



10<sup>th</sup> International Conference on Nuclear Energy

HOW TO BUILD UP NUCLEAR POWER PLANT?

Prague, November 8, 2017

**TRANSFER OF NUCLEAR KNOWLEDGE  
INDISPENSABLE CONDITION OF THE FUTURE  
NUCLEAR POWER DEVELOPMENT**

**Jiří MAREK**, President of the Association of Nuclear Veterans (CZ)

JADERNÍ  
VETERÁNI



NUCLEAR  
VETERANS

# What I am going to say

- definition of need
- analysis of possibilities
- way how to construct the support
- case study
- conclusion

# Definition of need

Czech Republic is highly developed „nuclear country“

- 2 nuclear site, 6 unit 4000 MWe, Dukovany , Temelin NPP, VVER (PWR) – relevant share on the realization
- 2 research reactor, school and training reactor
- Nuclear infrastructure, industry, laboratories, hospitals

# NPP in the Czech Republic



## Dukovany NPP

- 4x VVER 440 - 2013 from 1985 - 1997
- Upgrade to 500 MWe
- Large LTO program (Long Term Operation)
- License for EDU 1 and 2 unlimited (new license after 30 year operation)
- Unlimited license in the framework LTO expected for unit 3-4 as well
- Intermediate spent fuel storage
- Expected operation till 2035 as minimum



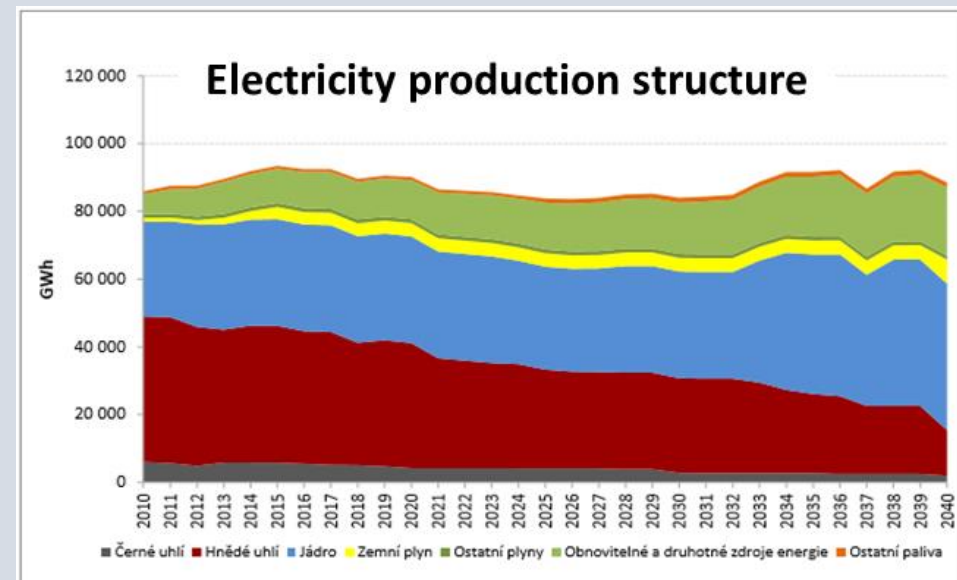
## Temelin NPP

- 2xVVER 1000 from 2001 /2003
- License till 2021 (10 years refresh period)
- Intermediate spent fuel storage
- Expected operation till 2060 as minimum



# Governmental energy strategy

- Actualization 2015
- Source mix : coal, Nuclear, RES
- Nuclear in long term horizon Dukovany 2000 Mwe, Temelin 2000-4000 MWe
- EDU 5 cca 2035
- ETE 3 ca 2040
- EDU 6 cca 2045
- ETE 5 cca 2050 ?



# Loss of the knowledge problem

Construction and commissioning will be executed by turn key contract

**BUT**

- Investor needs supervision, regulatory authority have to issue the license, future operator needs operation preparedness and planning
- Men who remember the construction of Dukovany NPP are today's distinguished veterans
- Men who remember the construction of Temelin NPP are almost retired now
- Existing operator has the only operating personnel training programs

# Sustaining of know-how

- technical base – fabrication of the equipment and facilities, supply, assembling, testing, services and operational support, operational feedback, engineering
- research and development
- legislation – laws, regulations, criteria, support of independent supervision
- manpower – knowledge, experience, education, training, know-how and skillfulness transfer

**One from the most challenging tasks in the nuclear power development**

# Future schedule - requirements

We need to sustain, manage and improve the whole complex of know-how and skillfulness:

- design and construction – 30 years
- operation – 60 – 80 years
- decommissioning – 40 years



# Analysis of possibilities

- Within 10-20 years there will be no experienced people for the investment control, licensing and preparation of the operation
- This problem affects in particular the Czech Republic, Slovakia, Hungary, Bulgaria, Great Britain, France, U.S. and others
- This problem does not exist in Russia where continuity of commissioning of new builds exist



# Analysis of possibilities

- Generation of nuclear experts and skillfull people from „70th“ is still available to communicate the upcoming problems
- Government and investor / operator can hire the experinced people abroad (including all risks raising from different environment)
- Education and preparation of own working power



**In every case the veteran's knowledge and support is needed**

# Association of Nuclear Veterans (CZ)

- generation of “70”
- about 50 members

We can currently see the downturn not only in the investment activities. There is a serious gap arising in the continuous replacement of skilled, educated and knowledgeable manpower.

# Association of Nuclear Veterans (CZ)

We, nuclear veterans, are aware of this deficiency. Our responsibility is to call alarm: *Do something, do your best to avoid lack of experience, lack of knowledge .... We are here; we are prepared to continue in our professional work in the most useful way – through the transfer of our knowledge to the young generation.*

Young generation understand it  
and politicians???

# Way how to construct the support

- As mentioned – the veterans are ready
- To propose, develop and formalize the basis to the continuous transfer of knowledge between veterans and the young generation
- To encourage the national nuclear operator, government and responsible bodies to commence a serious discussion with veterans

# Way how to construct the support

*Create a certain structure of various training sessions, seminars, workshops, schools, etc. where veteran's experience would be efficiently passed. This is of interest not only to veterans, but also to the IAEA, WANO and in particular to IYNC, which represents thousands young "kernels" from around the world. We also see great benefits and opportunities for overall nuclear industry.*

# Prague Appeal main ideas (1)

- To convince the decision makers on the risk raising from the nuclear knowledge loss; the experienced people are leaving quickly
- It is necessary to create sophisticated system to keep the specific knowledge over the generation

# Prague Appeal main ideas (2)

- The Czech nuclear veterans offer their experience and skills to the “project” of transfer of nuclear knowledge to the young generation
- We invite everyone, the individuals and the companies to join in the "Prague Appeal", and according to their abilities to participate in the “project”



# Case study

*The Czech Association of Nuclear Veterans elaborated internal documents concerning of passing through all phases of the nuclear projects – from original idea to commissioning of the plant. During the external discussion was acknowledged that the effective transfer of unique knowledge and skills is working mainly through the personal communication. The same conclusion we found during the investigation of the communication with stakeholders when the site selection process for deep geological repository of radioactive waste begun.*

# Conclusion

- definition of need
- analysis of possibilities
- way how to construct the support
- case study
- conclusion

# Conclusion

- The task No. 1:

Act quickly – veterans are leaving us!

- Lesson learned:

Czech national poet Jan Neruda (1834 – 1891) in his collection of poems „Songs of Friday“ wrote:

... who stopped and stood for a while, will be standing aside ...

# Thank you for your attention

Many thanks to my veteran's colleague **Aleš JOHN**, Chairman Emeritus WANO Moscow Centre, for the fruitful cooperation on this paper

Jiří Marek

[jiri.marek@jmm.cz](mailto:jiri.marek@jmm.cz)