



The role of nuclear energy in the European energy policy

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BULGARIAN NUCLEAR ENERGY – NATIONAL, REGIONAL AND WORLD ENERGY SECURITY

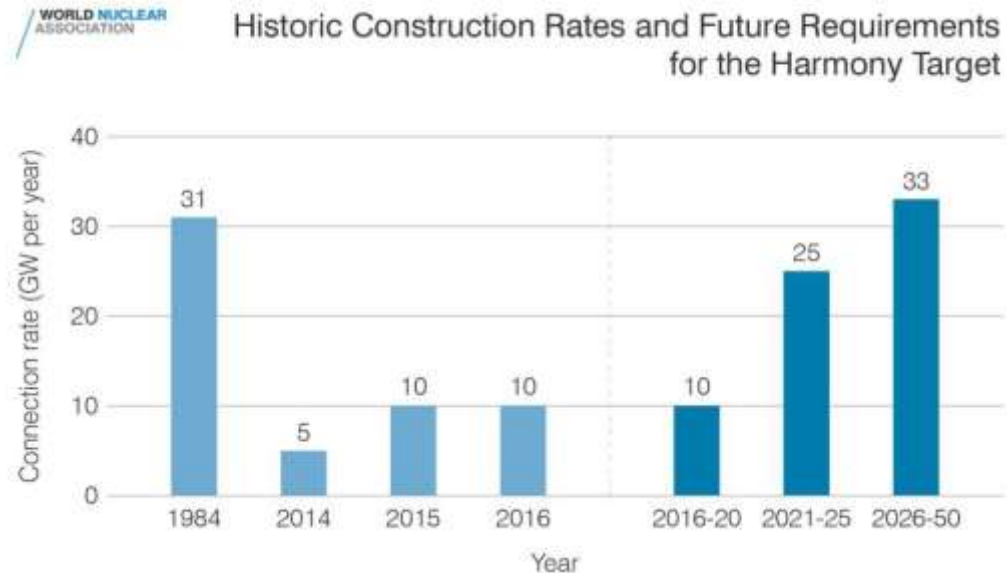
Varna, 6th June 2018

Nuclear in the future – WNA Nuclear Harmony projection

- 1000 GW new nuclear capacity by 2050
- Total 1250 GW nuclear capacity by 2050
- This means about to **triple** the size of the nuclear fleet worldwide in 32 years.
- Need for reach the historical maximum of capacity building
- Challenging, or even too optimistic?

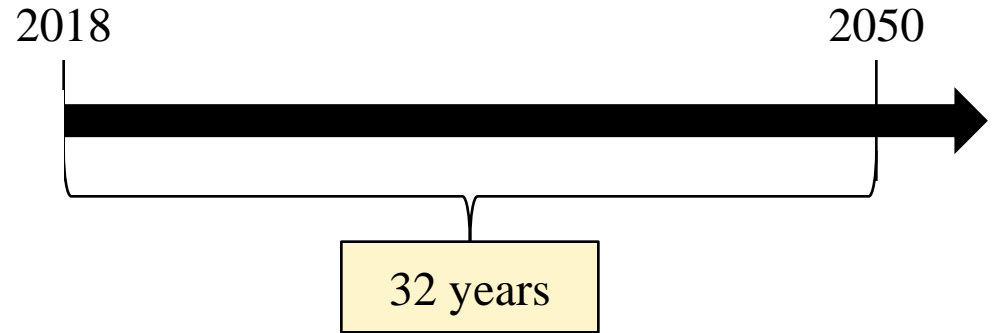


Leningrad-II/1 NPP – Russian Federation



2018 – 2050

- Today we are as far from 2050...



- ...as we are from 1986
- What happened in 1986?



Challenger Space Shuttle accident



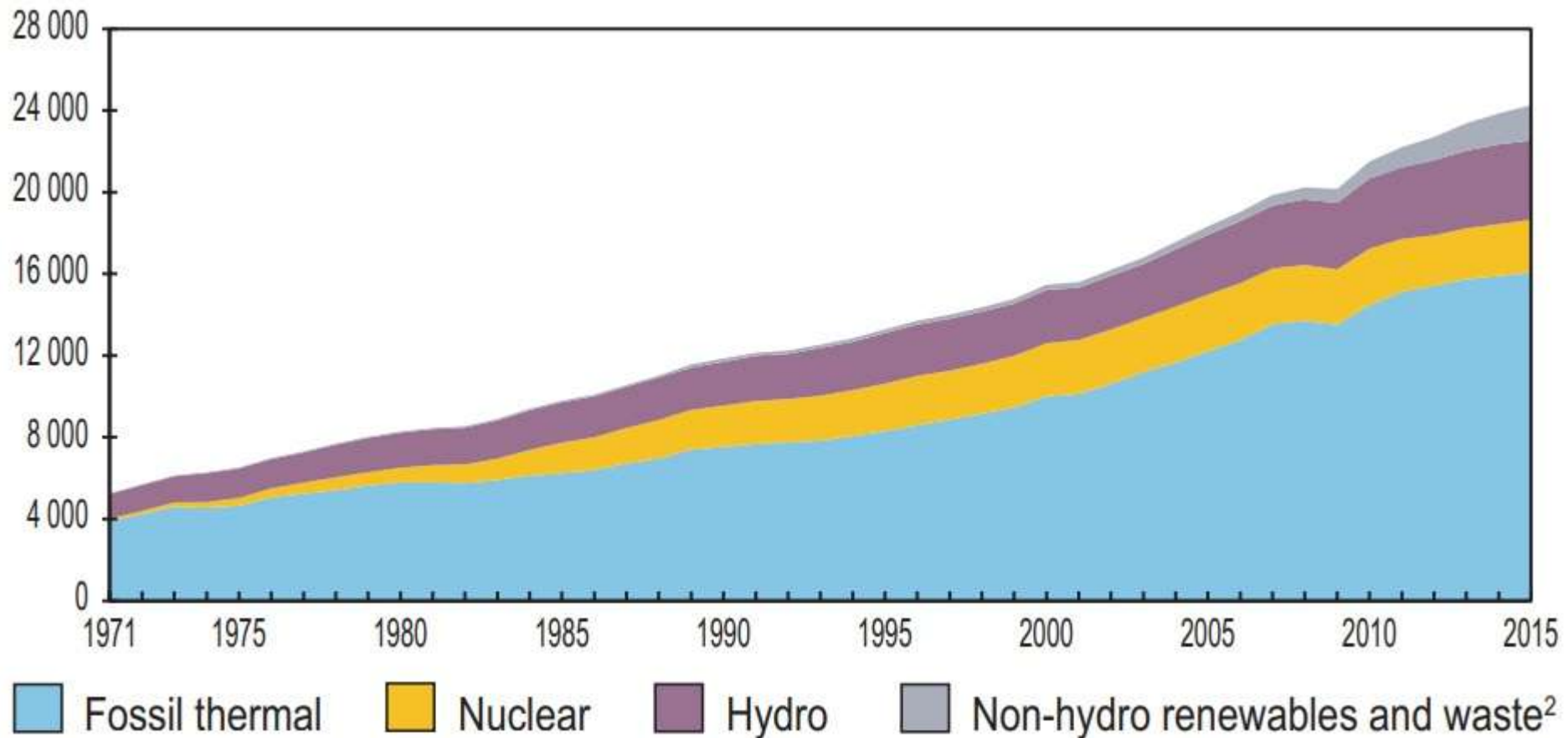
Chernobyl accident



'Hand of God' goal of Diego Maradona

Global electricity generation

- Continuous growth in the past, further increase expected

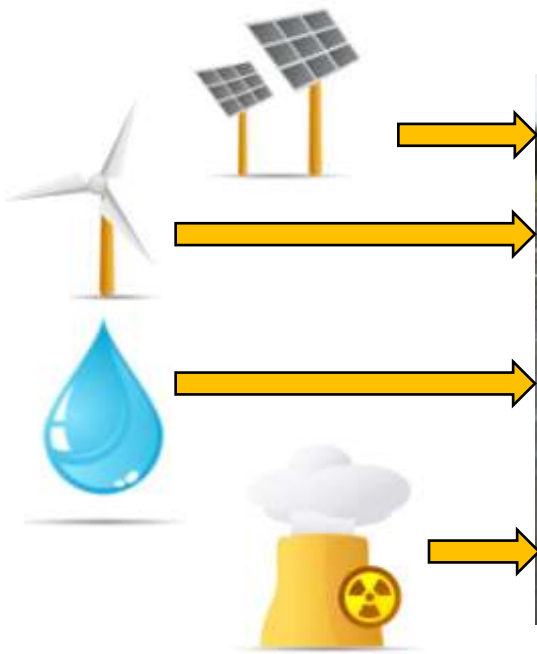


We expect the continuous growth of the electricity consumption



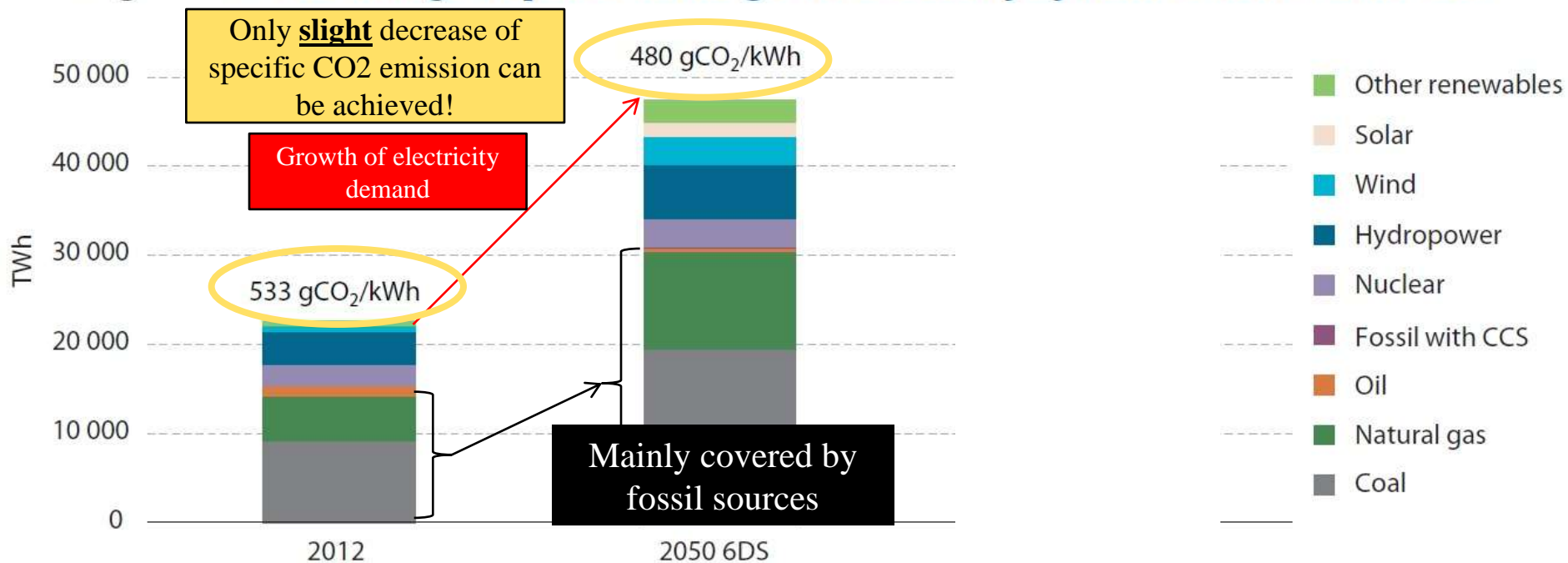
E- mobility

- E-mobility needs to be based on clean electricity sources
- Particularly great growth and improvement is envisaged
- „Zero-emmission”: practically nuclear, hydro, wind and solar can provide



Nuclear must be part of the low-carbon energy mix in the long run

Figure 4.4: The change required in the global electricity system to achieve the 2DS

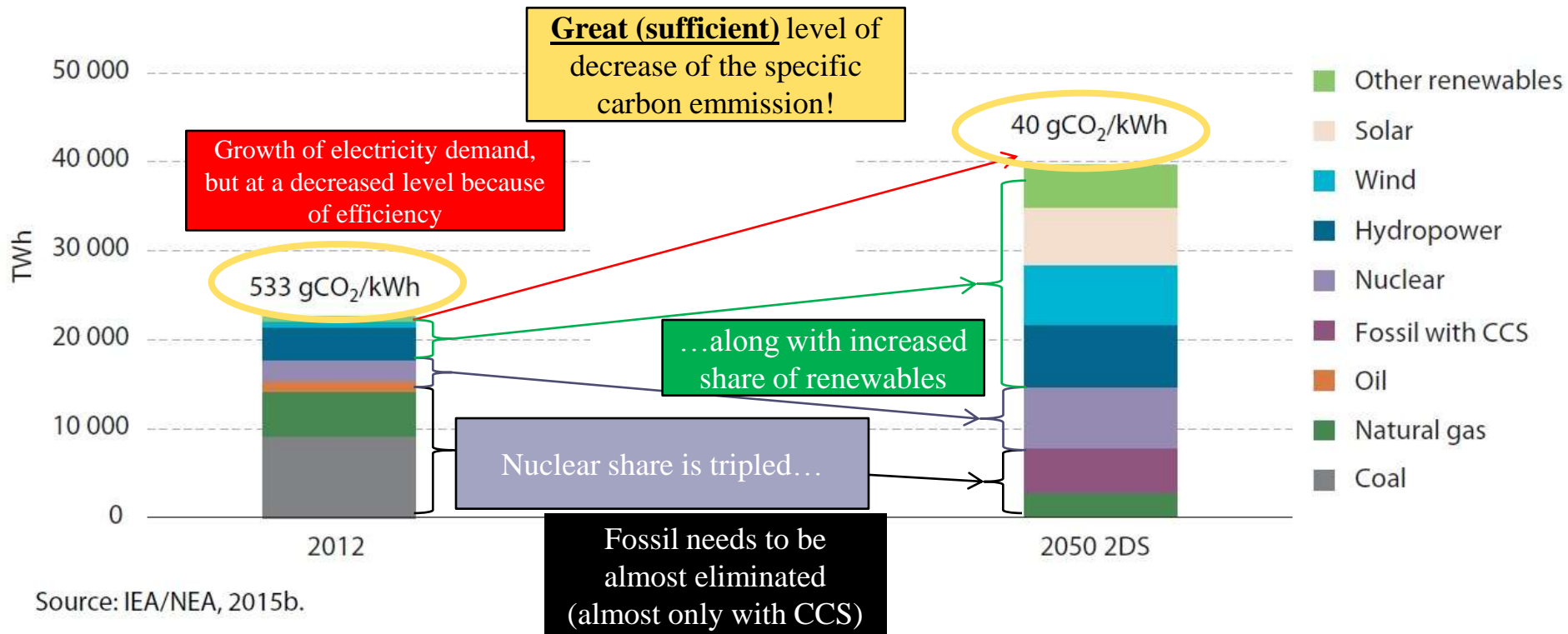


Source: IEA/NEA, 2015b.

Source: OECD NEA (2018): The full cost of electricity provision, p. 103.

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Figure 4.4: The change required in the global electricity system to achieve the 2DS



Source: OECD NEA (2018): The full cost of electricity provision, p. 103.

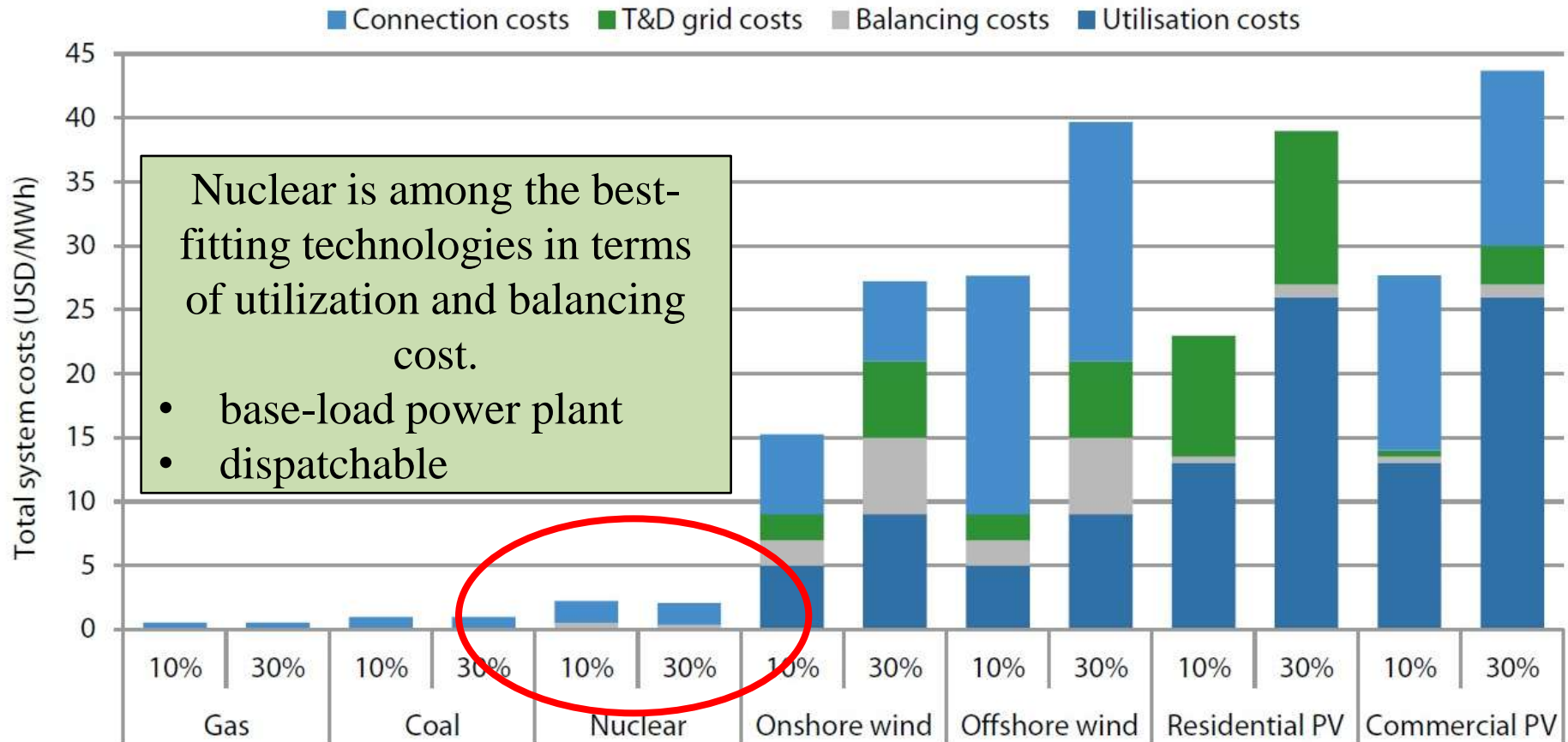
EU ETS (CO₂ price)



- Highest price since 2011 at around 16€/tons of CO₂ (2018.05.31. data)
- Currently in Phase 3 still around 53% the emission allowances are given out free
- Price is rising because UK announced it will stay in the ETS system till 2020.
- **Shift away from fossil generation need at least 25-30€/t price for CO₂ emission**

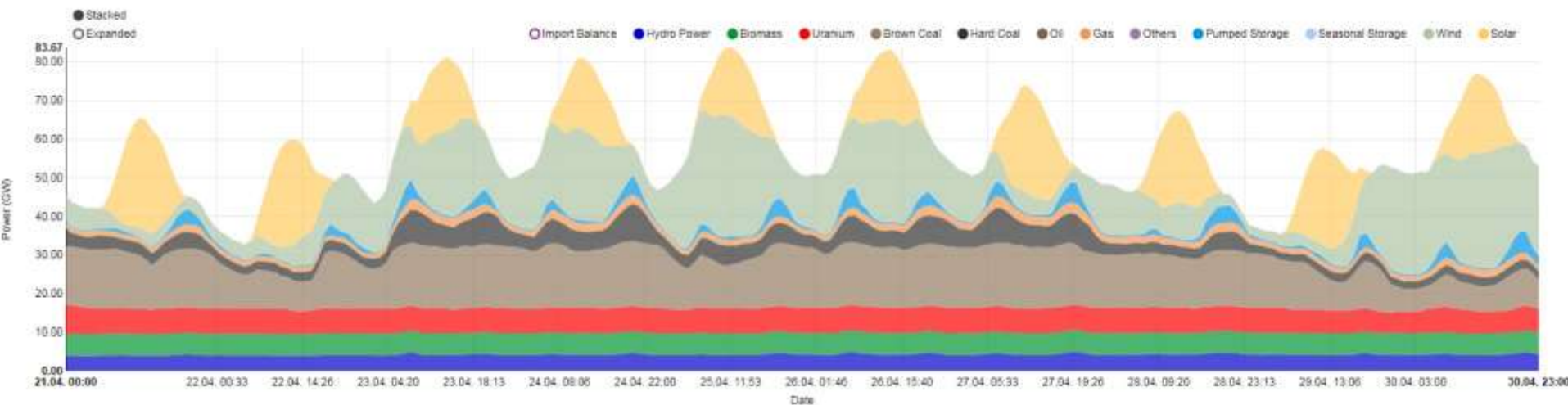
System cost of different generation technologies

- Integration costs also need to be taken into account.
- Different technologies have different effect on the grid stability
- In the EU because of the **increasing share of intermittent renewables** (PV, wind) **system costs will grow eventually** (utilization and balancing costs)!



Integration into the electricity system

- Increasing share of intermittent renewables results higher need for flexibility
- Nuclear and renewables together can fit in a clean electricity system
- **Load-following operation mode** of the new reactors will be more and more important for nuclear (and other dispatchable sources) as penetration of renewable generation grows



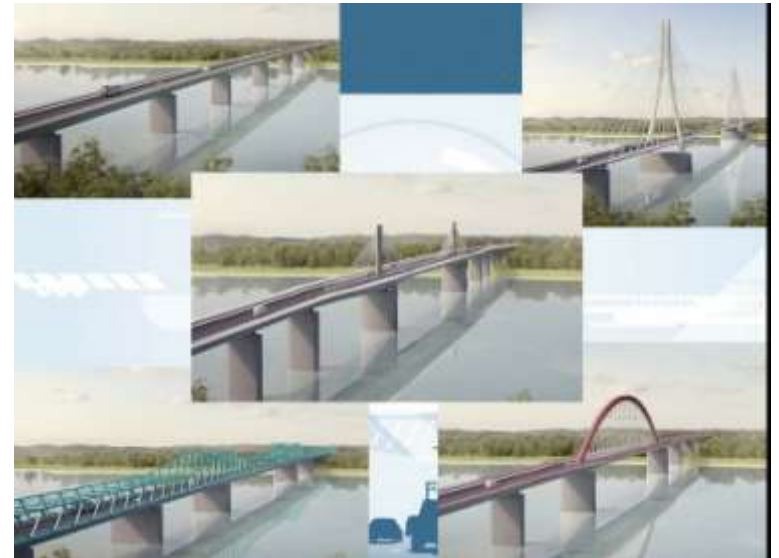
Electricity production in Germany between 21/04/2018 and 30/04/2018

Public acceptance – Hungarian experience

- To increase the role of nuclear energy in Europe, strengthening the **public acceptance** of the technology is inevitable
- Open discussions are necessary, participation of the public must be ensured during the main processes
- Experience gained related to the Paks II. project: frequent communication about the project leaves less concerns: the safety objectives and **safety features of GenIII+ reactors are highly appreciated by the public**
- The local population is mainly interested in the economical advantages of the implementation and the operation of the NPP,
- **Nuclear safety** needs to be the first priority!



Public hearing during the environmental licensing of the Paks II. project, 2015.05.07.



Visualizations of the planned bridge next to Paks

Paks II negotiations with the EU – since years

- Signature of the Intergovernmental Agreement (IGA):
14th Jan 2014
 - Negotiations with the Commission since end of 2013
- **All of the topics are closed**
 - 1) COM informed HU about „no objection” against IGA (Jan 2014) ✓
 - 2) Co-signature of **fuel supply contract** (by ESA in April 2015) ✓
 - 3) COM replied to the **notification** according to **Art 41** of Euratom Treaty: Paks II. fulfills the objectives of the Euratom Treaty (Sept 2015) ✓
 - 4) DG ENVI: 5. § in Paks II. Project act (access to specific information) – Legislation amended in March 2016 – COM accepted. ✓
 - 5) DG GROWTH: Tendering
 - Case dropped in Nov 2016 ✓
 - 6) DG COMP: State aid
 - Accepted in March 2017 ✓
 - Detailed decision published on 16th October 2017 ✓



The financing of the project is compatible with the internal market



Treaty on the Functioning of the European Union

„Article 107

(1) Save as otherwise provided in the Treaties, any AID GRANTED by a Member State or THROUGH STATE RESOURCES in any form whatsoever which distorts or THREATENS TO DISTORT COMPETITION by FAVORING CERTAIN UNDERTAKINGS or the production of certain goods shall, in so far as it affects trade between Member States, be incompatible with the internal market.”



Final conclusions:

- The financing of the project is compatible with EU law.
- The revenues of the new units will cover the CAPEX of the project, fuel, O&M and waste management costs and all other variable costs.
- There is state aid in the project, which means only that the projected internal rate of return is 7.35% p.a., a private market investor would have requested 7.88% from a similar project.
- According to the European Commission the implementation of the Paks II. project contains state aid, however:
 - 1) *It aims to achieve a well-defined objective of common interest (EURATOM Treaty)*
 - 2) *It is targeted for an improvement that the market alone cannot deliver*
 - 3) *It is an appropriate policy instrument*
 - 4) *It has an incentive effect*
 - 5) *It is proportional to the needs based on which it is deployed*
 - 6) *It does not unduly distort competition and trade between Member States*

EU requirements

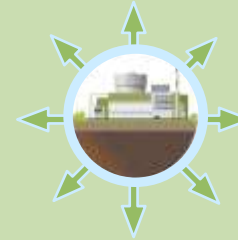
- Paks II. and MVM Group are independent, and they remain legally and structurally independent.
 - Changing name and image of Paks II.
- Power output trading strategy of Paks II. will be a commercial profit-optimising strategy.
 - At least 30% of its electricity output will be sold in HUPX (day-ahead, intraday, future markets)
 - The rest: on transparent auctions (conditions shall be determined by MEKH)
- Paks II will not retain extra profits beyond what is strictly necessary to ensure its economic operation and viability.



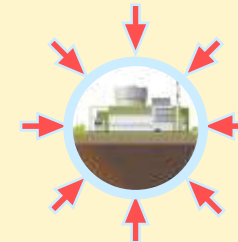
Source: European Commission, C(2017) 1486 final, p. 62

Status of the Paks II. project

Environmental licensing process



Site licensing process



Approvals of the European Union



Next task: implementation licensing and construction of the new units

Current status of the project

Main tasks of the next phase of the Paks II. Project

Construction of Construction and Erection Base Stage I.

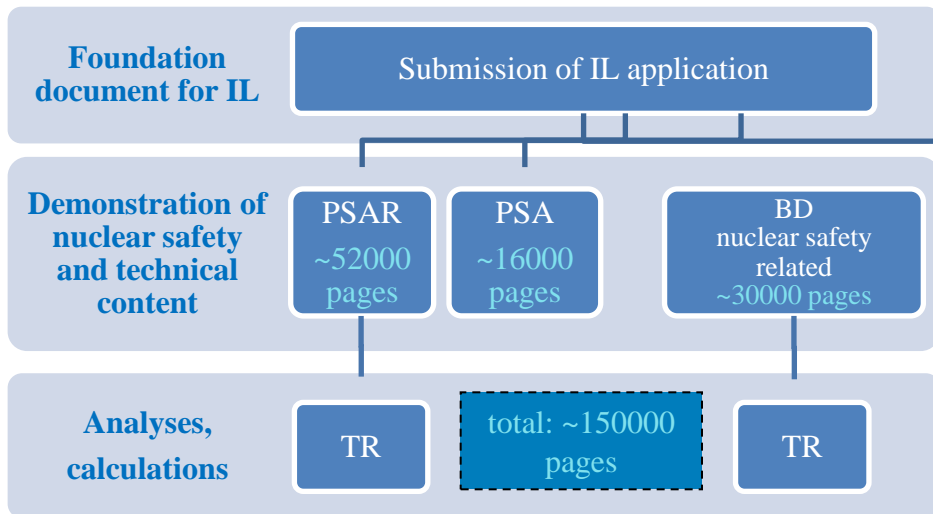
Preparation of the Implementation Licensing (IL) documentation



The Construction and Erection Base



Administrative and amenity building and the Licensing documentation for the first building



BD (Basic Design)

PSAR (Preliminary Safety Assessment Report)

PSA (Probabilistic Safety Assessment)

TR (Topical Reports= background documentation of PSAR and BD)

Take away messages

- Modern electricity systems require low-carbon base-load capacity
- Security of supply becomes more and more challenging
- The Paris agreement cannot be achieved without the CO₂-emission free nuclear energy
- Households and the industry needs electricity at affordable prices
- High level of nuclear safety remains a key requirement!

