

# Nuclear energy after Fukushima



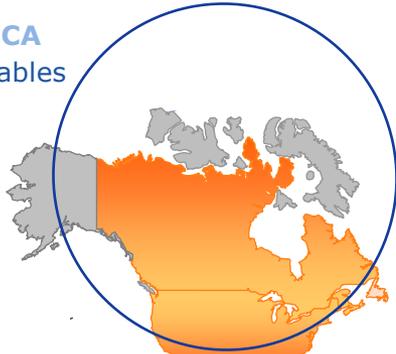
**Juraj Rovný**

The 6th annual energy conference  
Bratislava, 26 – 27 November 2012

# Slovenské elektrárne, Member of Enel Group

## Enel world presence

**NORTH AMERICA**  
Focus on renewables



**LATIN AMERICA**  
Strengthening leading position



**SLOVAKIA**  
Leading position in generation

**FRANCE**  
Focus on renewables and nuclear

**IBERIA**  
Strengthening leading position

**ITALY**  
Strengthening leading position

**RUSSIA**  
Capturing growth and value of our integrated position

**GREECE**  
Focus on renewables

**ROMANIA**  
Leading position in Romanian distribution

**World presence:**  
40 countries

**Customers:**  
61 million

**Installed capacity:**  
97.000 MW

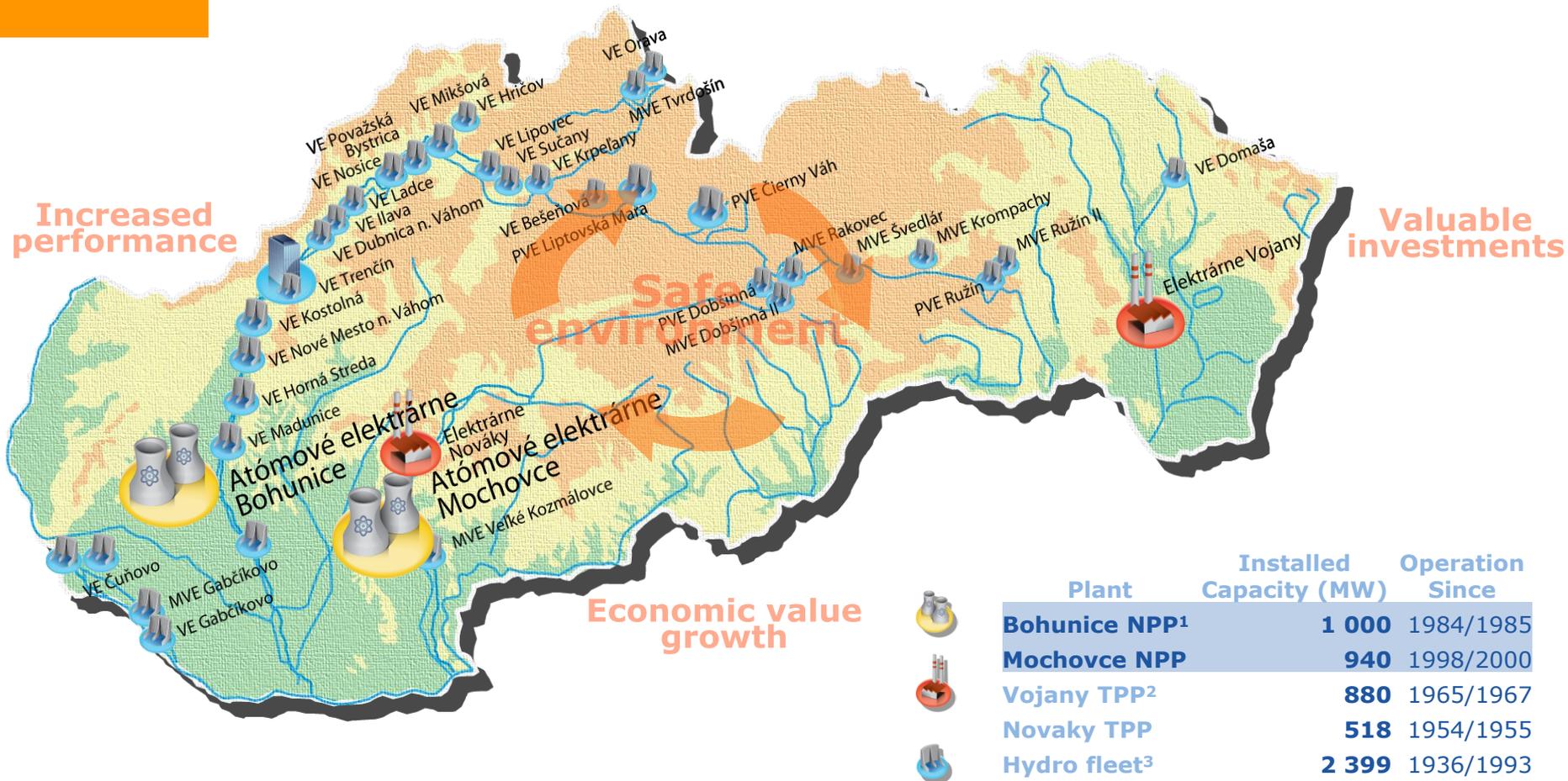
**Employees:**  
75.000

**EBITDA:**  
17.7 bn €

**CAPEX 2011-2015:**  
€31 billion

# Slovenské elektrárne: Power Plant Fleet

## Nuclear energy is the key building block of SE portfolio



- SE total clean production in 2011: 88.5 %

<sup>1</sup> Excluding the decommissioned Bohunice V1 units (1&2) which are not owned by SE

<sup>2</sup> Including 4x110 MW installed off-line capacity at TPP Vojany II

<sup>3</sup> Data include run-of-the-river plant VEGA (746,4 MW) which is operated by SE but owned by Vodohospodarska vystavba; Hydro plants consist of pumped storage and run-of-the river plants

# Fukushima accident

- The principles of nuclear safety are well known, and the Fukushima accident did not give any further insights.
- This does not mean that there are no lessons to be learned from the accident, but the main concept of nuclear safety, as developed so far, still remains valid.
- External natural hazards had been known to nuclear industry and had long been reflected in designs of NPPs (IAEA safety standards).
- Technical measures to coop with such hazards are also known.
- **Then why the Fukushima accident happened?**



# Causes of the accident

The official independent investigation commission appointed by the Japan parliament published the report that unveils the fact that **the root causes of the accident were not in extreme natural conditions:**

- *The Fukushima accident was the result of collusion between the government, the regulators and the operator.*
- *The direct causes of the accident were all foreseeable prior to March 11, 2011.*
- *...we conclude that the disaster was clearly „manmade“*
- *This was a disaster „Made in Japan“.*

# Reaction of SE to the Fukushima accident

- Steering committee managed by the DG of SE was established on 18 March 2011
  - » Main task: reassess safety of Slovak NPPs in case of beyond design basis external natural hazards
- Execution of **SOERs** issued by WANO.
- Performance of a set of **non-standard tests** and configurations at all NPP units.
- Joining the comprehensive risk and safety assessments (“**stress test**”) of nuclear power plants in the EU.

# Stress Tests main conclusions for SE

- SE submitted according to the agreed schedule final reports to the national regulator in October 2011.
- **National report** has been submitted to the EC on December 30, 2011.
- **Peer review** by a group of international experts has been conducted at Slovak NPPs in March 2012.
- The final report of the EC captures the **results of the peer review**:
  - » Up to date seismic risk analyses
  - » Large modernization projects performed
  - » Implementation of severe accident mitigation hardware modifications

# Stress Tests main conclusions for SE

- Based on the results of the peer review, own analysis and regulatory body comments SE proposed **supplementary measures**, taking into account potential extreme situations.
- An **integrated action plan** has been submitted to UJD for approval this month.
- These modifications will continue **to further improve safety of our NPPs.**

## Future of nuclear energy

- **Is nuclear energy in 2012 really on a crossroad?**
- **Did the Fukushima accident cause a turn over in nuclear energy?**
- **How do we see the nuclear safety concept today?**

# Historical evolution of nuclear safety concept

**1957-67**

## **SAFETY of DESIGN**

- Nuclear safety was a known term
- Traditional concepts : defence in depth, redundancy, single failure criterion, postulated initiating events

**1967-79**

## **Safety of CONSTRUCTION**

- Quality Assurance
- Discussions about primary circuit components breaks
- Severe accidents already mentioned

**1979-86**

## **Safety in OPERATION**

- TMI accident
- Significant design improvements of the majority of NPPs worldwide
- Operating procedures, training of personnel

**1986-2001**

## **Safety as an international issue**

- Chernobyl accident
- More intensive international cooperation despite it was present even before

**2001-2011**

## **Nuclear SECURITY**

- 9/11
- More focus on man-induced external events (terrorist attacks)

**2011-**

## **Safety vs. Natural external events**

- Fukushima accident
- Natural external events
- Severe accidents
- Emergency preparedness

# Learning by doing mistakes

- Every industry **learns also by doing mistakes**. Nuclear energy has that right as well.
- It is our duty to design and **implement corrective measures** from every mistake made and avoid or minimise their repetition.
- Nuclear energy has to be **assessed from a long-term perspective** taking into account all the advantages and previous achievements, as well as the drawbacks and failures.
- It has been announced by the EC that the main legal instrument for nuclear safety, the EC Directive No. 2009/71/EURATOM, **will be reviewed** as a response to the Fukushima accident.

# Nuclear energy after Fukushima (1)

- Fukushima accident did have and will continue to have **impact on nuclear energy sector**. But it did not cause any massive phase out.
- From a world-wide perspective the impact of the accident is moderate.
- 2012 Nuclear technology review issued by the IAEA states that the **Fukushima accident will slow down the development of nuclear energy but will not reverse it.**
  - » development of nuclear energy until 2030 between 35%(low projection) and 100% (high projection) in terms of installed capacity.
  - » These numbers were lowered by 7% and 8 % due to the Fukushima accident.

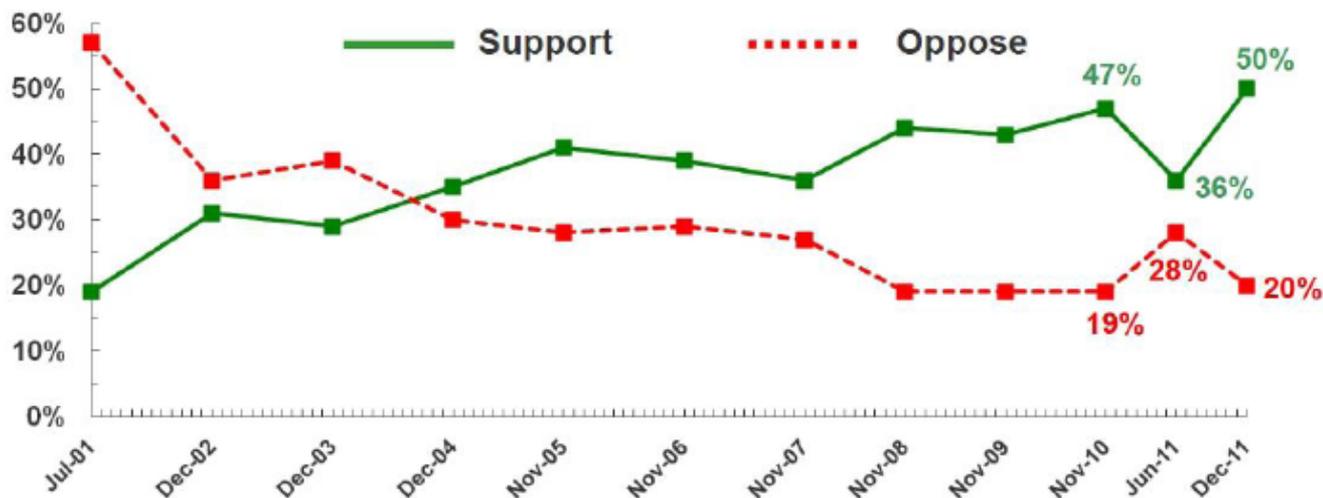
# Nuclear energy after Fukushima (2)

- EU reactions:
  - » Germany: speeding up withdrawal;
  - » Switzerland: no new reactors;
  - » Italy: no nuclear return
  - » **13 other MS operating NPPs:** no change and/or confirmation of the commitments
- before March 2011: **56 % of EU citizens wanting nuclear energy to be maintained or increased**  
[Eurobarometer on Nuclear Safety, April 2010]



## Nuclear energy after Fukushima (3)

In the UK, the Netherlands, Spain, Switzerland and France, after a dip just after the accident, public acceptance of nuclear has recovered.



UK: Support  
for Nuclear  
New Build

source: Ipsos MORI, 2012

# Conclusions

- Fukushima accident **did not challenge** known principles of nuclear safety.
- **Rather institutional than technical** issues turned out to play crucial role in the causes of the accident.
- Abandoning nuclear energy has to always be seen in the context of **all related aspects** (Germany announced the development of 10 GWe fossil plants over the next decade as a result of their nuclear phase out decision)
- Any judgements should be done with a **global perspective** and taking into account longer period of time.

**Nuclear energy will certainly be part of the energy mix of many countries for a notable period to come.**



**Thank you for your  
attention**