

Convention on Nuclear Safety 7th Review Meeting – 2017



International Atomic Energy Agency IAEA, Vienna

Country Review Report for Czech Republic

Drafted by Country Group 6

Republic of Korea, United Kingdom, Czech Republic, Bulgaria, Italy,
Indonesia, Luxembourg, Paraguay, Singapore, Albania, Chile

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Final version

DISCLAIMER: Per INFCIRC 571, Revision 7, Para. 16-19 and Annex IV, Contracting Parties were invited to comment on the implementation of the CNS reporting guidance. Contracting Parties were also encouraged to submit proposed Good Practices, Challenges, and Suggestions prior to the Review Meeting. The draft Country Review Report documents the preliminary observations identified by the Contracting Parties. The Country Review Report is the result of the CNS Review Process and was agreed by consensus by the Country Group.

Glossary

A **Challenge** is “a difficult issue for the Contracting Party and may be a demanding undertaking (beyond the day-to-day activities); or a weakness that needs to be remediated.”

A **Suggestion** is “an area for improvement. It is an action needed to improve the implementation of the obligations of the CNS.”

A **Good Practice** is “a new or revised practice, policy or programme that makes a significant contribution to nuclear safety. A Good Practice is one that has been tried and proven by at least one Contracting Party but has not been widely implemented by other Contracting Parties; and is applicable to other Contracting Parties with similar programmes.”

An **Area of Good Performance** is “a practice, policy or programme that is worthwhile to commend and has been undertaken and implemented effectively. An Area of Good Performance is a significant accomplishment for the particular CP although it may have been implemented by other CPs.”

Executive Summary

The Czech Republic has **6 nuclear power reactor units** in operation (at 2 locations), with 4 VVERs (440/213) in Dukovany NPP and 2 VVERs (1000/320) in Temelin NPP.

The Czech Republic voluntarily reports on its research reactors.

3 out of 6 Challenges from the **6th Review Meeting** have been closed; the remaining 3 are ongoing.

The Country Group highlights the following measures to **improve safety** in the national nuclear programme of the Czech Republic:

- The new Atomic Act came into force in January 2017. The new Act aims to reflect the experience of 20 year application of the existing act, the recommendations from international institutions such as the IAEA, updated EU Directives.
- Based on the stress tests, several measures were taken for existing NPPs, such as the diversification of the SG feed water system. The progress of such improvements was reviewed under the EU framework in April 2015.
- In 2015, the suppliers' systematic misconduct in the in-service inspections over welded joints was found and led to the extraordinary shutdown of Dukovany NPP Units 2 and 3, and significant extension of the outage of unit 1. The operators analyzed and improved suppliers' organizational structure and inspections. The improvements of SÚJB's inspections are now under discussion.

The Country Group took note of the fact that Czech Republic received **9 international peer review missions** in the past three years, such as IRRS mission in November 2013, several OSART missions. However, the Czech Republic does not report on the measures taken in response to these missions, while it explains that the SÚJB is preparing the internal Action Plan in order to address the IRRS recommendations in 2016. The follow-up IRRS mission is not planned yet.

The Czech Republic participated in the post-Fukushima activities led by ENSREG and the IAEA. The National Action Plans that resulted from these assessments and their progress have been reported and published on the regulator's website.

The Country Group identified the following Challenges for the Czech Republic:

- **Challenge 1:** Completion of actions related to “welds case”
- **Challenge 2:** Establishment of a new set of regulatory guides, in accordance with the new legislation
- **Challenge 3:** Recruitment of new staff and training of the staff based on human resource strategy, for both regulator and operator
- **Challenge 4:** Completion before 2022 of research and analytical activities related to prevention and mitigation of potential Temelin NPP core melt accidents
- **Challenge 5:** Completion of new Integrated Management System for the regulatory body.

In addition the country group identified no Suggestions, 2 Area of Good Performance and no Good Practices.

- **Area of Good Performance 1:** The bilateral cooperation with neighbouring countries, through for example innovative data exchange, emergency preparedness exercises, thematic workshops.

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- **Area of Good Performance 2:** Czech Republic timely issued a comprehensive package of legislation that implemented the Fukushima lessons learned, relevant latest EU directives, IAEA safety standards and WENRA reference levels.

The Country Group concluded that the Czech Republic:

- Submitted a National Report, and therefore complies with Article 5 and in time following Rule 39 of INFCIRC/573 Rev. 6.
- Attended the 7th CNS Review Meeting, and therefore complies with Article 24.1
- Held a national presentation and answered questions, and therefore complies with Article 20.3

1. Basic Information on the Nuclear Programme of Czech Republic

The Czech Republic has 6 NPPs in operation, with 4 units (VVER 440/213) in Dukovany NPP and 2 units (VVER 1000/320) in Temelín NPP. The Dukovany NPP started the commission for unit 1 in 1985, unit 2 in 1986, and units 3 and 4 in 1987. 2 units in Temelín NPP started into operation in 2004.

Preparations for the siting and construction of one nuclear unit at the Temelín NPP site and one unit at the Dukovany NPP site are ongoing.

The Czech Republic has three research reactors, Interim Spent Fuel Storage Facilities in Dukovany and Temelín NPPs and Radioactive Waste Repository.

The SÚJB is a regulatory body, which was established in 1993 and its mandate was further extended later in the Atomic Act.

Original expected lifetime of Dukovany NPP was 30 years (from 1985 or unit 1, 1986 for unit 2 and 1987 for units 3 and 4). Operating permit for “long term operation” for unit 1 has been issued in 2016. Application for LTO for unit 2 has been received and for units 3 and 4 an application is expected shortly.

The Licensee decided to stop the Temelin NPP unit 3, 4 project on the basis of Czech Government recommendation. The project is frozen since the date of the Site Permit (10/2014, valid till 01/2018).

A bidding process for new units at Dukovany NPP site is being prepared, including application for siting permit.

2. Follow-Up from previous CNS Review Meeting

2.1 Challenges and suggestions

The Czech Republic provided the following updates on the Challenges identified during the 6th CNS Review Meeting.

Challenge 1:

To implement Post Fukushima Action Plan on Strengthening Nuclear Safety

- New diversified and mobile systems installed for providing coolant to reactors and spent fuel pools as well as for power supply
- Accident management arrangements improved
- Conducting research activities for preventing and mitigating core melt accidents in Temelin NPP, with a view to completing the measures by 2022

Follow Up Status: most issues are closed; Temelin NPP core melt accidents solution – research and analytical activities are in progress – deadline is in 2022

Challenge 2:

Consistent and comprehensive updating Czech legislative and regulatory framework, and developing new regulations and guides according to the new IAEA standards.

The new nuclear law (Atomic Act No. 263/2016 Coll. and 22 decrees) came into force in 1 January 2017.

The new Act aims to reflect the experience of 20-year application of the existing act, the recommendations from international institutions such as the IAEA and updated EU Directives.

Follow Up Status: Open (in progress)

Challenge 3:

Further development and implementation of Integrated Management System as raised in the IRRS mission.

- First phase: Strategy and Manual of new Integrated Management System were established
- Second phase: development partial strategies (e.g. crisis communication, human resources development) are being developed, and components of the current SÚJB Management System are being transformed into the new framework;
- Third phase: completion of new IMS is planned

Follow Up Status: Open (In progress)

Challenge 4:

Development of a long-term strategy for human resources, including hiring new staff and knowledge management to transfer knowledge of experienced personnel to the new generation.

A long-term strategy for human resources still remains a priority for the State Office for Nuclear Safety; its preparation is currently in the final stage. Preparation of the Strategy has been impacted by the necessity of implementation of a new state service act. Within the preparation of the Strategy, the internal regulation VDS 039 - the system of training, education and assessment of employees of the State office for nuclear safety has been updated. Competency profiles have also been created, and the competency maps are being newly processed.

Follow Up Status: Open (In progress)

Challenge 5:

To continue enhancing the independence of technical support in the nuclear safety field

- New branch in the area of safety of nuclear installations was created under the existing SÚRO Institute and started operation from January 2017, following the approval by Ministry of Education for the modification of statute with new TSO branch in November 2016.
- SÚJB fully financed the new branch activities, and secured financial resources for 2017-2019.
- Head of new branch was appointed and staff is being recruited

Follow Up Status: Closed

Challenge 6:

Dukovany NPP long-term operation - renewal of nuclear license to be granted after PSR for further 10 years

Dukovany NPP U1 LTO license was granted with 98 licensing conditions, as no significant weaknesses found for the SSCs.

CEZ improved Ageing Management Review reports and changed its organisational structure in response to the „welds case“

Follow Up Status: Closed

3. Measures to improve safety

3.1 Changes to the regulatory framework and the national nuclear programme

The Country Group took note of the following changes to the regulatory framework and the national nuclear programme since the last Review Meeting.

- The new Atomic Act is in enforcement since in January 2017. The new Act aims to reflect the experience of 20-year application of the existing act, the recommendations from international institutions such as the IAEA, updated EU Directives.
- The Czech Republic reports on the following priorities:
 - Promotion of the awareness of safety culture
 - Increased emphasis on human resource development
 - Further training of radiation protection experts in emergency exposure conditions
 - Continuous assessment of the Dukovany NPP for LTO
 - Preparation for the follow-up IRRS mission
 - Increase of the SÚJB's credibility through open communication

3.2 Safety improvements for existing nuclear power plants

Safety issues:

The Country Group took notice of the following safety issues reported by the Czech Republic:

- **“Welds cases”**: In 2015, the suppliers' systematic misconduct in the in-service inspections over welded joints was found and led to the extraordinary shutdown of Dukovany NPP Units 2 and 3, and significant extension of the outage of unit 1. The operators analyzed the issue and several corrective measures were taken, among which the improvement of suppliers' organizational structure and inspections. Following this event, the Temelín NPP carried out special inspections over 30 selected welded joints, and found no defects. Improvements of SÚJB's inspections are now under discussion. The deficiencies affect several different systems, both in the nuclear and the non-nuclear parts of the plant, mainly small diameters piping with a low safety classification (safety class 3).
- A significant event at the Temelin NPP in 2015 was the loss of primary coolant in the secondary circuit at Temelin NPP unit 2, through SG No. 4 (INES 1, as rated by the operator). In terms of radiation protection, the event had limited impact in the working areas (slightly increased dose rate of 0.25 µSv/hour in a certain area in the turbine hall) and on the roof (surface activity up to maximum value of 6 Bq/cm² was also detected in certain places on the roof of unit enclosed space in the surrounding of the outfall of the steam dump to atmosphere). The event had no impact on the vicinity of the NPP. The preliminary analysis of the event resulted in the requirement for preventive inspection on SG primary collector bleeding pipes for all SGs on Temelín NPP Unit 2, including material analyses. After outage, the unit was put into operation after replacement of the critical parts of SG primary collector bleeding pipes. Additional periodic inspections of the state of the pipes were proposed and their modification is under preparation.

Safety improvements:

The Country Group took note of the following implemented and planned safety measures for existing nuclear power plants in the Czech Republic:

Dukovany:

The assessment of equipment state and international activities in 1992-1997 resulted in MORAVA “Equipment Renovation Program” elaborated as a set of requirements on modification of Dukovany

NPP equipment, to ensure safe, reliable and economical operation.

A subgroup of activities with direct relation to fulfilment of SÚJB and IAEA requirements was selected from the MORAVA program. This subgroup is called Modernization Program and its most important project is the “I&C Renovation” – replacement of safety-important parts for digital systems, which was performed in parts during unit outages.

At Units 1 - 4, the renovation of Instrumentation and Control Systems of the parts important to safety is fully implemented. The renovation of the main equipment of Instrumentation and Control System using modern control facilities started on the Dukovany NPP Unit 3 in 2009 with completion in 2013; implementation on other units took place at the following intervals: Dukovany NPP Unit 1 – 2011 to 2015, Dukovany NPP Unit 2 – 2012 to 2015, Dukovany NPP Unit 4 – 2010 to 2014.

The National Action Plan prepared on the basis of the LTO project and Stress Tests is a new stage of further enhancement of safety level. Implementation of the identified actions is ongoing.

Temelin:

Assessment of the original design at Temelín NPP performed by Czech and Slovak specialists has been under way since the beginning of its construction. After 1989, the demand for construction of 4 Units was re-evaluated, and particularly, the level of nuclear safety assurance was assessed, taking into account experience from Western nuclear power plants. This assessment was carried out in the form of international missions aimed at independently assessing the original design and other aspects of the construction from the viewpoint of internationally recognized standards.

Based on these assessments, technical improvements were proposed, the implementation of which assured attainment of Western NPP standards for Temelín NPP. Recommendations were implemented in the form of amendment to the Basic and Detail design. The following may be mentioned as supporting improvements:

- Replacement of the I&C system, including its new design,
- Replacement of the nuclear fuel, including a new core design,
- Replacement of the original radiation monitoring system, including its design,
- Replacement and supplementing of the diagnostic system,
- Replacement of original cables with fire-proof and non-propagating fire ones,
- Significant changes in the electric part.

Fukushima lessons learned:

The IRRS mission in November 2013 reviewed the set of the measures adopted to strengthen the safety of nuclear power plants on the basis of lessons learned from the Fukushima Daiichi NPP accident. The IRRS mission noted that the Czech authorities have adequately assessed the lessons learned from the accident, and defined and scheduled the necessary corrective measures in both technical and legislative areas, as the National Action Plan for the strengthening of the safety of nuclear installations was adopted and in the implementation.

The PSA analysis was conducted with covering natural hazards such as earthquake and extreme weather conditions for Dukovany NPP.

Periodic re-evaluation of the characteristics of the area for Dukovany NPP and Temelín NPP is carried out in the framework of PSR, which takes place at ten-year intervals.

3.3 Response to international peer review missions

The Country Group highlights the following results of international peer review missions to the Czech

Republic:

The Czech Republic received nine peer review missions in the past three years

- IRRS mission in November 2013,
- Corporate OSART at CEZ in September 2013, follow up in May 2015
- Dukovany: OSART follow up in July 2013, WANO follow up in October 2014, SALTO mission in November 2014.
- Temelin: WANO follow up in February 2013, OSART follow up in May 2014, WANO in December 2015

The Czech Republic responded to these missions, including:

- The SÚJB started work on preparing the internal Action Plan and is still working to address these recommendations, in order to address the IRRS recommendations and suggestions.
- The NPP renovated their facilities as results of the international peer review missions and stress tests, such as a renovation of instrumentation and control system important to safety in 2009 to 2015 in Dukovany NPP, replacement of I&C system, nuclear fuel design, radiation monitoring system, and cables in Temelin NPP.

The Czech Republic participated in the post-Fukushima activities led by ENSREG and the IAEA. The National Action Plans that resulted from these assessments and their progress have been reported and published on the regulator's website.

4. Implementation of the Vienna Declaration on Nuclear Safety (VDNS)

On 9 February 2015, the Contracting Parties adopted INFCIRC 872, “Vienna Declaration on Nuclear Safety”, which is a commitment to certain principles to guide them in the implementation of the CNS’ objective to prevent accidents and mitigate their radiological consequences, should they occur. The Contracting Parties agreed to discuss the principles of the Vienna Declaration on Nuclear Safety in their National Reports and in the subsequent Review Meetings.

4.1 Implementation of the VDNS’s principle on new nuclear power plants

The first principle of the VDNS is:

“New nuclear power plants are to be designed, sited, and constructed, consistent with the objective of preventing accidents in the commissioning and operation and, should an accident occur, mitigating possible releases of radionuclides causing long-term off site contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions.”

- The Czech Republic reports that the legislation valid in the Czech Republic and its implementation in practice is compliant with the requirements of Article 18 of the Convention as well as the VDNS principles.
- The Czech Republic reports that SÚJB issued a decision in 2014 to license two new reactor units in the Temelín site after reviewing the application of ČEZ, although it later postponed that construction plan. It reports that licensing was made by taking into account the historically most significant phenomena in the vicinity of the site, as well as a combination of natural and human induced events, and that the requirements for the evaluation and its scope are in compliance with the VDNS principles.
- The requirements for the commissioning of nuclear installations in the Czech Republic as well as for all stages of their operation are laid down so as to avoid an accident with radiological consequences and in the case of its occurrence, to mitigate the consequences of such accident, which is in compliance with the main objective and principles of the VDNS.
- The new Czech nuclear legislation coming into force on 1 January 2017 does not distinguish between "existing" and "new" nuclear installations. It applies requirements to all nuclear installations, using a graded approach based on principles of practical elimination and reasonable practicability.

The Country Group made the following observations:

- Principle 1 of the VDNS has been properly considered and incorporated in Czech regulations.

4.2 Implementation of the VDNS’s principle on existing nuclear power plants

The second principle of the VDNS is:

“Comprehensive and systematic safety assessments are to be carried out periodically and regularly for existing installations throughout their lifetime in order to identify safety improvements that are oriented to meet the above objective. Reasonably practicable or achievable safety improvements are to be implemented in a timely manner.”

The Country Group made the following observations:

- The Czech Republic reports that the safety of the existing plants is reviewed through periodic safety review. The fundamental documents, which demonstrate the safety of nuclear power plants are continuously assessed (reports on Periodic Safety Review, Final Safety Analysis Report with its periodic revisions, documented implementations of the PSR corrective measures program and implementations of measures under the National Action Plan

formulated on the basis of the Stress Tests and the Dukovany NPP LTO Project). Periodic and continuous nuclear safety level re-assessment tools will be further strengthened in the new Atomic Act under preparation in force in 2017.

- The Czech Republic reports that the new Atomic act stipulates (as the old one also did) the obligation to implement “based on safety assessment (note: established by special Decree) reasonably and practically achievable improvements of safety level”.
- The new Czech nuclear legislation (which came into force on 1 January 2017) does not distinguish between "existing" and "new" nuclear installations.

The Country Group made the following observations:

- Principle 2 of the VDNS has been properly considered and incorporated in Czech regulations: PSR are required and reasonably practicable/achievable safety improvements are to be implemented in a timely manner.

4.3 Taking into account IAEA Safety Standards and other international Good Practices in the national requirements and regulations addressing the VDNS principles

The Czech Republic reports that the main safety principles created by IAEA have been implemented into the Czech atomic law since 1980's. In the new Atomic Act, and its implemented SÚJB Decrees, the IAEA Safety Standards requirements are implemented as a legal claim.

A number of IAEA recommendations is applied in safety assessment, in particular the following documents: SF-1., GSR Part 4, GS-G-4.1, SSG-2, SSG-3, SSG-4, IAEA-TECDOC-1106, INSAG-12, ISAG-3, Rev. 1., INSAG-25, SSG 25, NS-G-2.3, NG-T-1.1, IAEA-TECDOC-1141, IAEA-TECDOC-1329, NS-G-2.12, SRS No. 57 and SRS No. 82, and WENRA documents: WENRA Safety Reference Levels for Existing Reactors, Update in relation to lessons learned from TEPCO Fukushima Dai-ichi accident, 24 September 2014 and relevant guidance for the implementation of reference levels. By including the best international practice, in particular IAEA requirements, into Safety Guides, the objectives, formulated in the Principle 3 of VDNS, are fulfilled.

These requirements were also applied in the review for site licence of Temelín NPP Units 3 and 4 in 2013 and 2014. The new Atomic Act under preparation contains the requirement for practical elimination of an early and large release of radioactive materials in order to allow the implementation emergency measures.

The Country Group made the following observations:

- IAEA safety standards, as well as internationally recognized good practices, have been taken into account in Czech regulations.

4.4 Issues faced by Czech Republic in the implementation of the VDNS

The Czech Republic expects to face the following issues in applying the Vienna Declaration principles and safety objectives to its existing fleet or new builds of nuclear power plants:

- For existing NPP's:
 - Actualisation of NPP site parameters and threats
 - Development of severe accident management focused to molten core retention inside containment
- New plants:
 - how the design of new units offered on the market will be able to fulfil the requirements of new Czech legislation

5. Results of the Review

5.1 General Quality of the National Report

Contracting Parties and officers were invited to provide general comments on the Czech Republic implementation of the obligations of the CNS (e.g., report submitted on time), addressed all articles, addressed the Vienna Declaration on Nuclear Safety, and addressed all Challenges and Fukushima lessons learned, the general quality of its National Report, transparency issues, and the compliance with the CNS guidance documents and special peer review topics identified in the previous CNS Review Meeting or specified by the President of the CNS (use of the templates for articles 17 and 18 and reporting on the management of spent fuel on site and radioactive waste on site - especially for CPs not signatories of the Joint Convention).

With regards to the general quality of the National Report and transparency issues, the members of the Country Group made the following observations:

- The National Report is qualified to be comprehensive and reader friendly.
- The Czech Republic partially made voluntary use of the National Report template for Articles 17 and 18.
- The Czech Republic reports that it complies with the VDNS. The National Report does not give details about the regulatory requirements related to the implementation of the VDNS.
- The National Report does not give details about the responses to the recommendations by the international peer reviews.
- The National Report does not give details about the way it addressed the challenges identified at the 6th CNS review meeting.

With regards to the compliance with the requirements of the CNS and its Guidelines, the members of the Country Group made the following observations:

- The Report was submitted on time, before the deadline of 15 August 2016.
- The content and structure of Czech Republic National Report complies with the CNS guidance.
- The directions of the Summary Report of 6th Review Meeting were partially taken into consideration.
- The directions given by the President of the 7th Review Meeting were partially followed.

5.2 Participation in the Review Process

With regards to the participation of the Czech Republic participation in the Review process, the members of the Country Group made the following observations. The Czech Republic:

- posted questions to Contracting Parties.
- delivered answers to the questions of Contracting Parties on time.
- delivered its national presentation.

5.3 Challenges

The Country Group identified the following Challenge(s) for the Czech Republic.

➤ **Challenge 1:** Completion of actions related to “welds case”

During the second half of 2015, significant weaknesses in the performance of non-destructive testing (NDT) became evident at both nuclear power plants.

Safety assessment was carried out for all nuclear units to assess the state of nuclear equipment with identified deficiencies demonstrating that even if any weakness is identified, it is possible to operate units safely until dates for settlement of deficiencies. The challenge concerns:

- To finish new NDT inspections and the repairs of the welds concerned by „weld issue“
 - Keeping the risks connected with all of the welds repairs under the control
 - Ensuring a sufficient number of qualified personnel
 - Introducing and keeping the appropriate quality management system of supervision under the suppliers
 - Ensuring of the in-house knowledge
 - Restriction on levels of supply chains
 - Safety culture of all involved parties
 - SUJB side specifically:
 - Increasing the number of expert support (TSOs)
 - Improving targets of inspection on regulatory side (transition from routine to deep inspections)
- **Challenge 2:** Establishment of a new set of regulatory guides, in accordance with the new legislation
- Dialogue with key stakeholders, through workshops, meetings, conferences, or social media
 - Changes in SÚJB management system documents
- **Challenge 3:** Recruitment of new staff and training of the staff based on human resource strategy, for both regulator and operator
- Recruitment of new staff and training of the staff based on human resource strategy in the new SÚJB IMS document (March 2017), since the number of aged staff has been increasing.
- **Challenge 4:** Completion before 2022 of research and analytical activities related to prevention and mitigation of potential Temelin NPP core melt accidents
- **Challenge 5:** Completion of new Integrated Management System for the regulatory body.

5.4 Suggestions

The Country Group identified no Suggestions for the Czech Republic.

5.5 Good Practices and Area of Good Performance

During the peer review of the Czech Republic National Report, the Contracting Parties were invited to recommend Good Practices and to highlight Area of Good Performance.

The Country Group identified no Good Practices.

- **Area of Good Performance 1:** The bilateral cooperation with neighbouring countries, through for example innovative data exchange, emergency preparedness exercises, thematic workshops.
 - In accordance with bilateral intergovernmental agreements concluded with the Federal Republic of Germany and with Austria, the Czech Republic submits to the state bodies of these countries information on its nuclear installations in border regions.
 - Information is transferred regularly, at periodic bilateral meetings (annual meetings), and irregularly, within the agreed meetings, or in writing.
- **Area of Good Performance 2:** Czech Republic timely issued a comprehensive package of legislation that implemented the Fukushima lessons learned, relevant latest EU directives, IAEA safety standards and WENRA reference levels.

6 Fulfilment of CNS Review Requirements

The Country Group concluded that the Czech Republic

- Submitted a National Report, and therefore complies with Article 5 and in time following Rule 39 of INFCIRC/573 Rev. 6.
- Attended the 7th CNS Review Meeting, and therefore complies with Article 24.1
- Held a national presentation and answered questions, and therefore complies with Article 20.3