ENERGOPROJEKT
PRAHA

CONTENTS

ÚJV Řež, a. s.

ÚJV Řež, a. s. is company which has great professional potential in employees and unique technological equipment, producing and scientific capacities, research and manufacturing background. Our workplaces and laboratories have both national and international level of certification. The company is respected member of thirty international organizations and associations, participating in many technical platforms with international structure.

ÚJV Řež, a. s. is based on more than six decades of experience in nuclear energy (the company established in 1955). The research nuclear reactor (LVR-15) has been operating in Řež continuously since 1957, the second one (LR-0) since 1972. Services provided by ÚJV Řež, a. s. significantly contribute to safe and efficient operation of power generation sources and cover broad activities from preparation, project documentation elaboration and execution, engineering, providing services during construction, commissioning and decommissioning including handling with radioactive waste (transport, classification, characterization, repository, modification) and handling with spent nuclear fuel. Significant part of ÚJV Řež activities, a. s. is a production of radiopharmaceuticals for special diagnostics in health care.
The company provides professional services and supplies for all kind of power generation sources, nuclear power plants, conventional power plants, incineration plants and waste handling plants.

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

- **Nuclear Safety and Reliability,**
- **Intergrity and Technical Engineering,**
- **Fuel Cycle Chemistry and Waste Management,**
- **ENERGOPROJEKT PRAHA,**
- **Radiopharmaceuticals.**

Seven hundred company employees (almost one thousand in ÚJV Group) represent potential from science authorities, technical experts and specialists, designers and experienced employees of research and development. ÚJV Řež, a. s. has 62% university degree and 27% high school degree educated employees.

THE ÚJV GROUP

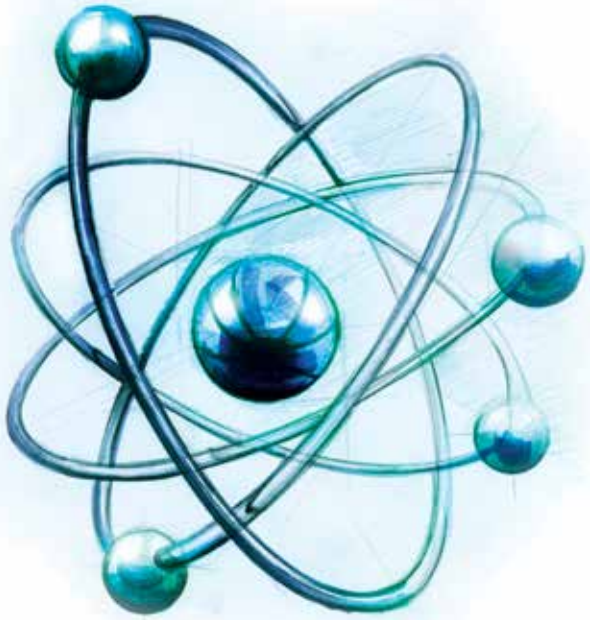
The ÚJV Group is unique and powerful connection of companies, which performs research, development, design and engineering services, technical engineering, production of a special products and equipment or expertise activities in energy sector, industry and healthcare. The companies within the ÚJV Group are 100% owned by ÚJV Řež, a. s. and represent leading companies in their discipline.

Research Centre Řež (www.cvrez.cz) focuses on basic and applied research performed on research reactors (LVR-15 a LR-0).

EGP INVEST, spol. s. r. o. with residence in Uherský Brod (ww.epgi.cz) provides design, engineering, investor and supplier services, particularly in civil engineering for nuclear and conventional energy sector, industry and infrastructure.

Institute of applied mechanics Brno Ltd. focuses on application of scientific knowledge, providing services in mechanical engineering and construction design.

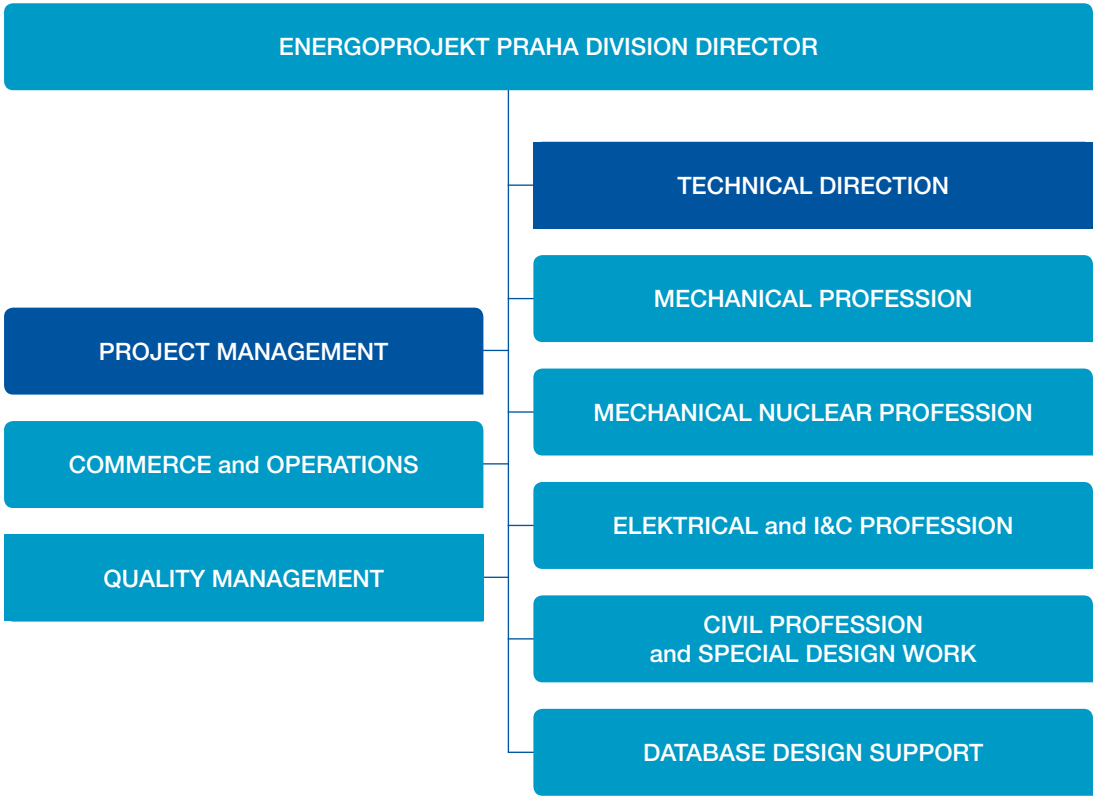
Výzkumný a zkušební ústav Plzeň s.r.o. (www.vzuplzen.cz) is active especially in segments of energetics and transport mechanics, metallurgy and material engineering



ENERGOPROJEKT PRAHA – HISTORY

- 1949 – ENERGOPROJEKT PRAHA was established in order to provide conceptual solutions and design documentation of power plants (General Designer)
- ENERGOPROJEKT PRAHA had a dominant position in the Czech and Slovak energy sector as the General Designer of:
  - Power plants (all types of fuels – coal, gas, nuclear, biomass)
  - District heating
  - Substations, transformers (up to 110 kV)
- 1992 – Privatization of the company
- ENERGOPROJEKT PRAHA, a. s. is the successor company and the owner of the know-how
- From the former state company were established the following companies:
  ENERGO-EKO-PROJEKT Trutnov Ltd., EGP Invest Ltd., Energoprojekta Přerov Ltd.,
  Energetické projekty a. s. (Bratislava), Energopower Košice a. s., ENERGOPROJEKTA a. s. (Banská Bystrica)
- 2002 – ENERGOPROJEKT PRAHA, a. s. became part of the ÚJV Řež, a. s.
  as the Division ENERGOPROJEKT PRAHA

PROFESSIONAL AND ORGANISATION DIVISION CHART



ENERGOPROJEKT PRAHA DIVISION – ACTIVITIES AND SERVICES

ENERGOPROJEKT PRAHA Division offers its services in the sphere of investment construction both in nuclear and conventional energy industry; these services are focused on preparation and realization of new energy sources and on technical support of the existing power and heating plants in the Czech Republic and abroad.
In its position of the general designer/designer, ENERGOPROJEKT PRAHA Division provides comprehensive pre-design and design activities in all stages of given project for energy sources construction, including provision of technical coordination and expert assistance in the form of **"turn-key" design and engineering services,** or in the form of partial design stages execution in standard structuring acc. to the specific requirements and conditions of the project.
Another significant area of the division activities is formed by an **engineering consultancy services** (technical consultancy and expert activities) and **programming services**.

Design and Related Engineering Services

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

- **Preliminary design stage – Conceptual Study, Feasibility Study**
- **Conceptual Design**
- **Tender documentation**
- **Documentation for site and construction permit procedures**
  - Documentation for Site and Building Permit
  - EIA documentation
  - IPPC documentation
- **Basic Design**
- **Detail Design**
- **Author Supervision**
- **As-Built Documentation**
- **Technical support of already existing Nuclear and Conventional Power Plants as well as Heating ones**

Comprehensive Engineering Consultancy Services:

- **Consultant Activities for Investors**
- **Owner´s Engineer Services for Investors**
- **Technical Support for Nuclear Safety Offices**

DESIGN ACTIVITIES – NUCLEAR, CONVENTIONAL ENERGY INDUSTRY

STUDIES

Feasibility and Conceptual Studies

Development of studies for preparation of energy production plants both in the Czech Republic and abroad as whole, but also for planned reconstructions, refurbishments and extensions of existing installations. The scope and details of such studies are adapted to specific conditions of the project, available design input data and the task of the documentation in given phase of the business plan.

Such studies serve usually as the material containing input data for:

- Decision taking of the investor or the supplier on the project realization
- Design variant selection
- Execution of the Site Permit documentation
- Execution of EIA documentation

Basic types of offered studies

- Conceptual Study: the initial draft of a technical concept acc. to the client's requirement
- Preliminary Feasibility Study: it draws up input data from actual input information on the project for the first assessment of the business/investment plan in an agreed scope
- Feasibility Study (FS): it is elaborated in more detail scope acc. to the project specific conditions; serves for selection of design variants and an assessment of the plan

  Feasibility of the project is evaluated from the following main:
  - Technical feasibility
  - Rate of investment return
  - Time schedule of preparation and realization of the project
  - Project implementation plan (preparatory stage, realization and operation)
    FS includes requirements on performance of needed surveys (Engineering-geological, hydrogeological etc.) of the locality

Related engineering activities

- Provision of input data for execution of given study
- Consultation of the proposed solution with affected administration authorities and main equipment suppliers

CONCEPTUAL DESIGN

Execution of Conceptual Design documentation for energy installations to be realized in the Czech Republic or abroad. Conceptual Design serves as the basis for:

- Elaboration of “Specification” for tender procedures of main equipment suppliers
- Execution of EIA documentation
- Elaboration of design documentation needed for the building permit granting
- Definition of the scope of delivery in relation to specific condition of the project
- Determination of technical and qualitative requirements on equipment

Design activities

Conceptual Design elaboration, i. e. determination of the basic technical conception in all professions.

Conceptual Design is usually elaborated for a selected variant of technical solution in structuring into functional technological systems and civil structures. The scope and required detail elaboration is always agreed in a reasonable level corresponding to given project conditions and possibilities.

Related engineering activities

- Provision of design input data for elaboration of the Conceptual Design
- Consultation with affected administration authorities and main equipment suppliers

TENDER DOCUMENTATION

Elaboration of complex “Tender documentation” or its technical part acc. to selected supply system, which serves in particular for purpose of the “Procurement notice“ acc. to the applicable legislation or selection of suppliers for projects not subjecting to the procurement.

Related engineering activities

- Evaluation of technical parts of bids submitted by single bidders
- Technical assistance of the investor at negotiations with bidders and preparation of contracts
- Explanations of questions raised to the tender documents

DOCUMENTATION FOR SITE AND BUILDING PERMIT PROCEDURES

Execution of documentation required for the site permit granting and elaboration of design documentation needed for building permit (in CR acc. to the Building Act No. 183/2006 Coll.) as amended and related engineering services.

Design activities

- Execution of documentation required for the site permit granting
- Elaboration of design documentation for the building permit granting

Related engineering activities

- Negotiations with affected administrative authorities
- Elaboration and submission of application for site and/or building permit (notification)

IPPC DOCUMENTATION

ENERGOPROJEKT PRAHA Division is on the **List of authorized persons** administrated by the Ministry of the Environment Czech Republic according to § 6, clause 2 of the Act No. 76/2002 Coll. on integrated pollution prevention and control and on the integrated pollution register as amended for categories:

Installation **Energy industries**

1.1 Combustion installations with rated thermal input exceeding 50 MW
1.4 Coal gasification and liquefaction plants

Installation Waste management

5.2 Installation for incineration of municipal waste with a capacity exceeding 3 t/ hour
5.4 Landfills with a total capacity exceeding 25 000 tons, excluding landfills of inert waste

Professional activities

- Preparation of the “Application for granting an integrated permit”

Related engineering activities

- Discussion of the application with regional authority and participants of the procedure

DOCUMENTATION OF ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

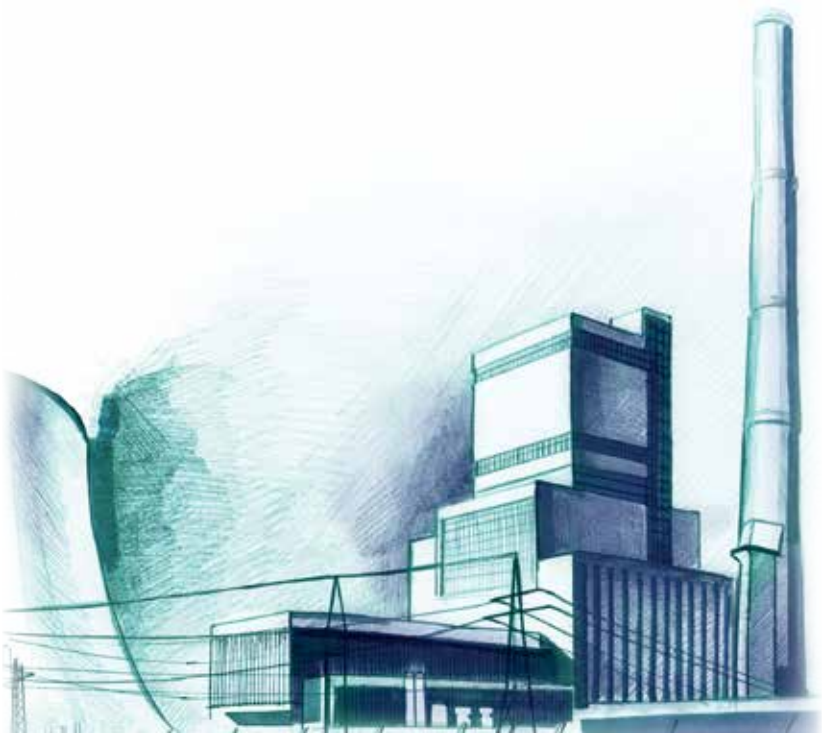
Documentation acc. to the Act No. 100/2001 Coll. on environmental impact assessment as amended; expert reports on environmental impacts of civil structures and technologies. An employee of ENERGOPROJEKT PRAHA Division is the holder of the Ministry of Environment Czech Republic authorization for elaboration of the documentation and the expert report acc. to the Act No. 100/2001 Coll. as amended.

Professional activities

- Elaboration of a Notification of the sub-limited plan acc. to the Annex No. 3a to the Act
- Elaboration of a Notification of the plan acc. to the Annex No. 3 to the Act
- Execution of the EIA documentation acc. to the Annex No. 4 to the Act for energy constructions, water management constructions, nuclear installations, sludge settling ponds and landfills
- Elaboration of the Expert reports for definition of environmental impacts of energy constructions, water management constructions, nuclear installations, sludge settling ponds and landfills

Related engineering activities

- Assistance at discussions of the plan with the affected administrative authorities and at the public hearings



BASIC DESIGN

Design documentation of complex energy units at Basic Design (BD) level for projects to be realized in the Czech Republic and abroad. The Basic Design level is fundamental for coordination of construction as a whole. It is usually elaborated from the design input data provided by the main equipment suppliers. In more simplified form, Basic Design can be elaborated without suppliers' design input data.

Basic Design serves as the base for:

- Specification for elaboration of profession documentation – Detail Design
- Coordination of profession Detail Design, sub-suppliers of technical units (mutual and with construction)
- Management of possible changes of Basic Design (e.g. those caused by selection of suppliers)
- Author supervision on the determined conception
- Specification for selection of auxiliary ("balance of plant") equipment suppliers

Basic Design defines:

- Basic technical conception of the project
- The scope of supply in relationship to specific conditions of the project
- Technical and qualitative requirements on equipment

Design activities

Elaboration of Basic Design, i.e. definition of the basic conception and ensuring of coordination of the construction technical solution in all professions.

BD is compiled in structuring into functional technological units or possibly into process systems (PS) and detailed process systems (DPS), as well as civil structures/buildings. The scope and detail of Basic Design elaboration is adapted to the conditions of given project and to the purpose of the documentation use.

Related engineering activities

- Provision of design input data for the Basic Design elaboration purpose
- Consulting of the draft design with affected administrative authorities and key suppliers

DETAIL DESIGN

Execution of particular technology installations and civil part documentation at the „Detail Design“ level (Realization documentation of the construction) for projects to be realized in the Czech Republic and abroad. The scope and detail of Detail Design (DD) documentation elaboration can be adapted to the conditions of given project and to the purpose of the documentation use.

Detail Design documentation defines:

- Civil structure design and its components
- Selection of components in conformity with the owner’s wish and the designer’s advice
- Dimensioning of components and equipment
- Detailed place of installation, interfaces, solution of possible collisions, etc.

Design activities

- Detail Design elaboration and coordination of particular technology systems in all professions (PS and DPS)
- Detail Design of the civil part (civil structures/buildings)

Related engineering activities

- Management (coordination) of the Detail Design elaboration for the installation as a whole
- Attendance of the designers on the site
- Solution of changes caused during the construction

AUTHOR SUPERVISION

Within the Author supervision, ENERGOPROJEKT PRAHA Division provides activities for verification of keeping the technical solution determined in the Basic Design for related activities of other participants in the construction.

Main activities performed within the Author supervision in single phases of construction preparation and realization of the Detail Design phase – verification of Detail Design documentation with approved solution in the Basic Design

Phase of execution of suppliers' documentation – verification of documentation with the defined basic solution

Realization phase

- Participation in the process of the site handover to suppliers
- Checking of the Basic Design technical keeping and the change over procedures management
- Participation in the process of handover and acceptance of the construction

After termination of the construction

- Participation at the trial operation, the final building approval procedure and the final evaluation of the construction

AS-BUILT DOCUMENTATION

Elaboration of the As-Built documentation in all professions of projects realized in the Czech Republic and abroad.

The As-Built documentation is drawn up on the basis of data provided by the suppliers of equipment and civil structures in the scope acc. to a character of the construction.

Related engineering activities:

- Provision of required input data
- Communication with suppliers

SUPPORT OF EXISTING ENERGY SOURCES AND INSTALLATIONS OPERATION – CONVENTIONAL ENERGY INDUSTRY

Optimization of energy sources and installations operation

Execution of studies and documentation of energy operations optimization. Such documents can be executed in the next stage for the whole plant or for partial equipment operations.

Optimization of energy sources is carried out mainly for increasing of energy production efficiency, reduction of losses and operation costs (also from changes of operation viewpoint).

It usually includes:

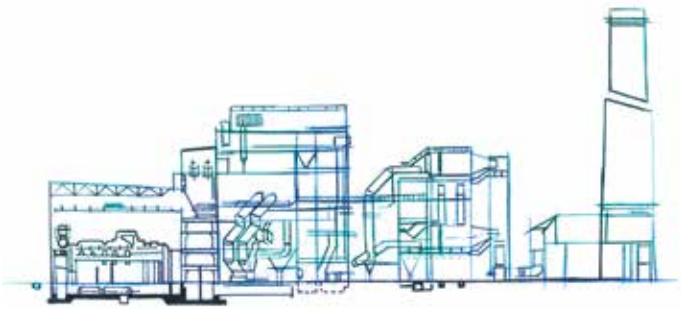
- Analysis of the existing operation on the basis of measured data and design parameters
- Search of possibilities for an increase of operation effectiveness
- Development of a computation model and evaluation of given change impact on efficiency
- Assessment of impacts of selected change realization on affected equipment
- Optimization of main electrical equipment parameters, optimization and draft of electrical diagrams, etc.

Design activities

- A draft and scope of the optimization
- Feasibility Study
- Design documentation (Site permit, Building permit, IPPC)
- Documentation up to the Basic Design level
- Technical specification within Tender documents for selection of the supplier
- Coordination documentation in Detail Design phase and elaboration of selected Detail Design documents
- Performance of the Author supervision

Related engineering activities

- Findings and analyses of equipment real condition
- Evaluation of gains potential from the energy source optimization
- Evaluation of technical parts of the suppliers' bids
- Technical assistance at negotiations with suppliers
- Management of execution of Detail Design documentation



ENVIRONMENT FRIENDLY MEASURES IN ENERGY SOURCES

Studies and documentation for preparation and realization of environment friendly measures to be taken in energetics – to be executed either as a whole or for partial operations.

Environment friendly measures for the sources burning solid fuels (mainly coal) are taken in order to reduce their negative environmental impact. It relates above all to reduction of emissions released into the air in order to meet emission values stated in the EU Directive 2010/75/EU and meeting conformity with the Act No. 201/2012 Coll. (Air protection act) and the Regulation No. 415/2012 Coll. on allowed level of air pollutants and its detection. Further objective of those measures is an increase power generation units efficiency and thus also reduction of CO_2 emissions.

Possibilities of environment friendly measures:

- Replacement of fuel – solid fuel to be replaced by liquid or gas ones
- Modification of fuel combustion, fuel treatment
- Reduction of solid pollutants
- Reduction of SO_2 and NO_2 emissions
- Combined techniques resulting into reduction of SO_2 and NO_2 emissions

Design activities

- Feasibility Studies
- Design documentation up to the Basic Design level
- Technical specification of tender documents for selection of the supplier
- Coordination documentation in the Detail Design phase
- Performance of the Author supervision

Related engineering activities

- Findings and analyses of equipment real condition
- Evaluation of technical parts of the suppliers' bids
- Technical assistance at negotiations with suppliers
- Management of Detail Design

REFURBISHMENT OF ENERGY SOURCES – STUDIES AND DESIGN DOCUMENTATION

Execution of studies and documentation for preparatory phases and realization of energy sources refurbishment. Such documents can be elaborated in the next stage both for the whole plant and for its partial equipment.

Energy sources refurbishment is usually realized for achievement of the following objectives:

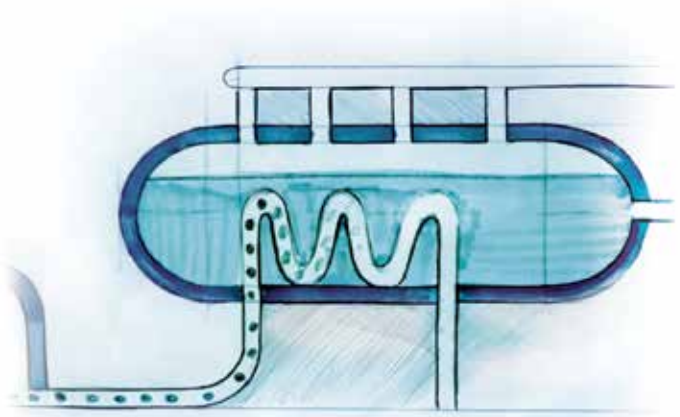
- Increase of output parameters of the energy source
- Increase of power and heat production efficiency
- Optimization of operation and operation costs
- Reduction of pollutants, emissions and production of waste
- Increase of attendance comfort level at the plant
- Increase of operation safety
- Energy source lifetime extension

Design activities

- Feasibility Studies
- Design documentation in the level required for Site permit, Building permit and IPPC documentation
- Basic Design
- Technical specification of Tender documents for selection of the supplier
- Coordination documentation in Detail Design phase and elaboration of selected Detail Design documents
- Performance of the Author supervision

Related engineering activities

- Findings and analysis of equipment real condition
- Evaluation of the energy source refurbishment gains potential from the viewpoint of power/heat output, efficiency, operation, etc.
- Evaluation of technical parts of the suppliers' bids
- Technical assistance at negotiations with suppliers
- Management of Detail Design



SUPPORT OF EXISTING ENERGY SOURCES OPERATION – NUCLEAR ENERGY INDUSTRY

Analysis and optimization of VVER 440 and VVER 1 000 Units operation

- Analyses of normal, abnormal and selected emergency transient processes and operation states analyses of the reactor unit
- Safety analyses and operation states analyses of the reactor unit
- Execution of design documentation of operation modes and maneuverability of reactor units, as well as capability of supporting services fulfillment for the transmission grid
- Draft programs of tests on reactor unit simulators and their evaluation
- Elaboration of thermohydraulic input data for strength and lifetime computations of NPP systems
- Execution of Basic Design and Detail Design of experimental research loops (CO_2, He, supercritical CO_2 and water loops) and hot cells projects
- Analysis and proposals of design modifications of the existing operation – increasing of efficiency
- Optimization of equipment parameters for the new operating conditions

Safety Analyses

- Analysis of both the existing and new systems/equipment use for BDBA control
- Analysis of safety systems divisions functions incl. computations of dynamic and static load of emergency diesel generators
- Complex analyses of failure modes and consequences (FMEA, FMECA)

NPP safety assessment reports (SAR) and licensing documentation

Execution of all phases of safety documentation, i.e. Initial SAR, Preliminary SAR, Pre-operation SAR and Final (Operation) SAR in structure acc. to US NRC RG 1.70 or IAEA, GS-G-4.

Power output increasing

Execution of studies, specifications, permitting and design documentation of all stages.

Projects of NPP units safety improvement

- Elaboration of safety increasing projects on the basis of “Stress Tests” performed after the accident in NPP Fukushima – comprehensive increase of NPP resistance and defense in depth for better coping with extreme external effects, earthquake, electrical feeding outage and heat removal)
- Procedures for control of ageing and establishment of conditions for long-term operation

Nuclear fuel

- Transport neutron-physical computations of fuel assemblies compositions
- Computations of transient processes in the reactor core
- Both fresh and spent nuclear fuel handling and to it related equipment
- Spent nuclear fuel storage issues – spent fuel storages, transport of nuclear fuel between single buildings within NPP, spent fuel casks, their handling and transport to the spent fuel storage

Radioactive waste management

- Elaboration of design documentation for complete radioactive waste management – from radioactive waste origination up to its treatment into a form acceptable in radioactive waste repositories
- Projects dealing with nuclear installations decommissioning and cost estimations of decommissioning

Special analyses of civil structures design

- Static and dynamic analyses of concrete and steel structures
- Design and analysis of a dynamically loaded structure
- Monitoring and analyses of reinforced concrete and prestressed reactor containment
- Determination of loads needed for execution of analyses, such as extreme values of rare meteorological phenomena, aircraft crash hazard, etc.

PREPARATION OF A NEW NPP CONSTRUCTION AND COMMISSIONING

Activities executed in this field cover the whole spectrum of documentation and to it related studies, in particular:

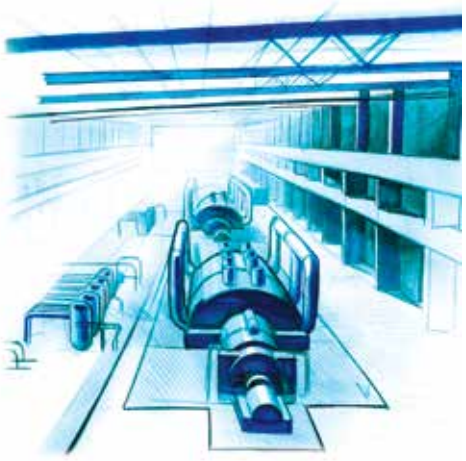
- Development of a Business Plan and a Project Plan for the investor
- Selection of an appropriate locality and its evaluation
- Cooperation with the investor in selection of the optimal technical solution; cooperation in the tender documentation preparatory works
- Elaboration of required documentation acc. to the Building Act needed for the site permit and building permit obtaining; cooperation in negotiations of that documentation
- Elaboration of permit documentation acc. to the Atomic Act; cooperation in its negotiations
- Elaboration of related studies and execution of technical assistance

Activities at a new nuclear power plant commissioning

- Preparation of documentation needed for NPP commissioning
- Cooperation with the investor in preparation of the commissioning schedule
- Assistance in communication with the state regulatory bodies in the course of commissioning

Other offered activities

- Independent verification of design and safety documentation in the phase of the Project Plan and project development
- Verification and assessment of documentation for developers and suppliers
- Cooperation with the operator and the state regulatory bodies



COMPREHENSIVE ENGINEERING AND CONSULTANCY SERVICES

- **Consultancy services for investors and suppliers**
  The consultancy services for investors in area of conventional and nuclear energetics is offered by ENERGOPROJEKT PRAHA Division in a very flexible scope, determined according to the specifics of the project and requirements of a client.

  As a consultant division offers complex consultancy services from the phase of a business concept and selection of optimal variant, including preparation input documentation for evaluation of the project feasibility and technical documentation for negotiations with banking institutions about funding of the project.

  In the realization phase the consultancy services also respect requirements of a client. The consultancy services in realization phase represents the “Owner´s Engineer” scope of activities, see below.

- **Owner´s Engineer services for investors**
  It is complex of services during pre-investment (preparation) studies and feasibility studies, design phase, project administration and project management of designers led by a client, including another specific activities – function of so called Construction administrator, Supervision etc.

- **Technical Support of Nuclear Regulatory Authorities**
  The division provides consultancy services for Nuclear Regulatory Authority in the assessment of documentation documented the application for construction licence for new Nuclear Power Plant. A part of technical support is the preparation of the information system to support the Safety Report and related documentation.

- **Expert activities for International Atomic Energy Agency (IAEA)**
  The division with its top experts operates in the long term also in area of IAEA activities and their educational programs. The division prepares and realizes trainings and internships for specialist from the developing countries, for example in **IAEA fellowship training**.

  The division also delegates its specialists on **Consultancy Meeting on the Technical Document (TECDOC), National Workshops (Training)** and similar workshops.

DATABASE DESIGN DOCUMENTATION PROCESSING

Elaboration of design and as-built documentation in the environment of mutually linked database systems, i.e. a detail model of the system including depiction of links and configuration of database objects in 2D or 3D graphics.

In ENERGOPROJEKT PRAHA Division there are used the following database systems

- AXSYS.Engine for design of multi-discipline intelligent diagrams
- PDMS for creation of spatial models and the follow-up generation of documentation
- Microsoft Access for establishing of applications for support of design and data sharing
- SQL (ORACLE or PostgreSQL) database for support of the design process and development of information systems

The main contribution of the system is a possibility of timely detection of possible disconformities in the design solution of single authors already before the realization phase.

The database system guarantees integrity of information in all documents and provides a possibility of continuous control of design. Its structure and form can be modified acc. to needs.

The database allows

- Following of links needed e.g. for maintenance and repairs planning, use of margins, etc.
- Creating of interfaces for other applications (computations, simulations, etc.) and in this way to provide required input data sets or to depict the computation outlets in the documentation or in the special model

The following SW systems were developed in ENERGOPROJEKT PRAHA Division

- **GAMED** – for execution of technical documentation in the database environment which enables data transfer via web interfaces and provides multidiscipline coordination.
- **GADUS** – for data presentation – it provides access to data models via internet and provides information and intelligent communication in 2D and 3D graphics.
- **COMA** – for collision management – web application is used to identify and evaluate collision between contractors. The application supports spatial coordination of project.
- **RDB** – review database – web application is used to make comments of delivered documents.
- **LBAT** – web application for the support of NPP licencing documentation evaluation.

OFFER OF SINGLE DESIGN PROFESSION

SERVICES MECHANICAL PROFESSION

Heat balance computations

- Thermal cycles computations
- Optimization and analyses of heat balance diagrams

Use of special SW:

- **GATE CYCLE** – development of models for heat balance computations and thermal cycles analyses in conventional power and heating plants, as well as in secondary circuits of nuclear power plants
- **THERMO FLOW** – Design and computations of thermal cycles with gas turbines and their optimization by means of this program

Hydraulic computations

- Optimization of piping networks operation
- Checking of hydraulic states in piping networks at unsteady flow conditions
- Two-phase flow

Optimization of a power unit operation

- Elaboration of start-up diagrams of power plant units
- Verification and optimization of parameters at the power unit start-up
- Optimization of equipment parameters for new operation conditions

Piping systems strength calculations

- Heat stress of pipes
- Seismic effects on piping systems
- Steam shock wave load

Use of special SW:

- **CAEPIPE** – pipe strength analyses of piping systems based on the finite element method with utilization of special pipe elements. Static analyses for linear and non-linear properties of piping routes components

Modeling of both indoor and outdoor piping systems in power plants, heating plants and industrial facilities in PDMS 3D model

MECHANICAL NUCLEAR PROFESSION

Analyses of transient processes and operation modes of reactor units

- Analyses of normal and abnormal transient processes of reactor units
- Verification and setting of setpoints for limitation systems and main controllers
- Verification of reactor trip, limitation systems and main controllers selectivity
- Evaluation of the acceptability criteria fulfillment in normal and abnormal transient processes

Use of special SW:
SIPRO – analyses of pressurized water reactor (PWR) units at normal/abnormal transient processes
RELAP – computations of flow parameters of media in the primary and secondary circuits

Thermal cycles computation, optimization and analyses of heat diagrams

Use of special SW: **PRIMUSIIB** – computations of thermomechanical parameters of coolant in the primary circuit; mass and energy balances of the primary circuits loops of reactor units

Hydraulic and thermohydraulic computations

- Computations of steady states and those ones with heat transfer
- Computations of unsteady (transient) states and unsteady states with heat transfer

Use of special SW: **FLOWMASTER** version 7 – computational models of pipes and piping networks

Optimization of radiation protection

- Assistance in assertion of the ALARA principle in design and permit documentation

Computation of radiological impacts of radionuclides spread in the environment

- Radiological impacts of normal operation and radiation accidents in NPP

Use of special SW:
- **NORMAL** – computational code for evaluation of NPP normal operation states impacts
- **HAVAR** – computational code for evaluation of NPP emergency operation states impacts

Computations of shielding

- Computations for dimensioning of civil structures in buildings with ionizing radiation sources
- Computations of dose rates and ionizing radiation rates in an environment with ionizing radiation sources

Use of special SW: **VISIPLAN** – program tool for shielding computations

ELECTRICAL PROFESSION

Connection of power plants into the electricity transmission system

Produced electricity outlet, standby feeding of auxiliary power supply, auxiliary power supply feeding diagram

- Operation fields of the unit (P/Q diagram) in relation to the network
- Capability of the power unit and auxiliaries in dependence on level of voltage and frequency, acc. to dimensioning and design of operated mechanical and electrical equipment. Normal and abnormal states.
- Dynamic transient states of the power unit and auxiliary power supply, dynamic stability, isolation from transmission network, island operation, automatic standby

Use of special SW for electrotechnical computations, modeling of electricity networks and analyses of electro-mechanical transient processes:

- Dynamic simulator **MODES**
- **NEPLAN**

Supporting calculations for electricity networks design and control

- Power balances
- Scheme of operation modes, nominal and maximal operation currents
- Operation modes, nominal and maximal operation currents
- Design of sources and networks parameters
- Short currents for equipment dimensioning
- Short currents for setting of protections
- Voltage conditions in stable and transient states
- Configuration and setting of the power unit and power outlet electric protections
- Protections and protective functions of the auxiliary power supply distributions, checking of protection selective function
- Dimensioning of cables

I&C PROFESSION

Complete Design of Instrumentation and Control System

- I&C concept – hookups, sensors, field instrumentation, evaluation, processing and interfaces
- V&V, layout, HMI – control rooms design considering Human Factors Engineering principles
- Standardized processing of functional descriptions, functional control diagrams, modules, blocks for type solutions – thus simplification for SW developers
- Project database connecting on-line list of actuators, measurements, PID, graphic algorithms

Complete Design of Physical Security Systems

- Design of systems and equipment – according to category – scope and extent
- Fencing, sensors, CCTV cameras, access systems, cabling, lighting, data transfer, layout proposal, HMI – control rooms interfaces with regulatory, local or police authorities

Complete Design of Fire Detection System

- Cabling of communication and data network – secured transfer of information
- Fire detection sensors specification, fire detection exchange – control room, equipment, layout and design of auxiliary systems, background, mobile equipment, O&M equipment

Complete Design of Data and Communication Systems

- Telephone exchange PBX
- Data network of information office system
- Cable piped radio system
- Dispatching speech equipment
- Synchronous time system
- Wireless network and warning systems
- CCTV systems for supervisory of equipment and area status

Use of special SW:

- **MATLAB/SIMULINK** – dynamic models of technological systems and I&C
- **ELCAD/AUCOPLAN**

CIVIL AND SPECIAL DESIGN WORK PROFESSION

Concrete structures and special computations

- Complete design documentation of reinforced concrete structures for all levels of constructions design documentation
- Computations of civil structures exposed to action of extreme loads and events (seismic effects, extreme temperatures, extreme wind and tornado, flying objects (projectiles) impact, aircraft crash, heat caused by a fire, explosion pressure waves)
- Static and dynamic computations of civil structures
- Analysis of residual lifetime of structures, controlled ageing programs

Use of special SW: **ABAQUS, NISA, STARDYNE**

Civil structures, architecture, technical design of buildings, layout plans and physical protection security

- Constructional and architectonical part – Modeling of civil structures constructions in PDMS-3D, design of the civil part of physical security systems on the basis of secret information classified up to the “Secret” category and prepared in a certified workplace

Steel and non-standard structures

- Design of bearing structures of buildings (mainly those in power plants, heating plants and industrial facilities)
- Static and dynamic computations of steel structures
- Design of special steel structures and constructions made of stainless steel

Use of special SW: **SCIA ENGINEER, FIN**

CONVENTIONAL ENERGY INDUSTRY – MAIN REFERENCES SELECTION

COMPLEX REFURBISHMENT OF THE POWER PLANT PRUNÉŘOV II – CZECH REPUBLIC

Owner: ČEZ, a. s.

Main parameters

Power output	3x 250 MWe
Heat supply into district heating	280 MWt
Net thermal efficiency	39% (condensing operation)
Fuel	lignite 9.75 MJ/kg

Main equipment

Boilers VÍTKOVICE	dry bottom, pulverized coal 660.4 t/h
– live steam parameters	18.2 MPa / 575 °C / 580 °C
Steam turbine ŠKODA	250 MW, 2-casing
FGD AEE	wet limestone scrubbing method
– emission limits in mg/Nm^3	SO_2 150 mg/Nm^3, NO_x 200 mg/Nm^3,
(at O_2 content 6%)	CO 200 g/Nm^3, solid pollutants 10 mg/Nm^3
Cooling system	wet natural draft cooling tower with inlet of flue gas emitted into the air

Division design and engineering activities

Business Plan	2006 – 07
Conceptual Design	2007
Tender documents (technical part)	2008
Basic Design	2009
Site permit documentation	2009
Technical input data for EIA	2009
Detail Design – selected parts	2011 – 12

COMPLEX REFURBISHMENT OF THE POWER PLANT TUŠIMICE II – CZECH REPUBLIC

Owner: ČEZ, a. s.

Main parameters

Power output	4x 200 MWe
Heat supply into district heating	72 MWt
Net thermal efficiency	37.6% (condensing operation)
Fuel	lignite 9.9 MJ/kg

Main equipment

Boilers VÍTKOVICE	dry bottom, pulverized coal, 492 t/h, 450 MWt
– live steam parameters	17.45 MPa / 565 °C / 576 °C
Steam turbine ŠKODA	250 MW, 3-casing
FGD AEE	wet limestone scrubbing method
– emission limits	SO_2 150 mg/Nm^3, NO_x 200 mg/Nm^3,
(at O_2 content 6%)	CO 200 g/Nm^3, solid pollutants 10 mg/Nm^3
Cooling system	wet natural draft cooling tower with inlet of flue gas emitted into the air

Division design and engineering activities

Business Plan	2004
Conceptual Studies	2004
Technical input data for EIA	2005
IPPC documentation	2005

SUPERCRITICAL COAL FIRED POWER PLANT LEDVICE – CZECH REPUBLIC

The first supercritical power plant in the Czech Republic – LEDVICE 660 MW

Owner:	**ČEZ, a. s.**

Main parameters

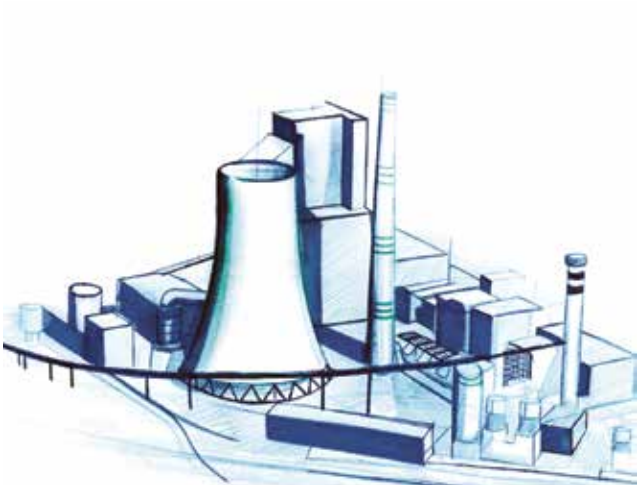
Power output	660 MWe
Heat supply into district heating	250 MWt
Net thermal efficiency	42.7% (condensing operation)
Fuel	lignite 11.5 MJ/kg

Main equipment

Boiler ALSTOM	pulverized coal, tower type design 1 678 t/h, 1 286 MWt
– live steam parameters	28 MPa / 600 °C / 610 °C
Steam turbine ŠKODA	660 MW, 4-casing
FGD AEE	wet limestone scrubbing method
– emission limits (at O_2 content 6%)	SO_2 150 mg/Nm^3, NO_x 200 mg/Nm^3, CO 200 mg/Nm^3, solid pollutants 10 mg/Nm^3
Cooling system	wet natural draft cooling tower with inlet of flue gas emitted into the air

Division design and engineering activities

Business Plan	2005
Conceptual Studies	2005
Technical input data for EIA	2006
Conceptual Design documentationt	2007
Site permit documentation	2008
Tender documentation – technical part	2008



COMBINED CYCLE POWER PLANT POČERADY – CZECH REPUBLIC

The biggest Combined Cycle Power Plant in the Czech Republic – POČERADY 840 MW

Owner:	**ČEZ, a. s.**

Main parameters

Power unit arrangement	1 Unit = 2 GT + 2 HRSG + 1 ST
Power output	840 MWe
Net thermal efficiency	57.6%
Fuel	natural gas

Main equipment

Gas turbines Siemens SGT5 4000F	2x 284 MW
HRSG SES Tlmače	13 MPa / 552 °C, 70.7 kg/s
Steam turbine ŠKODA	2-casing, 316 MW
Cooling system	wet natural draft cooling tower

Division design and engineering activities

Feasibility Study	2008
Technical parts of tender doc	2008 – 09
Conceptual Design	2010
Site permit documentation	2010

INTEGRATED COMBINED CYCLE POWER PLANT VŘESOVÁ – CZECH REPUBLIC

The first Combined Cycle Power Plant in Czech Republic

Owner:	**Sokolovská uhelná, a. s., Vřesová**

Main parameters

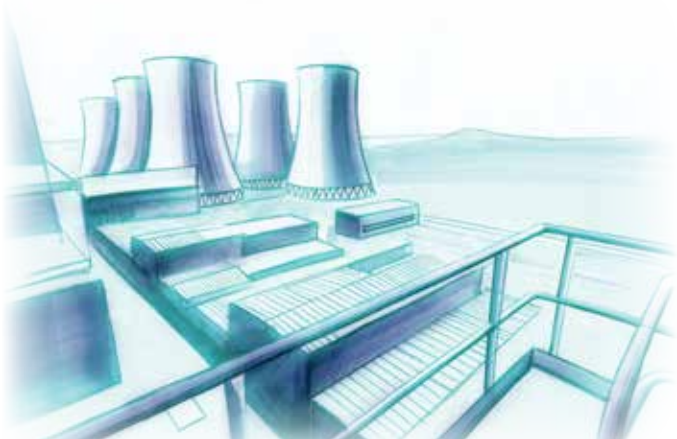
Power unit arrangement	1 Unit = 1 GT + 1 HRSG + 1 ST 2 Power Units
Power output	2x 200 MWe
Net thermal efficiency	43%
Fuel	syngas from brown coal gasification + natural gas

Main equipment

Gas turbines GE 9171E	128 MW/1GT
Fluidized bed coal gasification	high temperature Winkler generators
2 gasification units	2x 120 000 Nm^3
Parameters	950 °C, 2.75 MPa

Division design and engineering activities

General designer function	
Technical input data for EIA	1996
Conceptual Design	1998
Site permit documentation	2001
Tender documentation	2001



COMBINED CYCLE POWER PLANT BALLOKI – PAKISTAN

Owner:	**Orient Power Company Limited**
EPC:	**PA Export, a. s.**

Main parameters

Power unit arrangement	1 Unit = 2 GT + 2 HRSG + 1 ST
Power output	225 MWe
Net thermal efficiency	51.7% (25 °C, natural gas)
Fuel	natural gas/LFO

Main equipment

Gas turbines GE 6111 FA	2x 75 MW
HRSG	horizontal, 2-pressure
Steam turbine	condensing, 77 MW
Cooling system	wet fan cooling towers

Division design and engineering activities

Conceptual documentation	2006
Basic Design	2007
Engineering services	
Detail Design – civil part	2008

COMBINED CYCLE POWER PLANT MURIDKE – PAKISTAN

Owner:	**Sapphire Electric Company Limited**
EPC:	**PA Export, a. s.**

Main Parameters

Power unit arrangement	1 Unit = 2 GT + 2 HRSG + 1 ST
Power output	225 MWe
Net thermal efficiency	51.7% (25 °C, natural gas)
Fuel	natural gas/LFO

Main Equipment

Gas turbines GE 6111 FA	2x 75 MW
HRSG	horizontal, 2-pressure
Steam turbine	condensing, 77 MW
Cooling system	wet fan cooling towers

Division design and engineering activities

Conceptual documentation	2006
Basic Design	2007
Engineering services	
Detail Design – civil part	2008

YUNUS EMRE 2x 145 MW CFPP – TURKEY

Coal Fired Power Plant YUNUS EMRE 2x 145 MW, ADULARYA, TURKEY – Eskisehir

Owner:	**ADULARYA ENERJI ELEKTRIK ÜRETIMI VE MADENCILIK A. Ş.**
EPC:	**VÍTKOVICE POWER ENGINEERING, a. s.**

Main parameters

Power output	2x 145 MWe
Gross thermal efficiency	39%
Fuel	lignite

Notice: The power plant is under construction, commissioning in 2014

Main equipment

Fluidized bed boilers Andritz	
Steam turbines ŠKODA MTD40	2x 145 MW
FGD Andritz	dry additive method
Cooling system	wet natural draft cooling tower with inlet of flue gas emitted into the air

Division design and engineering activities

Conceptual Design	2010
Basic Design	2011
DD of internal connecting piping	2012 – 13
Management of DD documentation execution	2012 – 13

YUNUS EMRE II 2x 250 MW CFPP – TURKEY

Coal Fired Power Plant YUNUS EMRE II 2x 250 MW, TURKEY – Eskisehir

The planned future extension of Yunus Emre Power Plant

Owner:	**ADULARYA ENERJI ELEKTRIK ÜRETIMI VE MADENCILIK A. Ş.**
EPC:	**VÍTKOVICE POWER ENGINEERING, a. s.**

Main parameters

2 power generating Units	
Power output	2x 250 MWe
Gross thermal efficiency	42%
Fuel	lignite

Main equipment

Pulverized coal boilers VÍTKOVICE	536 MWt, 197 kg/s, 18.5 MPa, 575 °C/580 °C
Steam turbines ŠKODA MTD 60	2x 250 MW
Reheat steam condensing turbine	
FGD	wet limestone scrubbing method
Cooling system	wet natural draft cooling tower with inlet of flue gas emitted into the air

Division design and engineering activities

Conceptual Study	2012
Technical input data for EIA documentation	2012

COMBINED CYCLE POWER PLANT GARDABANI – GEORGIA

2 power units – extension of the existing installation with gas turbines by a steam part

Owner:	**ENERGO – PRO**

Main parameters

Power unit arrangement	1 Unit = 1 GT + 1 HRSG + 1 ST
Power output	2x 80 MWe
Net thermal efficiency	50.1%
Fuel	natural gas

Main equipment

Gas turbines Pratt and Whitney FT8	2x 55 MW
HRSG	horizontal, 2-pressure
Steam turbine	condensing, 2x 21 MW
Cooling system	wet fan cooling towers

Division design and engineering activities

Extension Study of the existing GT power plant	2012

COMBINED CYCLE POWER PLANT KHORMALA – IRAQ

Combined Cycle Power Plant KHORMALA 950 MW, Iraq

Owner:	**KAR GROUP**

Main parameters

Power unit arrangement	1 Unit = 2x GT + 2x HRSG + 1x ST + 1x ACC
Power output	2x 425 MWe
Gross thermal efficiency	50.2%
Fuel	LFO, sweetened gas

Main equipment

Gas turbines Siemens, SGT5 2000F	4x 157 MW
HRSG	horizontal, 2-pressure
Steam Turbine ŠKODA	
Cooling system	air cooled condensers

Division design and engineering activities

Preliminary Feasibility Study	2012

MUGHAL ENERGY 55 MWe CFPP – PAKISTAN

Coal Fired Power Plant 55 MWe, Lahore, Pakistan

Owner:	**MUGHAL ENERGY LIMITED**

Main parameters

Power output	55 MWe
Gross thermal efficiency	36.5%
Fuel	black coal (Indonesia, South Africa, Pakistan)

Main equipment

Boiler	fluidized bed boilers
– live steam parameters	14 MPa / 545 °C
Steam turbine	55 MW, condensing
FGD	dry limestone method
Cooling system	wet fan cooling tower

Division design and engineering activities

Conceptual Design	2015
Tender documentation for selection of EPC supplier	2015
Technical assistance of Owner	

Note: The action is in preparatory phase

DONIAMBO C 2x 100 MW – NEW CALEDONIA

Coal Fired Power Plant 2x 100 MWe Doniambo C, New Caledonia

Owner:	**Doniambo Energie**
EPC Supplier:	**Consortium: Eiffage TP, Vítkovice Power Engineering, Clemessy, CDFi**

Main parameters

Power output	2x 100 MWe
Gross thermal efficiency	41%
Fue	Black Coal

Main equipment

Boiler	Pulverized
– live steam parameters	14 MPa / 545 °C
Steam turbine	100 MW, condensing
FGD	wet scrubbing method
Cooling system	once through sea water

Division design and engineering activities

Coordinated BD	2015

Note: The project was terminated during the BD works by Owner

NUCLEAR ENERGY INDUSTRY – MAIN REFERENCES SELECTION

DUKOVANY NPP, CZECH REPUBLIC (START OF OPERATION: 1985 – 87)

Owner: **ČEZ, a. s.**

Main parameters and equipment (from the project preparation up to the present)

Type of nuclear reactors	pressurized water VVER 440/V213
Number of units	4
Thermal output	1 375 MWt
Thermal efficiency	32%
Number of loops	6
Safety systems	3 divisions, 3x 100%
Power output per unit	440 MWe
Steam turbine	2x ŠKODA 220 MW per unit
Cooling system	wet natural draft cooling towers

Division design and engineering activities

- Feasibility Study and a Study of NPP siting; Conceptual Design
- Basic Design both of the technological and civil parts
- Management of Detail Designs execution and elaboration of their civil part
- Safety Assessment Reports and detailed Safety Design Basis; Permit documentation
- I&C systems replacement design documentation
- Replacement and refurbishment of other equipment incl. long term operation programs
- Project of NPP power output upgrade up to 500 MW per unit
- Design concept for implementing measures resulting from the “Stress Tests” performed after the accident in Fukushima NPP; elaboration of selected Detail Design

TEMELÍN NPP, CZECH REPUBLIC (START OF OPERATION: 2000 – 02)

Owner:	**ČEZ, a. s.**

Main parameters

Type of nuclear reactors	pressurized water VVER 1 000/V320
Number of units	2
Thermal output	3 000 MWt
Thermal efficiency	32%
Number of loops	4
Safety systems	3 divisions, 3x 100%
Power output per unit	1 000 MWe
Steam turbine	1x ŠKODA 1 000 MW per unit
Cooling system	wet natural draft cooling towers

Division design and engineering activities (from the project preparation up to the present)

- Feasibility Study and a study of NPP siting;
- Conceptual Design
- Basic Design both of the technological and civil parts
- Study of beyond design basis accidents – e.g. SBO type
- Project of I&C systems replacement by the system of Westinghouse Company
- Management of Detail Design documentation and its civil part elaboration
- Safety Assessment Reports
- Permitting documentation
- Replacement and refurbishment of other equipment incl. long term operation programs
- Project of NPP power output upgrade up to 1 100 MW per unit
- Design concept for implementing measures resulting from the “Stress Tests” performed after the accident in Fukushima NPP; elaboration of selected Detail Design

SPENT NUCLEAR FUEL STORAGE DUKOVANY (START OF OPERATION: 2005)

Owner:	**ČEZ, a. s.**

Main parameters

Type of fuel storing	dry storage
Storage capacity	1 340 tons of uranium
Number of storage casks	133
Type of casks	Castor 440/84, steel cask with 2 lids, for transport and storage purposes
Cask transport into storage facility	special wagon on railway siding
Length/width/height of storage building	approx. 108 m x 35 m x 20 m
Presumed lifetime	60 years

Division design and engineering activities (from the project preparation up to the present)

- Feasibility Study
- Conceptual Design
- Basic Design
- Tender documentation for selection of suppliers of casks and the storage building
- Safety Analyses Reports including also analyses of internal and external hazards (e.g. aircraft crash)
- Permit documentation

SPENT NUCLEAR FUEL STORAGE TEMELÍN (START OF OPERATION: 2009)

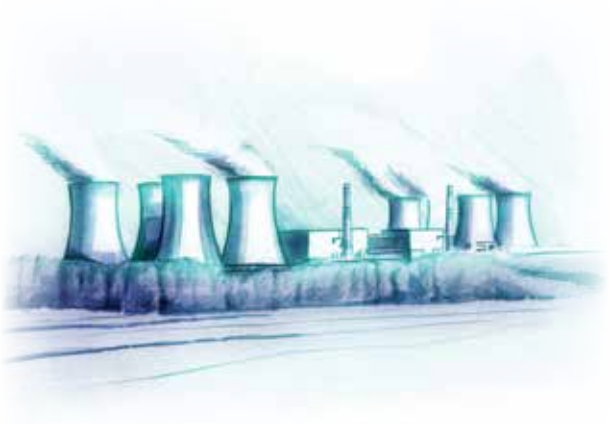
Owner:	**ČEZ, a. s.**

Main parameters

Type of fuel storing	dry storage
Storage capacity	1 370 tons of uranium
Number of storage casks	152
Type of casks	Castor 1 000/19, steel cask with 2 lids, for transport and storage purposes
Cask transport into storage facility	special wagon on railway siding
Length/width/height of storage building	approx. 98 m x 66 m x 26 m
Presumed lifetime	60 years

Division design and engineering activities (from the project preparation up to the present)

- Feasibility Study and a study of the spent fuel storage siting; it was selected the site within the NPP area
- Conceptual Design
- Basic Design
- Tender documentation for selection of suppliers of casks and the storage building
- Safety Analyses Reports including also analyses of internal and external hazards (e.g. aircraft crash)
- Permit documentation



JASLOVSKÉ BOHUNICE V2 NPP, SLOVAK REPUBLIC (START OF OPERATION: 1980 – 81)

Owner:	**Slovenské elektrárne, a. s.**

Main parameters and equipment

Type of nuclear reactors	pressurized water VVER 440/V213
Number of units	2
Thermal output	1 375 MWt
Thermal efficiency	32%
Number of loops	6
Safety systems	3 divisions, 3x 100%
Power output per unit	440 MWe
Steam turbine	2x ŠKODA 220 MW per unit
Cooling system	wet natural draft cooling towers

Division design and engineering activities (from the project preparation up to the present)

- Feasibility Study and studies of the NPP siting
- Conceptual Design
- Basic Design both of the technological and civil parts
- Some parts of Detail Design documentation
- Safety Analyses Reports
- Permit documentation
- Project of NPP power output upgrade up to 500 MW per unit
- Technical assistance in equipment refurbishment and replacement

MOCHOVCE NPP UNIT 1, 2 – SLOVAK REPUBLIC (START OF OPERATION: 1988 – 89)

Owner: Slovenské elektrárne, a. s.

Main parameters and equipment

Type of nuclear reactors	pressurized water VVER 440/V213
Number of units	2
Thermal output	1 375 MWt
Thermal efficiency	32%
Number of loops	6
Safety systems	3 divisions, 3x 100%
Power output per unit	440 MWe
Steam turbine	2x ŠKODA 220 MW per unit
Cooling system	wet natural draft cooling towers

Division design and engineering activities (from the project preparation up to the present)

- Feasibility Study and studies of the NPP siting
- Conceptual Design – completion with respect to the seismic conditions of Mochovce locality
- Basic Design both of the technological and civil parts (including implementation of the measures resulting from the conclusions of missions performing safety audits)
- Some parts of Detail Design documentation
- Safety Analyses Reports
- Permit documentation
- Project of NPP power output upgrade up to 500 MW per unit
- Technical assistance in equipment refurbishment and replacement

CURRENT NPP PROJECTS

MOCHOVCE NPP UNIT 3, 4 – SLOVAK REPUBLIC (UNDER CONSTRUCTION)

Owner: Slovenské elektrárne, a. s.

Main parameters and Equipment

Type of nuclear reactors	pressurized water VVER 440/V213
Number of units	2
Thermal output	1 375 MWt
Thermal efficiency	32%
Number of loops	6
Safety systems	3 divisions, 3x 100%
Power output per unit	440 MWe
Steam turbine	2x ŠKODA 220 MW per unit
Cooling system	wet natural draft cooling towers

Systems for coping with beyond design basis accidents and severe accidents mitigation

Division design and engineering activities (from the project preparation up to the present)

- Cooperation in projects specifying increased technical and safety level of NPP
- Basic Design of a modernized solution with increased safety features with a possibility of the power output upgrade up to 500 MW per unit
- Some parts of Detail Design documentation
- Safety Assessment Reports; checking of the safety documentation verification
- Permit documentation
- Author supervision of keeping the Basic Design Requirements; implementation of changes to Basic Design
- Extensive Basic Design amendment implementing safety measures resulting from “Stress Tests” after Fukushima NPP disaster. It includes mainly more demanding requirements on civil structures and technological equipment resistance against extreme internal and external impacts. A concurrent severe accident at all reactor units is considered

PLANNING AND PREPARATION OF NEW REACTOR UNITS CONSTRUCTION BOTH IN CR AND SR

Temelín NPP – new units 3, 4

- Feasibility Study of new units 3, 4 (technical input data for selection of the unit, layout draft design of units, connection into the transmission system and other infrastructure)
- Solution of interactions with the existing units operated in the same locality (ETE 1, 2)
- Technical assistance in preparation of the Tender documentation
- Cooperation in execution of the Safety Assessment Report

Dukovany NPP – new unit 5, eventually 6

- Feasibility Study of new units (analyses of technical, safety and operation properties on reactor units in power output range 1 100 –1 700 MWe, technical input data for the unit selection, layout draft design of units, connection into the transmission system and other infrastructure with putting stress on cooling water supply possibilities)
- Solution of interactions with the existing units operated in the same locality (EDU 1-4)
- Cooperation on studies dealing with connection of new units EDU and ETE into the transmission system with respect to the energy concept and transmission grid development in the Czech Republic
- Coordination of the performed Survey Works of the considered site (detailed hydrological and hydrogeological survey, detailed engineering - geological survey)
- Elaboration and Coordination of Supporting Technical Reports, serving as input data for EIA documentation

Jaslovské Bohunice NPP – new units, Slovak Republic (SR)

- Feasibility Study of new units construction – in alternative 1x 1 200, 2x 1 200 up to 2x 1 700 MWe (analyses of technical, safety and operation specification of reactor units in power output range 1 200 –1 700 MWe, technical input data for the unit selection, layout draft design of units, connection into the transmission system and other infrastructure with special attention to the cooling water supply possibilities and on foundation of buildings and structures in difficult geology and seismic conditions Solution of interactions with the existing units operated in the same site (in EBO 3,4 and EMO)
- Technical support in EIA documentation Elaboration, incl. Supporting Studies – Water management Conception of new NPP, Site Study of Electrical station, etc.

PLANNING AND PREPARATION OF NEW REACTOR UNITS CONSTRUCTION IN ABROAD

NPP AKKUYU – NEW 4 UNITS, REPUBLIC OF TURKEY

Owner:	**Türkiye Atom Enerjisi Kurumu (TAEK)** **Turkish Atomic Energy Authority**

Main parameters and equipment

Type of nuclear reactors	pressurized water VVER 1200/ TYP V-509
Number of units	4
Thermal output	3 300 MW
Thermal efficiency	32%
Number of loops	4
Power output per unit	1 255 MW
Steam turbine	ARABELLETM, producer Alstom Power
Cooling system	seawater, Mediterranean Sea

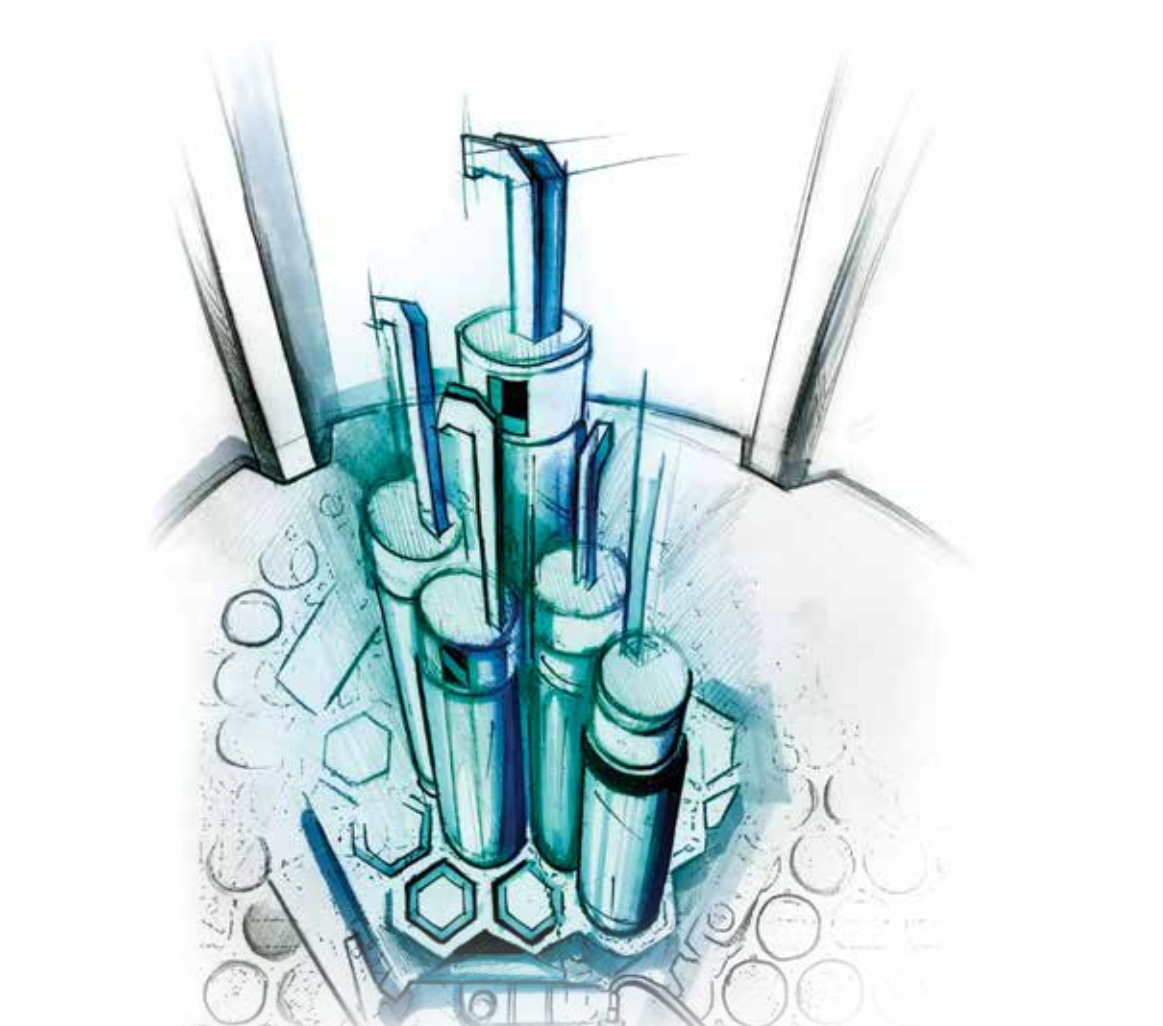
Provided services

- Technical Support (Technical Suport Organization) for the Turkish Atomic Energy Authority at the evaluation of Preliminary Safety Report and other documentation submitted by the Owner with the construction license application for 1. unit of Akkuyu Nuclear Power Plant.
- The supply includes an extensive training program and transfer of know-how of selected type of Nuclear Power Plants and approach to evaluation of documentation of the Applicant for a Nuclear Power Plant construction permit.
- In the framework of the preparatory work on the evaluation of the documentation of construction license application the special SW tool developed in the division ENERGOPROJEKT PRAHA for support of evaluation of Nuclear Power Plant Safety Documentation (LBAT) was adjusted for the Akkuyu project. LBAT includes an extensive database of:
  - Requirements of applicable regulations (Turkish regulations, IAEA standards and country of the origin of the project regulations) for Nuclear Power Plant project in the Republic of Turkey,
  - Acceptance criteria for the assessment of fulfillment of the requirements in the Nuclear Power Plant Documentation
  - Instructions for application of acceptance criteria for the review and assessment of particular parts of Preliminary Safety Report and related documentation

  The database is processed so that it enables adaptation to other projects with the design and equipment of other provenance than the Nuclear Power Plant Akkuyu.
- The part of performance are the Evaluation Reports to the Preliminary Safety Report of Nuclear Power Plant Akkuyu and evaluation of other documentation supplementing the Preliminary Safety Report e.g. Probabilistic Safety Analyses level 1, personnel training program and execution of comprehensive set of independent safety analyses.

NPP HANHIKIVI – NEW UNIT, FINLAND

- Providing of technical Support to Fennovoima company, the owner of the Nuclear Power Plant Hanhikivi (Unit PWR with an output 1200MW) in the preparing construction phase.
- Assessment of documentation of the Preliminary Safety Report proposal elaborated by the Nuclear Power Plant Contractor in terms of requirements of the State Office for Nuclear Safety in Finland (STUK) for Nuclear Power Plants.



DATABASE DESIGN DOCUMENTATION PROCESSING – MAIN REFERENCES

NUCLEAR POWER PLANT TEMELÍN – CZECH REPUBLIC

- The model of reactor building and of active part BAPP according with Detail Design Documentations
- Detai Design of OU 2.13 – Modification of turbine condensate
- Digitalization of dokumentation non-active BAPP according with Detail Design Documentations
- Digitalization a harmonization of as-built schemes of mechanical, elektrical and I&C in the scope of the entire NPP technology
- Updating of the model of building structures of reactor building and BAPP in accordance with actual state after implementation
- Databese of equipment qualification of ETE and EDU
- GADUS – web application for viewing and searching data of As-Built documentation (data storage)
- GPZ – application for graphics support of securing
- 3D generel ETE
- Data migration from PlantSchema system into AXSYS.Engine system
- Processing schemes ZI in the system AXSYS.Engine
- Implementation of measures from stress tests

NUCLEAR POWER PLANT DUKOVANY – CZECH REPUBLIC

- Replacement of generator switches – the initial state and Detail Design
- Digitalization of Detail Design Documentation of projects Filling Station II
- Digitalization of documentation of OU14 – SAOZ
- Replacement of own consumption switchboards – the initial state and detail Design
- Support of project „Recovery of I&c 1. – 4. Units
- Nuclear Power Plant decommissioning – application for pro technical and economical evaluation of the process of the EDU decommissioning

SLOVAK NUCLEAR POWER PLANTS – SLOVAK REPUBLIC

- Replacement of generator switches NPP V2 – the initial state and Detail Design
- As build documentation of level +14,70m a +22,50m in Lengthwise building of NPP Mochovce 3D model – photogrammetry
- 3D generel of NPP Mochovce
- Basic Design HVB (main production Unit) 3. a 4. Units NPP Mochovce in the systems AXSYS.Engine a PDMS
- Detail Design of conventional island of 3. a 4Units NPP Mochovce in the system PDMS
- PDMS model coordination of entire NPP Mochovce

POWER PLANT PRUNÉŘOV – CZECH REPUBLIC

- Coordinated Basic Design in the systems AXSYS.Engine and PDMS
- Detail Design of connecting piping in the systems AXSYS.Engine and PDMS
- GAMED – system for designing support

POWER PLANT MĚLNÍK – CZECH REPUBLIC
- Basic Design hotwater output for Prague in the system PDMS
- Detail Design of interconnection of PP EMĚ I and PP EMĚ II

IVITAS a. s. – CZECH REPUBLIC
- Creation of a pipe components catalog in PDMS

YUNUS EMRE CFPP – TURKEY
- Coordinated Basic Design in the system PDMS
- Detail Design of connecting piping in the system PDMS

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

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

EIFFAGE Infrastructure – Génie Civil – FRANCE
- Coordinated BD for coal fired power plant 2 x 100 MW Doniambo power plant C – New Caledonia in the system PDMS

COMMENT:

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