



Preparatory activities of the Czech regulatory body for SMR licensing

Michaela Ratajova

Director of Nuclear Safety Assessment Department

State Office for Nuclear Safety

Czech Republic

michaela.ratajova@sujb.gov.cz

Regional Workshop on Safety Benefits and Challenges in the Development of the Adoption of Small
Modular Reactors

31 March - 4 April 2025, Daejeon, Republic of Korea



Outline

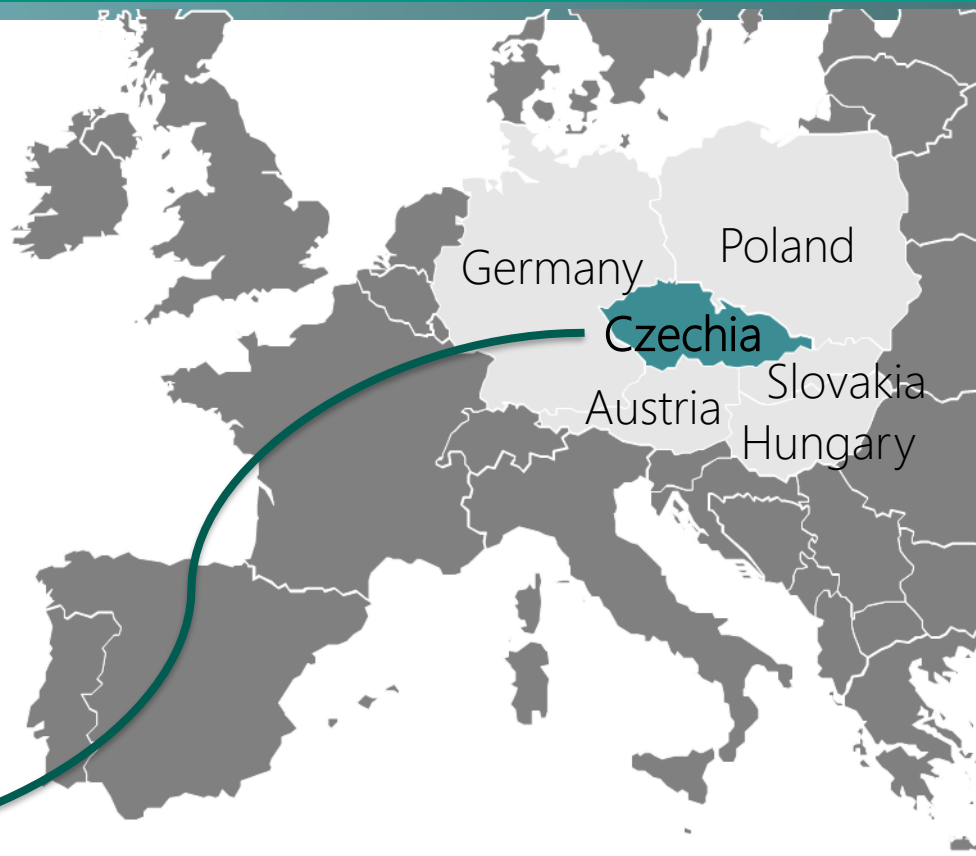
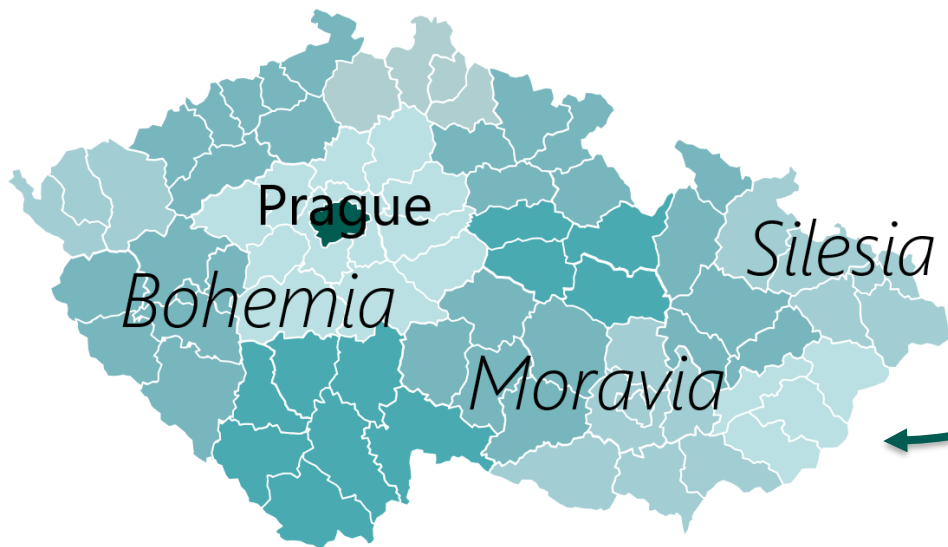
- Czech nuclear profile
- Regulatory body of the Czech Republic
- Licensing proces
- SMR related activities
 - Legal basis
 - Staff and knowledge management
 - National activities
 - International activities



CZECH NUCLEAR PROFILE



Geography

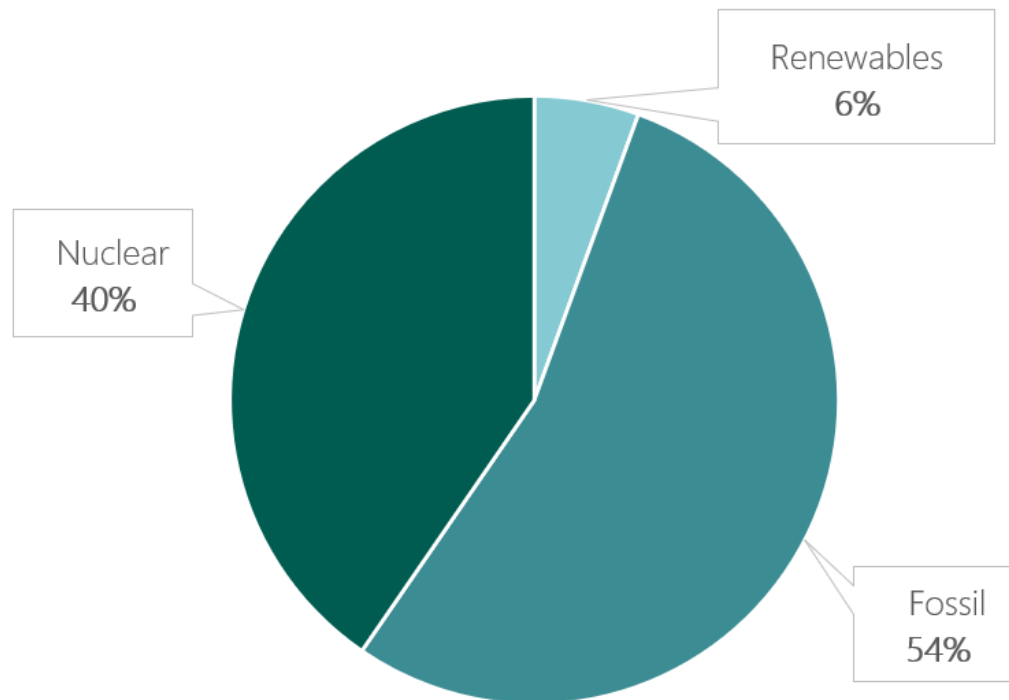




Energy resources

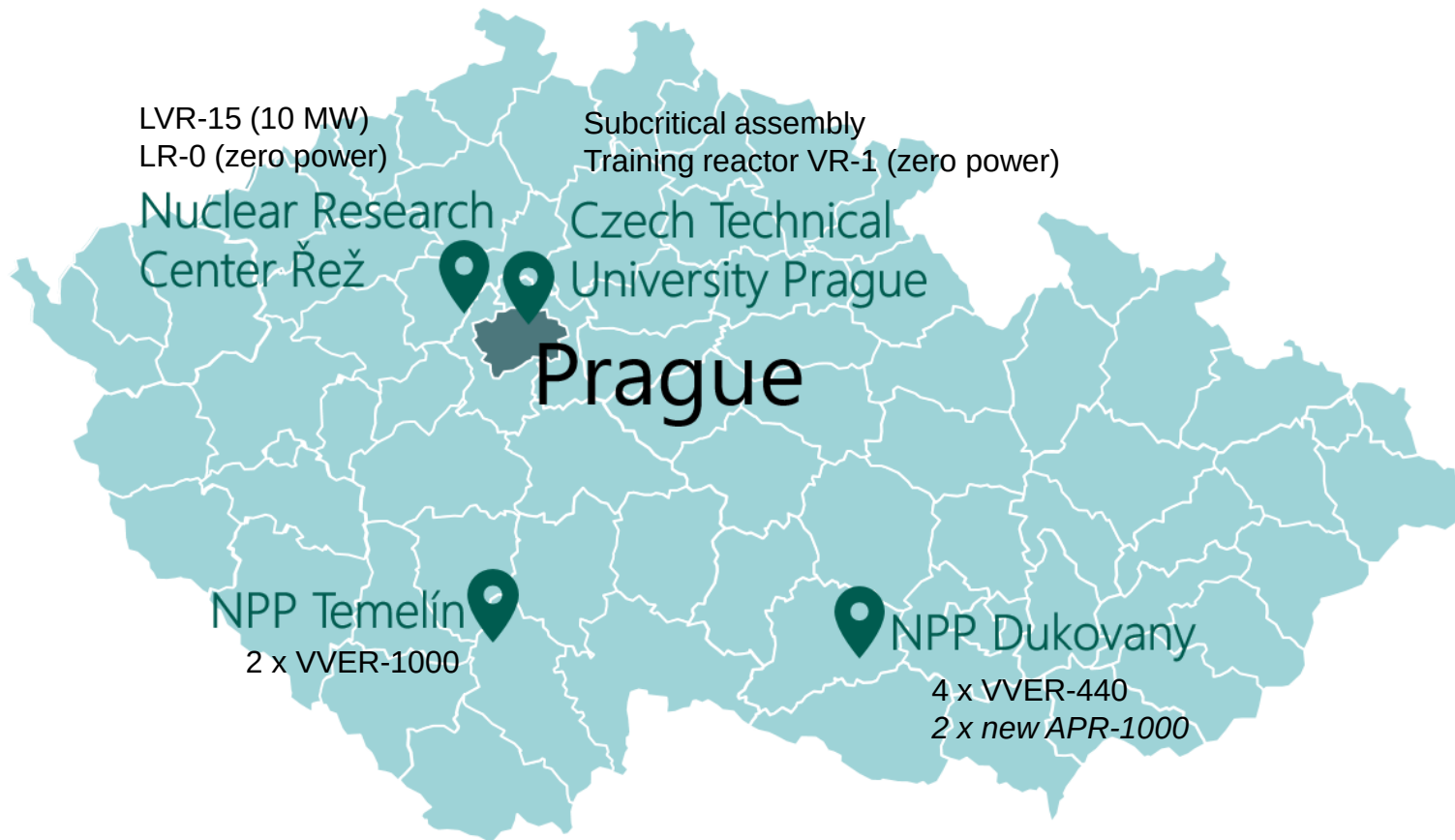
National residual mix 2021

Energy sources	
Renewables (total)	5,56%
- solar	1,65%
- wind	0,00%
- hydro	0,61%
- geothermal	0,00%
- biomass	3,31%
- others	0,00%
Fossil (total)	54,03%
- lignite	43,89%
- hard coal	0,00%
- natural gas	9,89%
- oil and petroleum products	0,12%
- secondary sources and others	0,12%
Nuclear (total)	40,41%





Nuclear instalations with a nuclear reactor



Nuclear facilities – key facts

Site	Nuclear installation	No. of units	Type	Commissioning	Operator
Dukovany	NPP	4	VVER 440/213	1985-1987	ČEZ
	Interim Spent Fuel Storage Facility	1		1995	ČEZ
	Spent Fuel Storage Facility	1		2006	ČEZ
	Radioactive Waste Disposal Facility	1		1995	SÚRAO
Temelín	NPP	2	VVER 1000/320	2000-2004	ČEZ
	Spent Fuel Storage Facility	1		2010	ČEZ
	Fresh Fuel Storage Facility	1		2000	ČEZ
Řež	Research Reactor	1	LVR 15	1972	CV ŘEŽ
	Research Reactor	1	LR-0	1995	CV ŘEŽ
	Spent fuel and high level waste storage facility	1		1997	ÚJV ŘEŽ
Prague	Training Reactor	1	VR-1	1992	ČVUT
	Subcritical Assembly	1	VR-2	2025	ČVUT
Litoměřice	Radioactive Waste Disposal Facility RICHARD	1		1964	SÚRAO



Nuclear power plants

- Dukovany NPP – LTO regime, 2x power uprate
- Temelin NPP – preparing for LTO

Source: IAEA Power Reactor Information System, and CEZ

Facility Name		Dukovany NPP			
Location		Dukovany			
Owner		CEZ			
Operator		EDU			
Reactor Supplier		SKODA			
Reactor Typy		WWER 440 213			
Net Capacity		4 x 500 MW			
	Status	Construction started	First criticality	First grid connection	Commercial operation
Unit 1	Operational	1 Jan 1979	12 Feb 1985	24 Feb 1985	3 Nov 1985
Unit 2	Operational	1 Jan 1979	23 Jan 1986	30 Jan 1986	21 Sept 1986
Unit 3	Operational	1 Mar 1979	28 Oct 1986	14 Nov 1986	20 July 1987
Unit 4	Operational	1 Mar 1979	1 June 1987	11 June 1987	19 Jan 1988

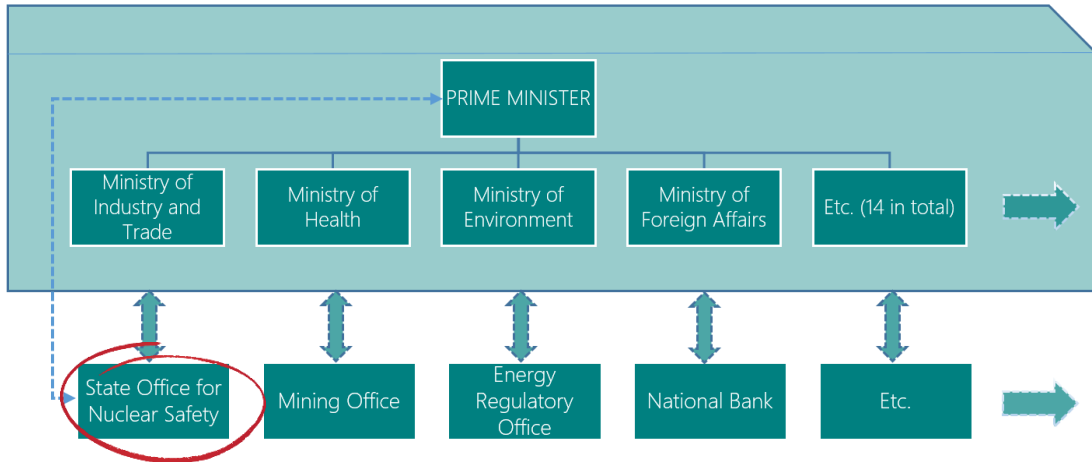
Facility Name		Temelín NPP			
Location		Temelín			
Owner		CEZ			
Operator		ETE			
Reactor Supplier		SKODA			
Reactor Typy		WWER 1000			
Net Capacity		2 x 1000 MW			
	Status	Construction started	First criticality	First grid connection	Commercial operation
Unit 1	Operational	1 Feb 1987	1 oct 2000	1 Dec 2000	1 May 2001
Unit 2	Operational	1 Feb 1987	1 Jan 2002	1 Mar 2002	1 Aug 2002



REGULATORY BODY OF THE CZECH REPUBLIC



State Office for Nuclear Safety (SÚJB)

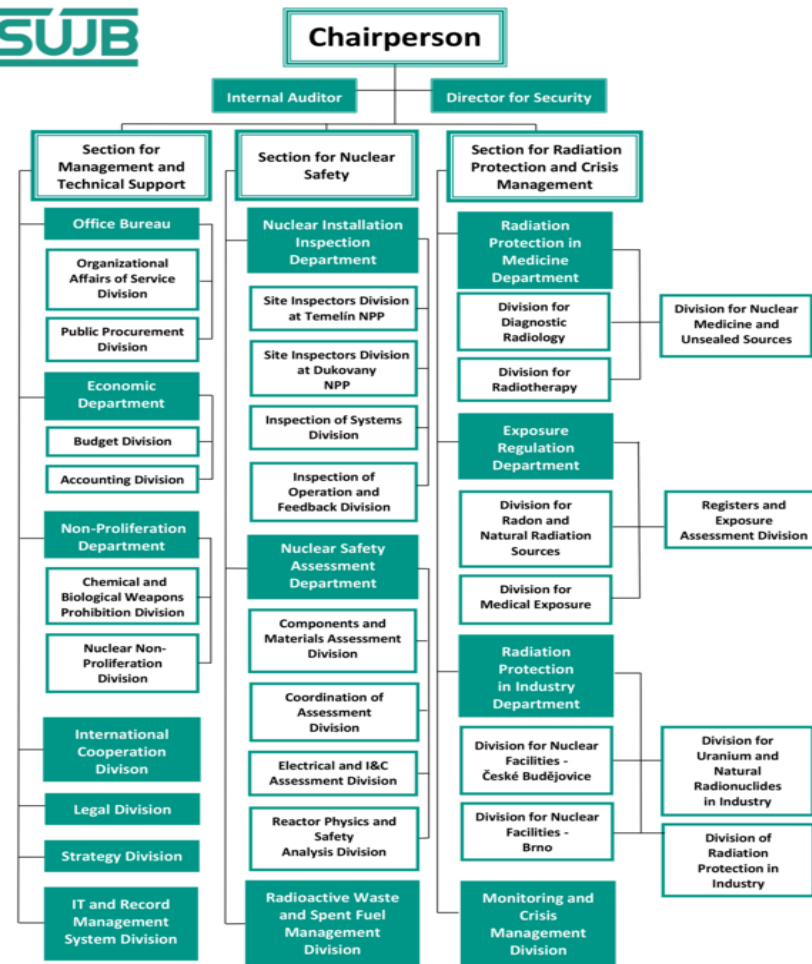


- ✓ Central administrative (governmental) body - powers and duties comparable to a ministry
- ✓ Head of the SÚJB – chairperson
- ✓ Powers enumerated by law (Atomic Act)
- ✓ Authority to issue decrees (implementing procedures to Atomic Act)



SÚJB – structure

- 3 sections
 - ✓ Section for management and technical support
 - bureau, economics, legal,..
 - non-proliferation
 - ✓ Section for nuclear safety
 - nuclear safety, technical safety, nuclear security
 - ✓ Section for radiation protection and Crisis Management
 - radiation protection, emergency preparedness
- Staff
 - cca 205 in total
 - cca 65 in Section for Nuclear Safety



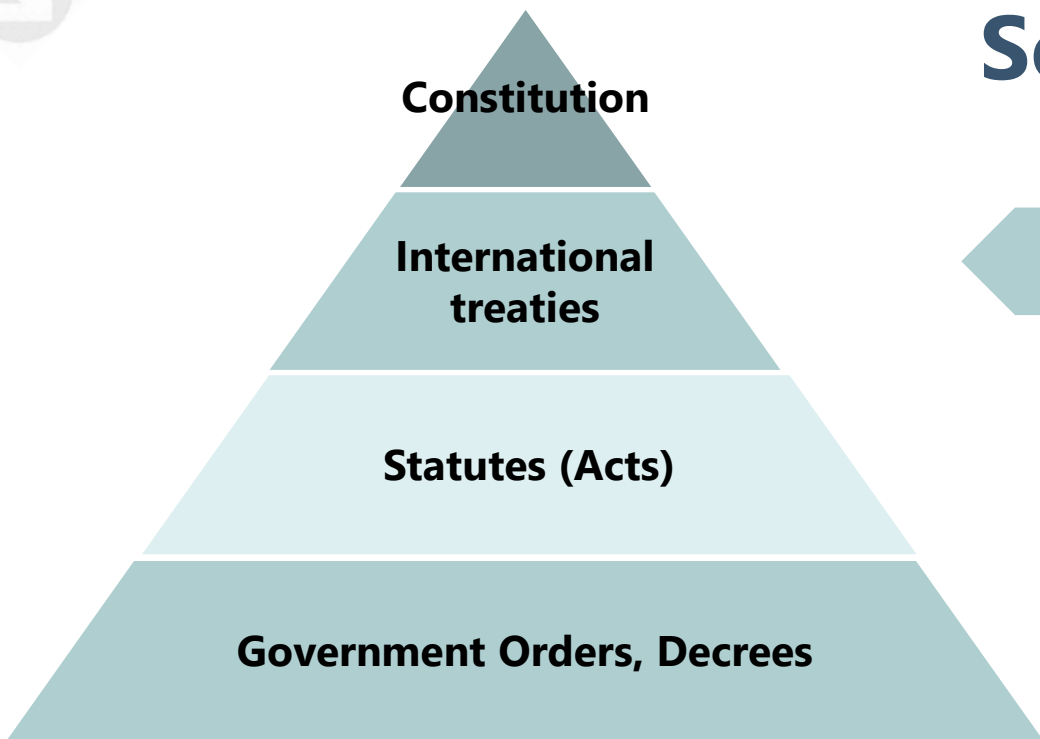
2 supporting organizations – TSOs

- **National Institute for Nuclear, Chemical and Biological protection (SÚJCHBO)**
- **National Radiation Protection Institute (SÚRO)**
 - TSO in nuclear activities (support in assessment, inspections, safety analyses, etc.)



-
- | | |
|--|--|
| <ul style="list-style-type: none"> ✓ Public scientific research institutions ✓ established by SÚJB | <ul style="list-style-type: none"> ✓ at least 50 % of activities – research ✓ director appointed by SÚJB chairperson |
|--|--|

Sources of Czech law



CNS, *CPPNM*, CENNA, CACNARE, NPT,....

Atomic Act (AA), Criminal Code,

SUJB Decrees

Legaly non-binding

Regulatory Guides

Codes, Standards



Legislation within the SÚJB's competences

- ✓ 3 Acts
 - Atomic Act (AA)
 - Act on some measures concerning chemical weapons prohibition
 - Act on some measures related to prohibition of bacteriological (biological) and toxin weapons
- ✓ 20 + 2 Decrees

Supportive acts used for SÚJB's activities

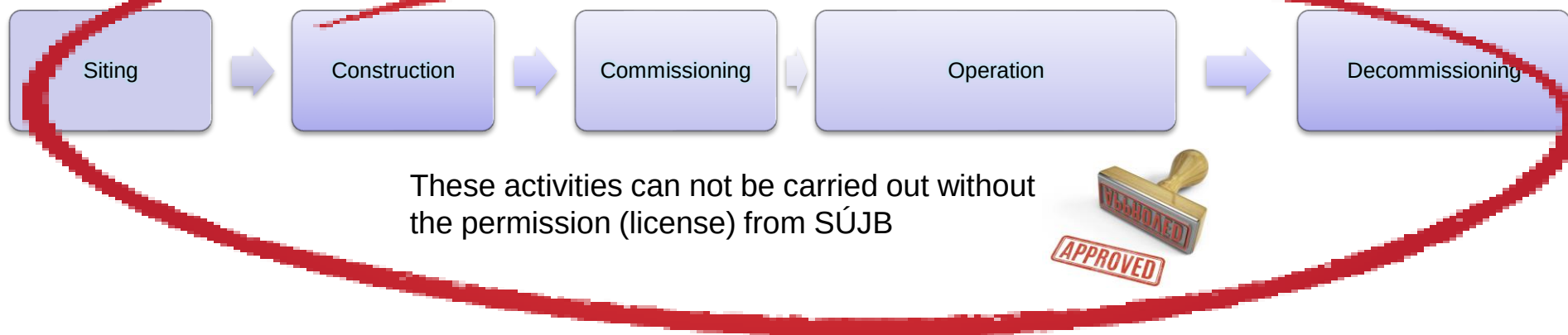
- | | |
|---------------------------|-------------------------|
| ✓ Administrative Code | ✓ Act on inspection |
| ✓ Criminal Procedure Code | ✓ Crisis Management Act |
| ✓ Building Act | ✓ Etc. |



LICENSING PROCESS



Licencing in Czechia



Relevant authorities involved (issuing various authorizations)

- Ministry of Environment (EIA Act)
- State Office for Nuclear Safety (Atomic Act)
- Ministry of Transport - Transport and Energy Building Authority (Building Act – Planning Permission, Building Permit)



SMR RELATED ACTIVITIES

LEGAL BASIS

Amendment of legal framework

Analytical Phase

Goal – to acquire relevant knowledge about designs and their life cycle

Tools

- Gathering information
- Site visits
- WS and conferences – NHSI, EU Pre-partnership
- Design assessment projects – NUWARD, GDA RR, BWRX

Regulatory Phase I

Amendment to the Atomic Act

- **Enhanced implementation of the graded approach principle**
- **Simplification of the licensing steps**
- **Pre-licensing information**
- **„General exclusion“ from legal requirements**

Entry into force on the 1st July 2025

Regulatory Phase II

Amendments to the Decrees

- Design
- Operation
- Technical Reqs. on SCC
- Safety Assessment
- Personnel

Expected entry into force on the 1st July 2025 or on the 1st January 2026

**Application and
Evaluation Phase**
2026+



Nuclear Law – Examples Of „New Approach“

Atomic Act § 228a

- (1) Upon request, SÚJB shall provide **preliminary information** on the criteria according to which it will assess the application for a decision or under what conditions the applications can be submitted.
- (2) SÚJB shall provide preliminary information within 180 days from the date of the request.
- (3) The provided preliminary information is valid for a maximum period of 2 years from the date of provision, unless otherwise limited by SÚJB.

Decrees

- Design requirements generalization
- Implementation of IAEA and WENRA recommendations/Safety Reference levels
- Inspiration from NUWARD JER, RR SMR GDA observation, other activities

Atomic Act § 228b

- (1) A person subject to a requirement set forth by this law regarding nuclear safety, radiation protection, technical safety, radiation monitoring, emergency management, security, or non-proliferation of nuclear weapons may request SÚJB to approve **an exemption** from such requirement.
- (2) SÚJB may approve an exemption under paragraph 1 if:
 - a) it is demonstrably impossible to fulfill the requirement set forth by this law under paragraph 1,
 - b) the procedure to be carried out based on the requested exemption is justified, and
 - c) the approval of the exemption will not lead to a reduction in the achieved and required levels of nuclear safety, radiation protection, technical safety, radiation monitoring, emergency management, security, and non-proliferation of nuclear weapons, and will be carried out in accordance with best practices.
- (3) SÚJB may revoke the approved exemption by decision if:
 - a) the person to whom the exemption was granted has seriously violated the obligations set forth by this law or has not rectified serious deficiencies in activities identified by SÚJB,
 - b) the conditions relevant to the approval of the exemption under paragraph 2 are no longer met, or
 - c) the person to whom the exemption was granted has requested in writing the revocation of the exemption.



SMR RELATED ACTIVITIES STAFF AND KNOWLEDGE MANAGEMENT



Staff and knowledge management

- SÚJB – plan to increase capacities – also for SMRs
 - 52 new staff members – during upcoming 3 years (3 phases)
 - new department for licensing of new nuclear installations to be created
 - enhancing capacities of TSO
- Introduction of adjusted training program - focused on
 - sharing of knowledge/experience in general aspects (procedures, methodologies, legal requirements)
 - training in SMR specific issues (designs, new approaches to processes and nuclear related activities, incl. suppliers' chain)
 - Study tour (SMR designs on the list of CEZ company) (2022)
 - RR SMR seminar (February 2025)
 - BWRX-300 seminar (July 2024)
 - Numark Associates, Inc – 1 year (2025) training program focused on BWRX-300. Supported by the U.S. State Department's Nuclear Expediting the Energy Transition (NEXT) program – currently stopped
 - Study tour – deployment of SMRs in USA (2 weeks, December 2024) to USA, supported by NEXT program
 - NUWARD JER, RR SMR GDA observation (see later)



SMR RELATED ACTIVITIES

NATIONAL ACTIVITIES



National level of work

- Working Group for the Applicability of Small and Medium-sized Modular Reactors in the Czech Republic:
 - The group has been under the Ministry of Industry and Trade since 10/2021,
 - representatives from all relevant stakeholders: ministries, SUJB, other central administrative authorities, TSO, nuclear research representatives, future possible vendors/operators, incl. heating and steel making companies, regions and municipalities,
 - collect information on needs and capabilities to prepare a policy for the use of SMRs,
 - share information between shareholders, to find possible use cases for SMRs, update the regulatory framework and accelerate the development of SMRs.
- Several R&D projects to:
 - identify possible gaps and obstacles in national regulatory and legal framework and to provide inputs for adjusting this framework – preparation of the safety guide for specific SMR licensing topics
 - support Czech R&D SMR-related projects (under the Technology Agency of the Czech Republic): Allegro SMR, Energy Well, Applicability of Small and Medium-Sized NR in the Energy Sector of the Czech Republic, etc.



SMR RELATED ACTIVITIES

INTERNATIONAL ACTIVITIES



International cooperation

- SÚJB (and its TSO) experts are involved in international activities in working groups that are largely related to the regulatory activities of SMRs and new technologies such as:
 - OECD NEA WGNT
 - WENRA WG SMRs
 - EU SMR Pre-Partnership (3 work streams)
 - IAEA SMR Regulators Forum
 - IAEA Nuclear Harmonization and Standardization Initiative
 - WENRA RHWG Working group on New Reactors and Small Modular Reactors
- SÚJB cooperates at the international level with other regulatory bodies:
 - new MoUs adopted involving cooperation in the field of SMRs
 - older MoUs of SÚJB contain provisions on sharing of knowledge on new technologies thus SMRs are included
- A selection of sub-topics for collaboration directly with ONR (British regulatory body) is currently being discussed - experience with GDA, SMR RR assessment



NUWARD Join Early Review (JER)

- JER Phase I (2022-2023), Phase II (2023-2025)

Goals

- to acquaint with a SMR design and identify the potential challenges that it raises prior to the beginning of a licensing process
- to share regulators' expectations, knowledge and practices about the identified topics
- to increase knowledge transfer about regulatory practices and expectations
- to provide EDF with an early feedback about its design and possible associated regulatory challenges

Working group

- regulatory bodies + TSOs of France, Czechia and Finland + Poland, Netherlands, Sweden



NUWARD Join Early Review (JER)

Selected Topics

- Definition of safety objectives
- Identification of “Design Basis Conditions” (DBC)
- Use of cooling passive systems in the safety analysis of DBC and Design Extension Conditions without severe fuel damage (DEC-A)
- Development plan of scientific computing tools
- Twin modules integration
- PSA methodology
- Design extension conditions management strategies
- Containment and radiological consequences assessment
- Criticality risk management
- Electrical and I&C systems architecture

Criteria for selection

- The topic brings answers on the expected level of safety
- SMR safety specific topic
- Late change would have a substantial impact
- Important complex feature of the safety demonstration which requires a lot of time to be developed and assessed
- Basic design phase regarding the topic has been completed



NUWARD Join Early Review (JER)

Metodology

- Providing documentation on the design
- Meetings of the vendor and regulators or of regulators only
- Development of questionnaires
- Reports presenting the results of the review

Lessons learned

- International standards (from IAEA or WENRA) are a very good harmonized reference but are not sufficient to provide a position other than an in-principle acceptability of a design or a safety approach
- The ability to openly share technical information was a key prerequisite for the JER
- The larger membership in phase two made the working process more challenging
- As the JER initiative does not lead to regulatory binding decisions, it enables to have more open discussions between the regulators and the vendor



NUWARD Join Early Review (JER)

Benefits

- Identification of safety challenges for licensing
- Discussions with the vendors enable the regulator to better understand the design and the safety challenges
- Possibility of comparing regulatory approaches
- Opportunity to consider evolutions of their national regulatory framework including the regulatory safety guides

Limits

- Generating interest is the first prerequisite for establishing such a forum.
- Availability of resources for both regulators and the vendor
- Synchronizing schedules of stakeholder
- Challenge of an expanded working group



NUWARD Join Early Review (JER)

Nuward decided to reconsider some key concepts of its SMR design during JER Phase II.

It was decided to maintain the programme of work considering the discussions were still very valuable for both the vendor and the regulators.



EDF simplifies Nuward SMR design

EDF subsidiary Nuward has relaunched the development of its small modular reactor after announcing last year that it planned to optimise the design.

New Nuclear - Tuesday, 7 January 2025

EDF to modify Nuward design to aid commercialisation

France's EDF plans to optimise the design of its Nuward small modular reactor design, focusing on existing and proven technologies. The move follows feedback from potential European customers in order to guarantee that project deadlines and budgets are met.

New Nuclear - Wednesday, 3 July 2024





RR SMR GDA observation

Goals

- Observe technical meeting within the Generic Design Assessment (GDA) of RR SMR and flag any high-lights or challenges against their own country specific requirements
- Observe of the Discuss the outcome of the IAEA Technical Safety Review of the RR SMR design
- Royce SMR view this proposal (to observe the GDA process) as an initial step in a continuing relationship in the deployment of the RR SMR.

Benefits of the process

- Providing early identification of any country-specific regulatory concerns,
- De-risking the project and reducing the regulatory licensing effort
- Creating trust and confidence in the credibility of the RR SMR design and suitability with local regulatory requirements.



RR SMR GDA observation

Working group

- Regulatory bodies of Czech Republic, Finland, Poland, Netherlands, Sweden

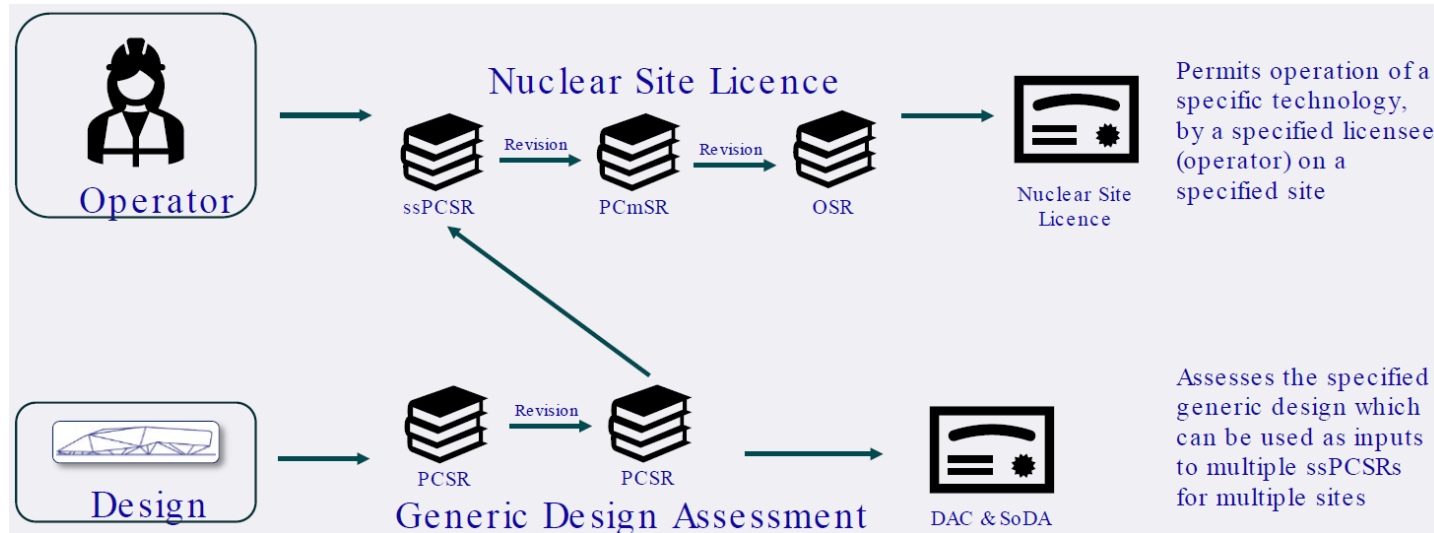
Metodology

- Kick-off meeting held in Manchester in September 2023
- On-line observation of technical meetings between RR SMR and regulator (step 2 of GDA)
- Possibility of raising queries, sharing insights of observing regulators (International Regulator Query Form)
- Providing of design documentation (export control license)
- Latest workshop in September 2024 – presentation of regulatory body observation results
- Currently on-line observation of technical meetings between RR SMR and regulator (step 3 of GDA)
- If appropriate, to present a joint public statement on the outcome



RR SMR GDA observation

- GDA consists of 3 Steps:
 - Step 1 assesses QA arrangements, security arrangements, readiness for GDA, familiarisation and training on the assessed design
 - Step 2 begins the detailed assessment of the safety, security, safeguards and environment cases including supporting documents
 - Step 3 continues and completes the detailed assessment including supporting documents and evidence set





RR SMR GDA observation

SÚJB's Approach

- Highlighting inconsistencies in documentation; Noting comments and remarks based on review; Assessing alignment with local legislation, codes, and standards; Summarizing questions raised during the review process. **The choice was based on the experts.**

Investigated Areas (by SÚJB):

- Containment and Civil Structures; Electrical Systems; External Hazards; Fuel and Core; PSA; Security; Severe Accidents; Waste Management
- Only minor inconsistencies found, **no red flags!**

Lesson learned

- Most of the review was based on documentation sent at the very end of GDA Step 2, giving us approximately 2 months for evaluation.



QUESTIONS?

