

# Preparing for the Future: Innovations and Education – Czech Nuclear Power Program

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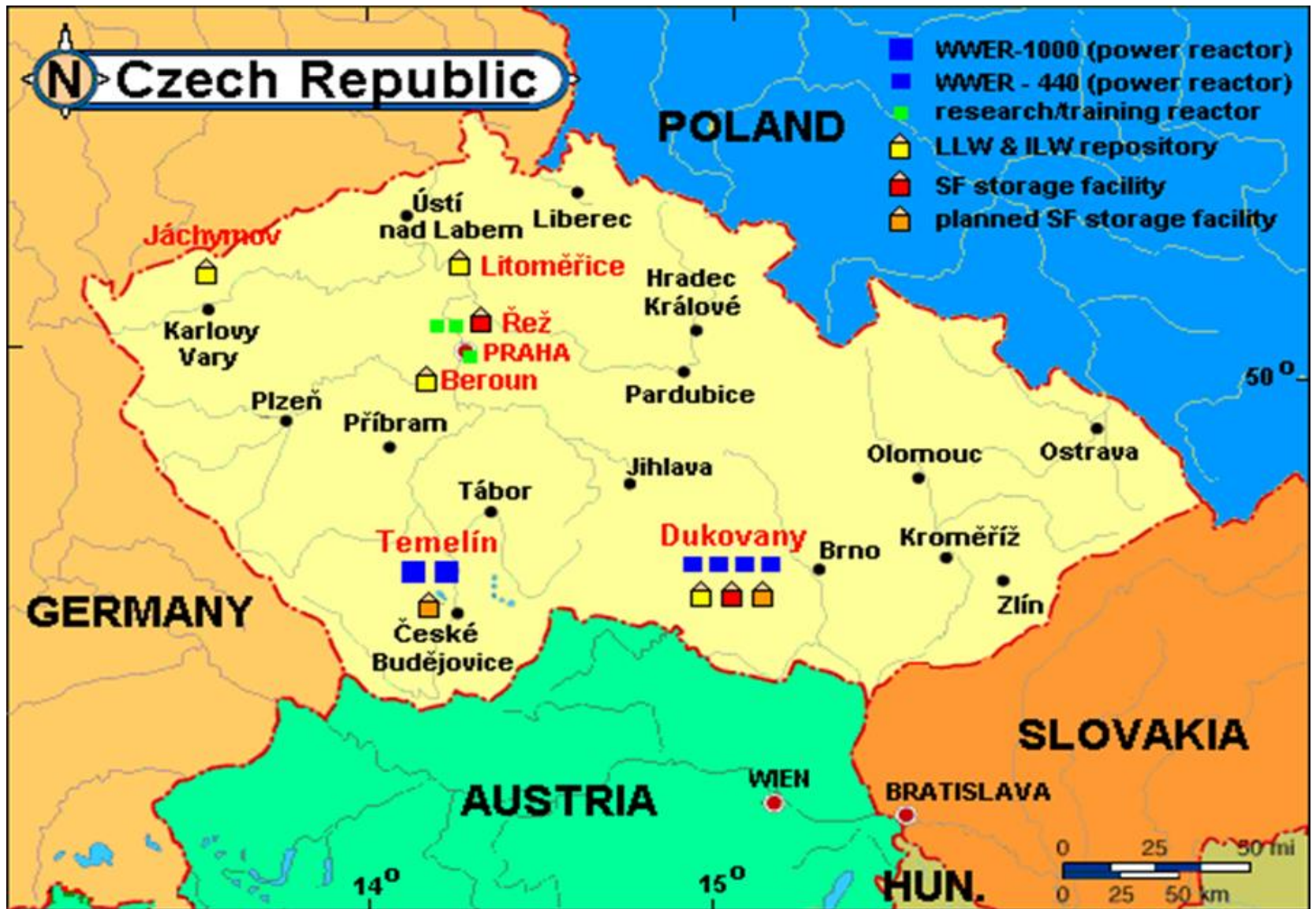
MINISTRY OF  
INDUSTRY AND TRADE

Presentation

Ministry of Industry and Trade Czech Republic

# Czech republic





# Present and Future Czech Nuclear Power Program

- ➔ At present nuclear power (4x 510 MWe + 2x 1040 MWe) provides approx. 33% of electricity annual production in the country.
- ➔ Our plan is to continue and extend the operation of the NPPs at Dukovany and Temelín sites and to build new nuclear units at these sites so as to increase the share of nuclear power in electricity production up to 50 % in next two decades.

# Challenges

- ➔ Maintaining and extending NPP operation and expanding the use of nuclear power in the country is closely connected to introduction and use of new materials and technologies, to innovative methods and approaches in operating the NPPs and their maintenance, including the nondestructive testing, repairing and modernization.
- ➔ In industry supporting our current nuclear power plants but also the construction of the nuclear units planned to be built in the future we need, besides improved materials, to introduce and implement modern methods for designing, manufacturing and testing, which would in summary bring new technologies more tolerant to man-induced or external risks.

**ALL THIS REQUIRES A LARGE NUMBER OF WELL PREPARED, EDUCATED AND TRAINED PEOPLE.**

# Challenges (2)

- ➔ Our nuclear program can only be maintained and further developed if based on human resources adequate in qualification and number, so as we can:
  - ▶ manage to well understand the new trends and technologies,
  - ▶ successfully implement new technologies and procedures in our operations.
- ➔ We believe that our current needs in terms of human resources are sufficiently covered and assured. **HOWEVER FUTURE DEVELOPMENT OF NUCLEAR POWER IN THE COUNTRY WILL REQUIRE MORE EFFORT, ENERGY AND RESOURCES AND A MORE SYSTEMATIC APPROACH.**

# Solutions

In the Czech republic the people get ready for their future job in nuclear industry through:

- ➔ education at high schools and universities (Czech Technical University in Prague (including the university reactor at the Faculty of Nuclear Physics and Engineering in Prague), University of West Bohemia in Plzeň, Technical University in Brno, Technical University in Liberec and University of Mines in Ostrava),
- ➔ complementary educational programs – post graduate studies and training (universities and research centres )
- ➔ specific training programs in enterprises, factories, NPPs,...

# Solutions (2)

- ➔ Important activities aimed at a more systematic and comprehensive approach to nuclear education are carried out by CENEM – Czech nuclear education network.
  - ▶ It is a voluntary academic organization of educational institutions in the field of nuclear engineering, which pursues the development and quality of the Czech nuclear education
  - ▶ CENEM platform provides for close cooperation and synergy between academic (universities) system, industry practices (ČEZ a.s., ÚJV Řež a.s., Škoda JS a.s., ...) and regulatory approaches (SÚJB).
- ➔ Joint research and education projects.



# Long tradition of nuclear R&D has always gone hand by hand with in the education

Research and development has always been an opportunity for younger generations of scientists, technicians and engineers to develop their talent and skills but also to learn from more experienced colleagues.

## Former Nuclear Physics Institute

- Established in 1955
- First research reactor – put in operation in 1957 (VVR-S: 2 MWt)

In addition to research activities carried out by the industry a series of research institutions were founded and oriented to:

- nuclear fuel
- materials Institute,...

# State financed projects through Technology Agency of the CR (TACR)

**TACR – Agency for support applied and industrial R&D**

**Theta – energy-focused R&D programme (2018 – 2025, 5,7 bil. CZK)**

The programme will help in energy transition of the country

The programme is structured into 3 sub-programmes:

<b>Research in general (public) interest</b>	<b>Technology research</b>	<b>Long-term technology perspectives</b>
Goal is to increase quality of decision making (incl. nuclear regulator) and bring knowledge in preparation of strategic documents (in energy)	Key technologies with rapid commercialization, increasing competitiveness and export potential	Lower stage projects with potential breakthrough innovations

**Nuclear projects are eligible in all sub-programmes**

# Technology Agency of the CR (TACR)

## Theta – examples of nuclear projects

**Sub-program 1**: New models for air transport of radionuclides (recipient of results: nuclear regulator)

**Sub-program 2**: Advanced SW for deterministic calculations of stationary and transient stages of nuclear reactors (recipient of results: NPPs operator)

**Sub-program 3**: Highly innovative inorganic materials for nuclear industry

# Nuclear R&D projects – international aspects

## Horizon 2020 – active participation in projects

In 2018 – participation in approx. 30 project in various areas – safety, materials, deep geological repository, Gen IV research,.....

## Jules Horowitz Reactor (Cadarache) - active involvement

Delivery of components – hot cells

Preparation of experimental programme



# SUSEN infrastructure project (RCR)

Severe accidents laboratory



Hot cell laboratory



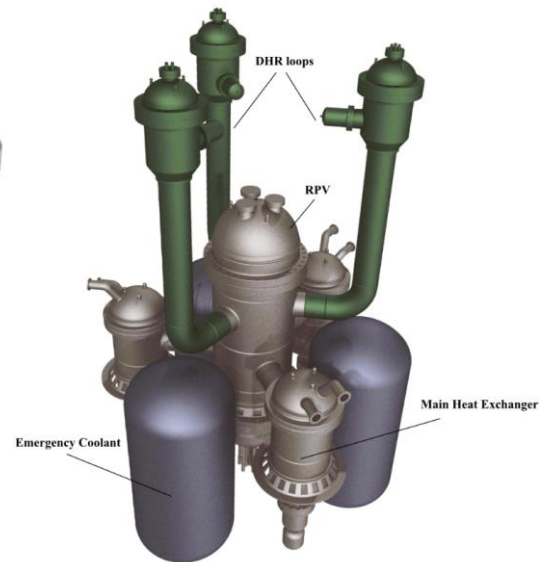
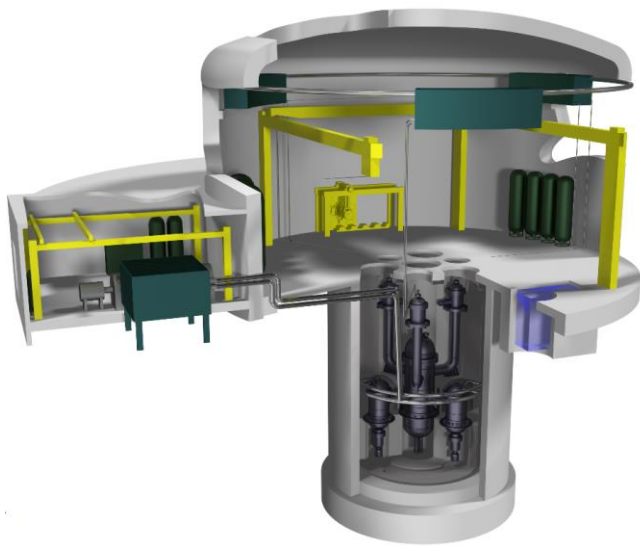
Experimental loops - LWR loops, SCWR, supercritical CO<sub>2</sub>, liquid metal, FLiBe



# Allegro project (RCR)

High-temperature gas cooled reactor - demo

V4G4 Centre of Excellence – CR, SR,  
Poland, Hungary, France



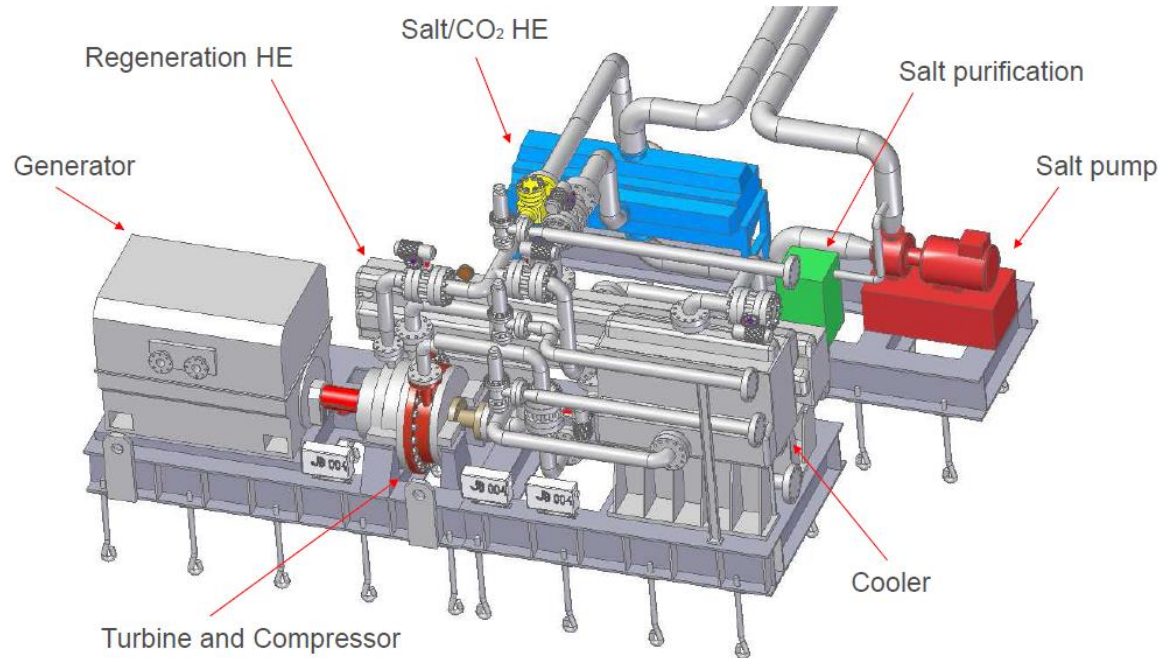
Helium experimental loop



# EnergyWell project (RCR)

## Molten Salt Cooled Small Modular Reactor

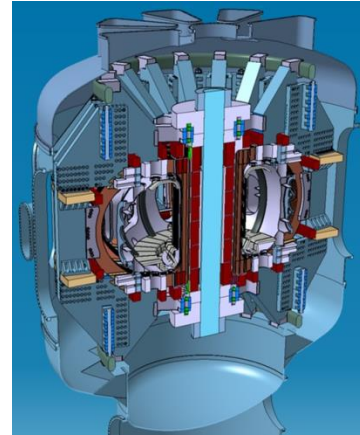
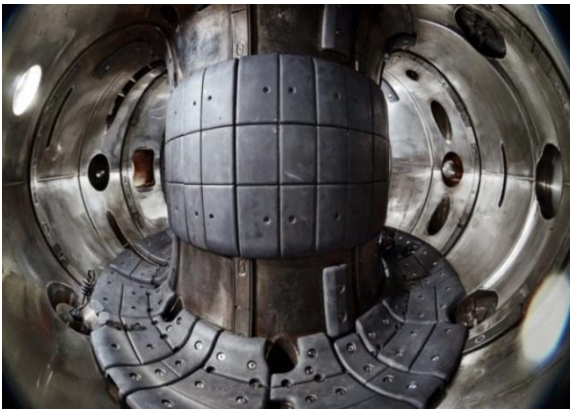
- High passive safety
- Long fuel campaign operation
- Modularization and high transportability
- Practically independent on existing local infrastructure
- 20 MWt
- LEU fuel



# Czech Republic – active in fusion research

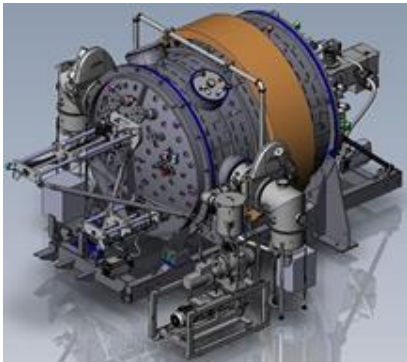
Institute of Plasma Physics (Czech Academy of Sciences)

Tokamak COMPASS facility and its upgrade - ITER relevant geometry

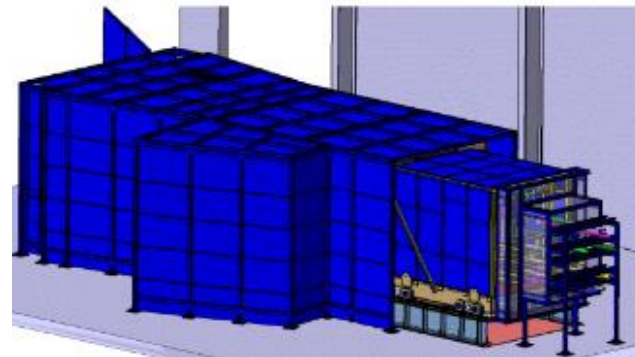


## Research Centre Rez (RCR)

Helcza (testing of plasma facing components)



## TBM (Test Blanket Module)





# Thank you for your attention



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