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REFERENCES

Commissioning of nuclear and fossil fuel power plants

Development and implementation of the commissioning programmes after the NPP power up-rating

Programme development, preparation, implementation and test evaluation including coordination of the commissioning works after the Instrumentation and Control (I&C) system and secondary circuit refurbishment and power up-rating.

Customer: Skoda Praha INVEST, a.s.

Location: CEZ – Dukovany NPP (Czech Republic)

Implementation: 2008–2012

Commissioning of the primary electrical protection, synchronization and excitation systems

Programme development and realization of primary tests of electrical protection, synchronization and excitation systems of Siemens generator.

Customer: SIEMENS

Location: Nyirseg (Hungary), Krasavino (Russian Federation), Soul (Korea)

Implementation: 2009–2010

Development and implementation of the commissioning programmes of the fossil fuel power plants

Elaboration of the programmes, implementation and evaluation of the tests during the commissioning of fossil fuel power units after the general refurbishment.

Customer: Skoda Praha INVEST, a.s.

Location: CEZ – Tusimice Power Plant, Prunerov Power Plant

Implementation: since 2008

Independent commissioning supervision

Technical support of nuclear regulatory authority within commissioning of Unit 3 and 4 of NPP Mochovce

The goal of the contract is to provide scientific and technical support to the Nuclear Regulatory Authority (UJD) of the Slovak Republic and its assessment and decision-making processes within commissioning of Unit 3 and 4 of NPP Mochovce. The support will be provided at all stages of inactive and active testing of plant equipment and systems and the stress is put on checking the compliance with nuclear safety requirements. The project involves not only the assessment of documentation, but also round-the-clock monitoring of commissioning activities at NPP Mochovce site until all required tests will be successfully finished.

Customer: Nuclear Regulatory Authority of the Slovak Republic

Location: Slovak Republic | **Implementation:** since 2016

Engineering support of the NPP commissioning

Technical support of NPP commissioning providing independent review of the proper and correct evaluation of the selected tests which are realised during the commissioning after I&C system refurbishment and the power up-rating.

Customer: CEZ, a.s.

Location: CEZ – Dukovany NPP | **Implementation:** 2005–2012

Scientific supervision of the commissioning

Technical support of the scientific supervision of the commissioning works provided at Temelin NPP ensuring the highest safety level and commissioning procedures quality. Round-the-clock attendance during the active commissioning programme, cooperation in the test results evaluation, independent evaluation of the non-active and active stage of commissioning, recommendations for safety enhancement.

Customer: UJV Rez, a.s.

Location: CEZ – Temelin NPP | **Implementation:** 1999–2003

Engineering support of the NPP operation

Design and drawing of operational diagrams and data acquisition for NPP IPIS.3D

The project included design new operational diagrams models, drawing operational diagrams by the designed models and the acquisition of necessary additional data for NPP Integrated plant information system providing NPP processes IT support based on full graphical environment: “MNT Graf system”.

Customer: CEZ, a.s.

Location: CEZ – Dukovany NPP | **Implementation:** 2013–2015

Process and data analysis of NPP processes

The aim of the project was to analyse the current state of processes (As Is analyse) and perform their optimization (Should Be analyse). Furthermore, the aim was to map existing data sources, data management processes and to provide the necessary range of dates for the implementation of optimized processes. The project also included building a young team and a transfer of know-how to the team members.

Customer: CEZ, a.s.

Location: Czech Republic | **Implementation:** 2013–2014

Periodic Safety Review for Czech nuclear power plants

Assessment of the reports for the Periodic Safety Review which is the base for NPP operating licence extension.

Customer: CEZ, a.s.

Location: CEZ – Dukovany NPP, Temelin NPP

Implementation: 2006–2010

System of the operation control, maintenance and configuration management at NPP

Data acquisition and up-dating for MNT Graf application which is to integrate operation control, maintenance and configuration management functions. The system is based on the visualisation of the operational schemes and logical interconnections of the equipment. The system application results in more efficient maintenance, reduction of the outage period and enhancement of the work safety at NPP.

Customer: CEZ, a.s.

Location: CEZ – Dukovany NPP | **Implementation:** since 2006

Validation of the operating procedures and test programmes on the NPP display simulator

Validation of the operating procedures and test programmes on the NPP display simulator for the subsequent unit commissioning after I&C system refurbishment.

Customer: CEZ, a.s. (UVJ RES,a.s.)

Location: CEZ – Dukovany NPP | **Implementation:** since 2004

Diagnostic measurement of plant cabling and cable hermetic penetrations

Long-term monitoring of the cabling and connected electrical devices by means of non-destructive cable diagnostic system ECAD®. Periodic measurement enables to evaluate the cable ageing and prevent the electrical device failure. The system is used for regular diagnostics, monitoring and identification of malfunctions.

Customer: CEZ, a.s.

Location: CEZ – Dukovany NPP | Implementation: since 1995

Periodic tests of NPP safety systems

Programme development, implementation and evaluation of the safety systems periodic tests including power supply, which are required by directives of the Czech regulatory authority.

Customer: CEZ, a.s.

Location: CEZ – Dukovany NPP, Temelin NPP

Implementation: since 1992

The safety analyses of the Czech NPPs following the Fukushima accident

Technical support in the severe accident area

Performance of analyses including thermohydraulic calculations following the stress tests evaluation. Assessment of the potential NPP equipment modification to prevent or mitigate the severe accident consequences.

Customer: CEZ, a.s.

Location: CEZ – Dukovany NPP | Implementation: 2011–2012

Development of computational models and their application for operational and transition conditions

Analysis of the I&C system performance after unit power up-rating

Technical support provided to the fuel supplier of Temelin nuclear power plant to assess the impact of power up-rating on I&C system performance. The necessary setpoint modifications of I&C system were proposed considering especially limitation system.

Customer: TVEL (Russian Federation)

Location: CEZ – Temelin NPP | Implementation: 2011–2012

Thermal stress analysis of the hermetical lining of the spent fuel pool

Thermal stress evaluation and its influence to the leak tightness and operating lifetime of the hermetical lining of the spent fuel pool at Temelin NPP. The CFD (Computational Fluid Dynamics) code FLUENT outputs were used for subsequent structural calculations of the hermetic lining.

Customer: UJV Rez, a.s.

Location: CEZ – Temelin NPP | Implementation: since 2011

Technical support of the development and updating of the Accident Management procedures

Elaboration of the preliminary and validation thermohydraulic analyses used for Accident Management (AM) procedures applied at the Czech NPPs. The technical support provided to NPP operator also includes elaboration of training materials, NPP personnel training and participation at the full-scope simulator training. AM procedures are continuously reviewed and updated according to the realized modifications of the NPP equipment and/or power up-rating.

Customer: CEZ, a.s.

Location: CEZ – Dukovany NPP, Temelin NPP

Implementation: 1998–2012

Research and development

Centre for Research and Experimental Development of Reliable Energy (CESEN)

TES s.r.o. participates in the project contributing – mainly to the research and development of a complex system for processing diagnostic information and evaluation of the components of power systems. The project is being implemented within the framework of the Programme of the Technology Agency of the Czech Republic, which aims to ensure sustainable development of – safe, reliable and economically available fossil and nuclear energy sources. -. Activities of the Centre are supported from financial resources of the state budget to R&D.

Customer: Technology Agency of the Czech Republic

Location: Czech Republic | Implementation: 2012–2019

Research and development of advanced methods for testing of electrical equipment of nuclear and fossil fuel power units during commissioning

It is a research and development and subsequent optimization of the complex set of measuring methods, -available resources – of measured signals, a method of recording and evaluation signals allowing to assess – correctness of the behavior of electrical equipment or its part during proposed tests. This project is realized with financial support from the state budget of the Ministry of Industry and Trade.

Customer: Ministry of Industry and Trade of the Czech Republic

Location: Czech Republic | Implementation: 2013–2015

Research and development of the discharge activity detection methods in oil transformers

Design and development of innovative measuring methods of partial discharge activity and diagnostic methodology for evaluation of oil transformers operating condition. Design and development of the sensor, which is used to detect the electromagnetic pulses in UHF band accompanying the discharge activity, including mathematical processing of sensor signals. Identification of the intensity, location and frequency of discharges. The results will enable prediction of potential transformer malfunctions.

Customer: Ministry of Industry and Trade of the Czech Republic

Location: Czech Republic | Implementation: since 2013

Validation of the TRACE code for VVER reactors

TRACE validation was performed on the basis of data from the integral experimental facility PSB-VVER and real plant data from VVER-440 and VVER-1000 units. The validation enables to use the TRACE code for the application of the safety analyses of VVER type reactors being operated in the Czech Republic.

Customer: Ministry of Industry and Trade of the Czech Republic
Location: Czech Republic | **Implementation:** 2008–2010

Application of CFD codes for the nuclear reactor flow research

Research of the flow inside the reactor pressure vessel based on the outputs from the experimental measurements and key thermohydraulic effect analysis by CFD codes. The research enabled to develop strategies, procedures and methods for safe and effective reactor cooldown under accident conditions. The main aim of the project was to enhance the operating safety of the unit, reduction of the radiation risk during the potential accident, development and upgrading of the system thermohydraulic codes for NPP.

Customer: Ministry of Industry and Trade of the Czech Republic
Location: Czech Republic | **Implementation:** 2004–2007

Diagnostic systems

TACIS project – Branch diagnostic system in Concern Rosenergoatom

Development and supply of the branch diagnostic system for NPPs operated by Concern Rosenergoatom. The system provides the diagnostic data collection from various sources at NPP, their processing and recording to the central database at NPP site and their transfer to the Concern diagnostic centre in Moscow. The system also defines criteria for the selection of diagnostic methods and procedures for mitigation of potential safety risks.

Customer: European Commission
Location: Concern Rosenergoatom – Moscow, Kalinin NPP (Russian Federation)
Implementation: 2009–2011

TACIS project – Development of the Hydrogen Monitoring and Removal System for VVER reactors

Development of the system for measurement of the hydrogen concentration and its safe removal from the VVER-1000 containment under the severe accidents conditions. The system includes monitoring system and passive catalytic hydrogen recombiners facilitating flameless hydrogen burning.

Customer: European Commission
Location: Concern Rosenergoatom – Moscow, FEI Obninsk (Russian Federation)
Implementation: 2007–2009

On-line diagnostic system MOSAD®-MST for the oil transformers

Development, manufacturing, implementation and operating of MOSAD®-MST system, which is used for on-line diagnostics of the oil transformers. The system provides information on the transformer conditions and potential developing malfunction. The system functions include measurement of selected parameters (gas concentration dissolved in the oil, currents, voltages, power, capacitance, overvoltage, temperatures, partial discharge, etc.), visualisation of actual and historical data, temperature model, alarm system and the self-diagnostics.

Customer: I&C Energo, a.s.
Location: CEZ – Dukovany NPP, Temelin NPP
Implementation: since 2008

The secondary equipment for hydrogen and oxygen capacity measurements

Development and manufacturing of the secondary equipment for hydrogen and oxygen monitoring system used for severe accident management. The secondary equipment provides the power supply, hydrogen and oxygen sensors control including digitalization of measured values and their transfer to the central control unit.

Customer: RET (Russian Federation)
Location: Moscow (Russian Federation)
Implementation: since 2007

On-line diagnostic system MOSAD®-5 for the electrical equipment

Development, manufacturing, implementation and operation of the modular system MOSAD®-5 (Monitoring System of Analogue and Digital signals). The system continuously monitors the operation of complex electrical equipment and systems. The system records fast transient and failure events and identifies the failure sources.

Customer: CEZ, a.s.
Location: CEZ – Temelin NPP, Dukovany NPP
Implementation: since 2006

On-line diagnostic system MOSAD®-IRIS for generator brush gear

Development, manufacturing, implementation and operation of MOSAD®-IRIS diagnostic system enabling continuous measurement of the DC currents flowing through the brushes. The system identifies developing malfunction of the brush gear and prevents its failure due to timely information to operator.

Customer: CEZ, a.s.
Location: CEZ – Temelin NPP | **Implementation:** since 2005

Data interfaces of MOSAD®-5 system

Development and implementation of special data interfaces extending the scope of data directly measured by MOSAD®-5 by data from external protection, control and diagnostic systems.

Customer: CEZ, a.s.
Location: CEZ – Dukovany NPP, Temelin NPP
Implementation: since 2005

Advisory and consulting services

New nuclear power plant units

Review of the tender documentation requirements relating to new nuclear power plant units in the period of documentation development and clarification.

Customer: CEZ, a.s.
Location: CEZ – Temelin NPP | **Implementation:** 2008–2011