REPOSITORIES IN THE CZECH REPUBLIC AND ABROAD

Czech Republic

2015–2018	Evaluation of geological and other information in terms of suitability of placing the deep repository on the EDU site
2012–2014	Preparation of Feasibility Studies for 6 hypothetical sites + Kraví Hora and Boletice sites
2009–2011	Update of the reference deep repository project on hypothetical site 2011,
2003–2006	Series of studies, e.g. comparison of vertical and horizontal storage methods, study of optimization of the surface part of the deep repository and others
1998–1999	Reference deep repository project on hypothetical site

Slovakia

2013–2015	Analyses of future costs of SE, a.s. intended for deep storage of spent nuclear fuel
2013	Update of the reference deep repository project for Slovakia in 2013 and following years
1999 –2000	Reference deep repository project on hypothetical site

DESIGN AND ENGINEERING ACTIVITIES OF THE DIVISION ENERGOPROJEKT PRAHA IN RADIOACTIVE WASTE MANAGEMENT

Czech Republic:

2001–2006	Richard repository projects
1995–2003	Dukovany radioactive waste storage

Slovakia:

2015–2017	Integral radioactive waste storage on the Jaslovské Bohunice site
from 2000	Regional radioactive waste depository for Slovakia
1999–2003	Final treatment of liquid radioactive waste (FsKRaO) in Mochovce
1995–1999	BSC Jaslovské Bohunice – treatment of radioactive waste from nuclear power plants A1 and V1

Other abroad:

2011	Repository for institutional radioactive waste in Nigeria

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CONVENTIONAL ENERGY – SELECTION OF KEY REFERENCES

COMPLEX RENEWAL OF THE PRUNÉŘOV II POWER PLANT – CZECH REPUBLIC

Investor:	ČEZ, a. s.

Key parameters

Power	3x 250 MWe
Heat delivery to the CZT system	280 MWt
Pure thermal efficiency	39% (condensate operating mode)
Fuel	brown coal with a calorific value of 9.75 MJ/kg

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2015–2016	Technical support during start-up, testing and commissioning
2012–2015	Designer‘s supervision and engineering services
2013–2015	As-built Documentation
2011	Coordinated Basic Design
2011	Conversion of detail design into a 3D model
2011–2013	Detail design – selected parts
2009	Input technical data for EIA Documentation
2009	Documentation for the zoning and planning documentation
2008	Documentation for the award procedure (technical part)
2006–2007	Business Plan, Concept Design

COMPLEX RENEWAL OF THE TUŠIMICE II POWER PLANT – CZECH REPUBLIC

Investor:	ČEZ, a. s.

Key parameters

Power	4x 200 MWe
Heat delivery to the CZT system	72 MWt
Pure thermal efficiency	37.6% (condensate operating mode)
Fuel	brown coal with a calorific value of 9.9 MJ/kg

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2007–2009	Design documentation for the building permit, Tender Documentation, engineering activities, Designer‘s Supervision
2006	Feasibility Study
2005	Input technical data for EIA Documentation
2005	Integrated Pollution Prevention and Control (IPPC) Documentation
2004	Business Plan, Concept Design

LEDVICE COAL-FIRED POWER PLANT WITH SUPER-CRITICAL UNIT – CZECH REPUBLIC

The first coal-fired power plant with a super-critical unit in the Czech Republic – LEDVICE 660 MW

Investor:	ČEZ, a. s.

Key parameters

Power	660 MWe
Heat delivery to the CZT system	250 MWt
Pure thermal efficiency	42.7% (condensate operating mode)
Fuel	brown coal with a calorific value of 11.5 MJ/kg

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2015	Expert technical support during commissioning
2015	Technical part of the Tender Documentation for technology packages
2008–2009	Construction organization design, Designer‘s Supervision
2008–2009	Design documentation for the building permit at the detail design level
2008	Documentation for the award procedure (technical part)
2008	Documentation for the zoning and planning documentation
2007	Concept Design
2006	Input technical data for EIA Documentation
2005	Business Plan, Concept Study

MUGHAL ENERGY, COAL-FIRED POWER PLANT 55 MWE – PAKISTAN

Investor:	MUGHAL ENERGY LIMITED

Key parameters

Power	55 MWe
Net thermal efficiency	32.6%
Fuel	black coal (Indonesia, South Africa, Pakistan)

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

Continuously	Technical support for the investor
2016–2017	Tender Documentation for the selection of EPC supplier
2015	Concept Design

DONIAMBO C COAL-FIRED POWER PLANT 2x 100 MW – NEW CALEDONIA

Investor:	Doniambo Energie
Turnkey supplier:	Consortium: Eiffage TP, Vítkovice Power Engineering, Clemessy, CDFi

Key parameters

Power	2x 100 MWe
Net thermal efficiency	37.35%
Fuel	black coal

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2015	Coordinated MCR

YUNUS EMRE COAL-FIRED POWER PLANT 2x 145 MW – TURKEY

Investor:	ADULARYA ENERJI ELEKTRIK ÜRETIMI VE MADENCILIK A. Ş.
Turnkey supplier:	VÍTKOVICE POWER ENGINEERING, a. s.

Key parameters

Power	2x 145 MWe
Net thermal efficiency	34.8%
Fuel	lignite

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2012–2013	Coordination of detail designs
2012–2013	Detailed designs for inner connecting pipes
2011	Basic Design
2010	Concept documentation

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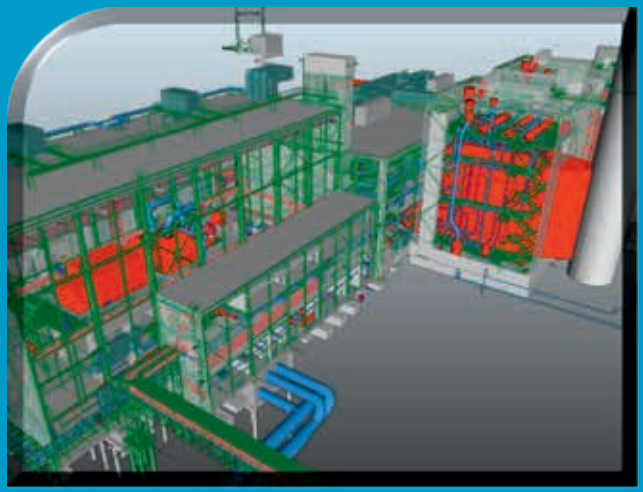

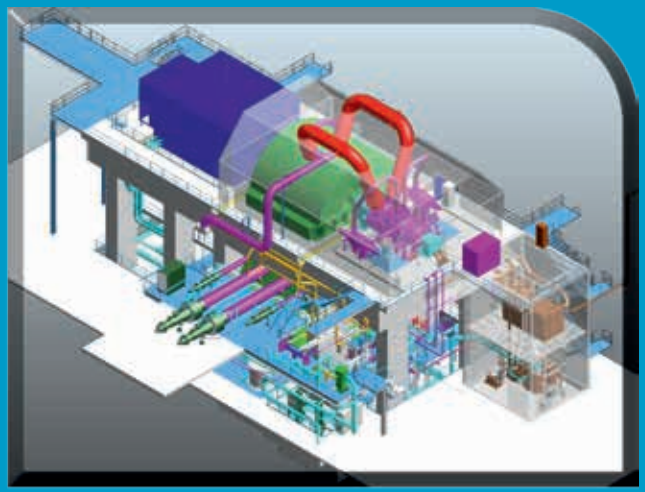

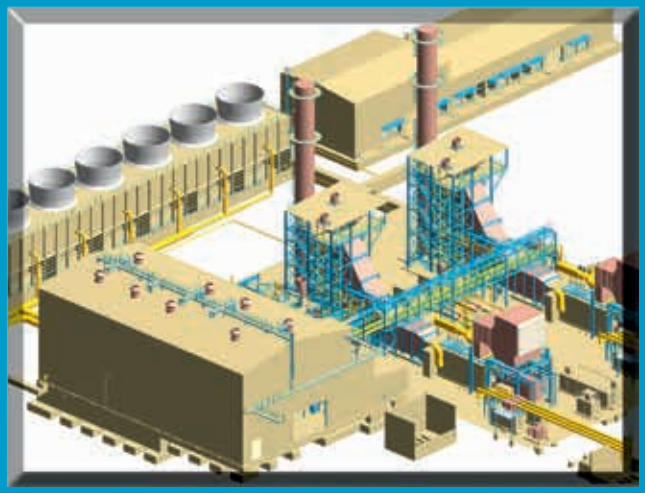

POČERADY COMBINED-CYCLE POWER PLANT – CZECH REPUBLIC

The biggest steam-gas cycle (SGC) in the Czech Republic – POČERADY 840 MW

Investor:	ČEZ, a. s.

Key parameters

Unit arrangement	1 unit = 2 gas turbines Siemens + 2 heat recovery steam generators (HRSG) + 1 steam turbine ŠKODA
Power	840 MWe
Net thermal efficiency	57.6%
Fuel	natural gas

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2010	Related engineering services
2010	Building Permit Documentation
2010	Change of IPPC for the duration of construction of the new source
2010	Documentation for the zoning and planning documentation
2010	Concept Design
2008	Variant study 2x 440 MW, industrial water feeder study
2008–2009	Tender documentation for the award procedure (technical part)
2008	Feasibility Study

STEAM-GAS POWER PLANT WITH INTEGRATED SGC IN VŘESOVÁ – CZECH REPUBLIC

First steam-gas cycle (SGC) in the Czech Republic

Investor:	Sokolovská uhelná, a. s., Vřesová Key parameters
Unit arrangement 2 units are installed	1 unit = 1 gas turbine + 1 heat recovery steam generator + 1 steam turbine,
Power	2x 200 MWe
Net thermal efficiency	43%
Fuel	treated gas from brown-coal generators, energy gas (“syngas”) + natural gas

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

1993–1996	Designer‘s Supervision
1993–1995	Detail Design for civil engineering
1992	Building Permit Documentation
1992	Concept Design
1991	Documentation for the zoning and planning documentation
1991	Input technical data for EIA Documentation

BALLOKI COMBINED-CYCLE POWER PLANT – PAKISTAN

Investor:	Orient Power Company Limited
Turnkey supplier:	PA Export, a. s.

Key parameters

Unit arrangement	1 unit = 2 gas turbines GE 6111 FA + 2 heat recovery steam generators (HRSG) + 1 gas turbine
Power	225 MWe
Net thermal efficiency	51.7% (25 °C, natural gas)
Fuel	natural gas/light fuel oil (LFO)

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

continuously	Performance of Designer‘s Supervision on site
2009	As-built Documentation
2008	Detail Designs for civil engineering
2006 –2009	Engineering services – coordination, consultancy
2007	Basic Design
2006	Concept documentation

MURIDKE COMBINED-CYCLE POWER PLANT – PAKISTAN

Investor:	Sapphire Electric Company Limited
Turnkey supplier:	PA Export, a. s.

Key parameters

Unit arrangement	1 unit = 2 gas turbines GE + 2 heat recovery steam generators + 1 steam turbine
Power	225 MWe
Net thermal efficiency	51.7% (25 °C, natural gas)
Fuel	natural gas/light fuel oil

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2009	Performance of Designer‘s Supervision on site, As-built Documentation
2005–2009	Engineering services – coordination, consultancy
2008	Detail Designs for civil engineering
2006–2007	Basic Design, Concept Documentation

GARDABANI COMBINED-CYCLE POWER PLANT – GEORGIA

Two generating units – extension of the existing equipment with gas turbines by adding the steam part

Investor:	ENERGO – PRO a.s.

Key parameters

Unit arrangement	1 unit = 1 gas turbine + 1 heat recovery steam generator + 1 gas turbine
Power	2x 80 MWe
Net thermal efficiency	50.1%
Fuel	natural gas

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2012	Study of extension of the existing gas power plant

KHORMALA COMBINED-CYCLE POWER PLANT 950 MW – IRAQ

Investor:	KAR GROUP

Key parameters

Unit arrangement	1 unit = 2 gas turbines + 2 heat recovery steam generators (HRSG) + 1 steam turbine + 1 air-cooled condenser
Power	2x 425 MWe
Net thermal efficiency	49.3%
Fuel	light fuel oil, sweetened gas

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2012	Preliminary Feasibility Study

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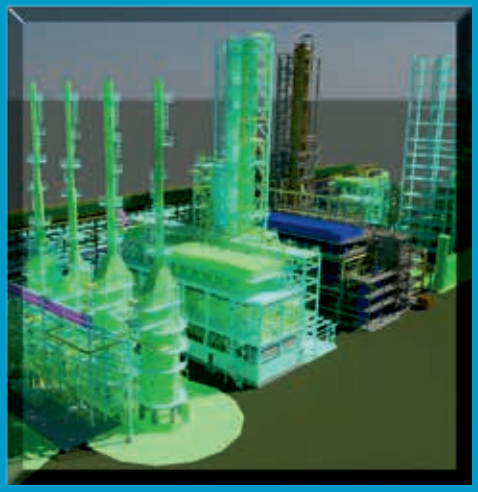

PETROCHEMISTRY – SELECTION OF KEY REFERENCES

ANTIPINSKY REFINERY – ISOMERIZATION SECTION „PENEX" – RUSSIAN FEDERATION

Investor:	Antipinsky Oil Processing Plant

Key parameters

Project	construction stage III, fourth complex
Purpose	combined unit of production of high-octane gasoline – isomerization section
Applied standards	GOST, SNIP, structure of documentation based on the legislation of the Russian Federation

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2014–2017	Detailed documentation of pipe bridges and the backbone pipe bridge
2014–2017	Detailed documentation of isometrization units
2014–2017	Documentation for a coordination 3D all-profession model of construction in PDMS

BSC ADAMTASH – UZBEKISTAN

Investor:	LUKOIL OVERSEAS SERVICE, B.V.

Key parameters

Project	Boost natural gas compressor station
Purpose	Increase of pressure of natural gas from the deposit upstream of the pipeline inlet
Scope of design work	Compressor station, input gas object, pipe bridges, separators and coolers
Applied standards	GOST, SNIP, ASME, structure of documentation based on the legislation of the Russian Federation

Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2015–2018	Detailed documentation for pipe systems
2015–2018	Coordination 3D all-profession model of construction in PDMS

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Design and engineering activities of the Division ENERGOPROJEKT PRAHA

2017–2018	Design of the boiler room of the Unipetrol ethylene production unit – preparation of the As-built Documentation for pipe bridges
2016–2018	Comprehensive analysis of existing and future energy assets in Litvínov
2016–2017	Performance of coordination activities for the OBSL (off-site battery limits) project in Litvínov
2014–2015	Update of P&ID (for energy production and water management)

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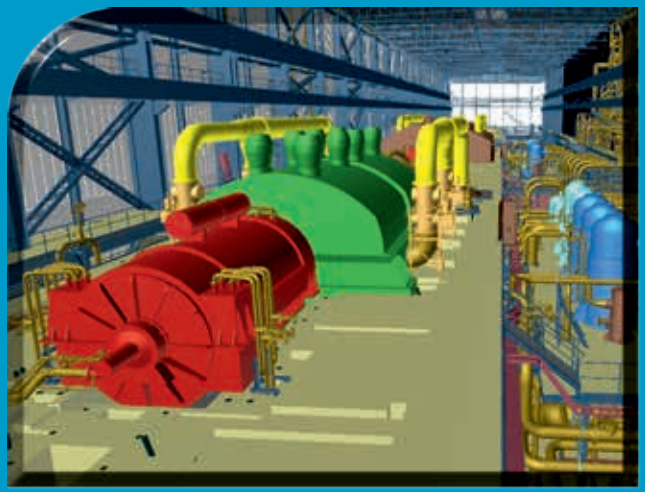

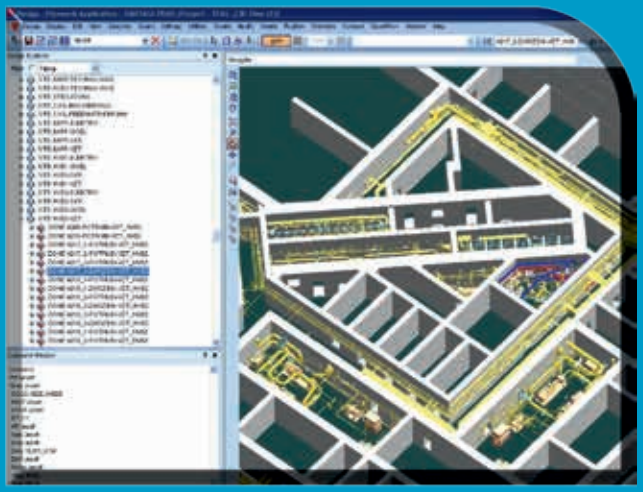

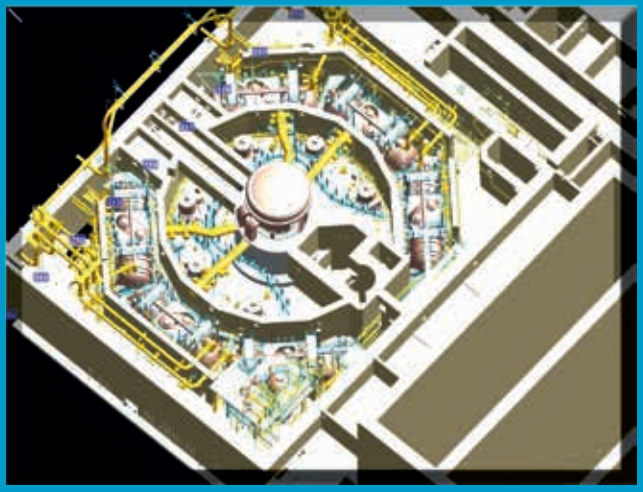

KEY REFERENCES IN DATABASE DESIGN

TEMELÍN NUCLEAR POWER PLANT – CZECH REPUBLIC

- Model of the reactor building and the active part of the auxiliary building based on the detail design documentation
- Detail design of the system of treatment of turbine condensate
- Digitization of the non-active auxiliary building documentation based on the detail design documentation
- Digitization and harmonization of as-built schemes of engineering, electrical and I&C to the extent of entire power plant technology
- Update of the model of civil structures of the reactor building and the auxiliary building based on actual condition after implementation
- Database of qualifications of ETE equipment
- GADUS – web application for viewing and searching data of the as-built documentation (data warehouse) for GPZ – application for graphical support of procurement
- 3D master plan of ETE
- Data migration from the PlantSchema system to the AXSYS.Engine system
- Preparation of ZI schemes in the AXSYS.Engine system
- Introduction of measures from stress tests
- Sub-contract for I&C Energo a.s., graphical support for the GOMS system – system of time planning and procurement for nuclear power plants (ETE + EDU)
- Adjustment of the GADUS system for the purposes of GOMS (ETE + EDU)

DUKOVANY NUCLEAR POWER PLANT – CZECH REPUBLIC

- Replacement of generator switches – baseline condition and detail design
- Digitization of detail design documentation for pump station II
- Digitization of documentation for PS14 – ECCS
- Replacement of station service load distributors – baseline condition and detail design
- Support for the “Refurbishment of I&C of Units 1 to 4” project
- Database of qualifications of EDU equipment
- Decommissioning of the power plant – application for technical and economic evaluation of the EDU decommissioning process
- Conversion of operational schemes from MNT-Graf to the AXSYS.Engine system and then to the GADUS system
- Modifications of the AXSYS.Engine extension for work with converted operational schemes (ETE + EDU)

MĚLNÍK POWER PLANT – CZECH REPUBLIC

- BD for heat discharge for Prague in the PDMS system
- DD for connection of EMĚ I and EMĚ II

PRUNÉŘOV POWER PLANT – CZECH REPUBLIC
- Coordinated MCR in the systems of AXSYS.Engine and PDMS
- DD for connecting pipes in the systems of AXSYS.Engine and PDMS
- GAMED – design support system

SLOVAK NUCLEAR POWER PLANTS – SLOVAKIA
- Replacement of generator switches in V2 NPP – baseline condition and detail design
- Chart of the as-built condition of floor +14.70 m and +22.50 m of unit 1 of the Mochovce NPP
- 3D master plan of Mochovce NPP
- BD of MGB, units 3 and 4 in EMO in the AXSYS.Engine and PDMS systems
- DD of conventional island for units 3 and 4 of EMO in the PDMS system
- Coordination of the PDMS model of the entire Mochovce power plant

IVITAS A. S. – CZECH REPUBLIC
- Production of a catalogue of pipe components in PDMS

YUNUS EMRE CFPP – TURKEY
- Coordinated BD in the PDMS system
- DD for connecting pipes in the PDMS system

BMW DINGOLFING – GERMANY
- Detail design of the painting line in the PDMS system

BALLOKI COMBINED-CYCLE POWER PLANT – PAKISTAN
- Detail design in the PDMS system

DONIAMBO C. – NEW CALEDONIA
- Coordinated BD for the coal-fired power plant 2x 100 MW Doniambo C, New Caledonia in the PDMS system

SAMRA COMBINED-CYCLE POWER PLANT – JORDAN
- Sub-contract for DOOSAN Škoda Power s.r.o. – BD, DD and production documentation of the steam-water system

UNIPETROL – CZECH REPUBLIC
- Formation of a 3D model and export of as-built documentation for pipe bridges from clouds of points in laser scanning

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