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ENS YG

# Role of nuclear in European Net Zero Perspective

INSC WORKSHOP 2024  
ENS Presentation



EUROPEAN NUCLEAR SOCIETY

Visit ENS site <https://www.euronuclear.org/>

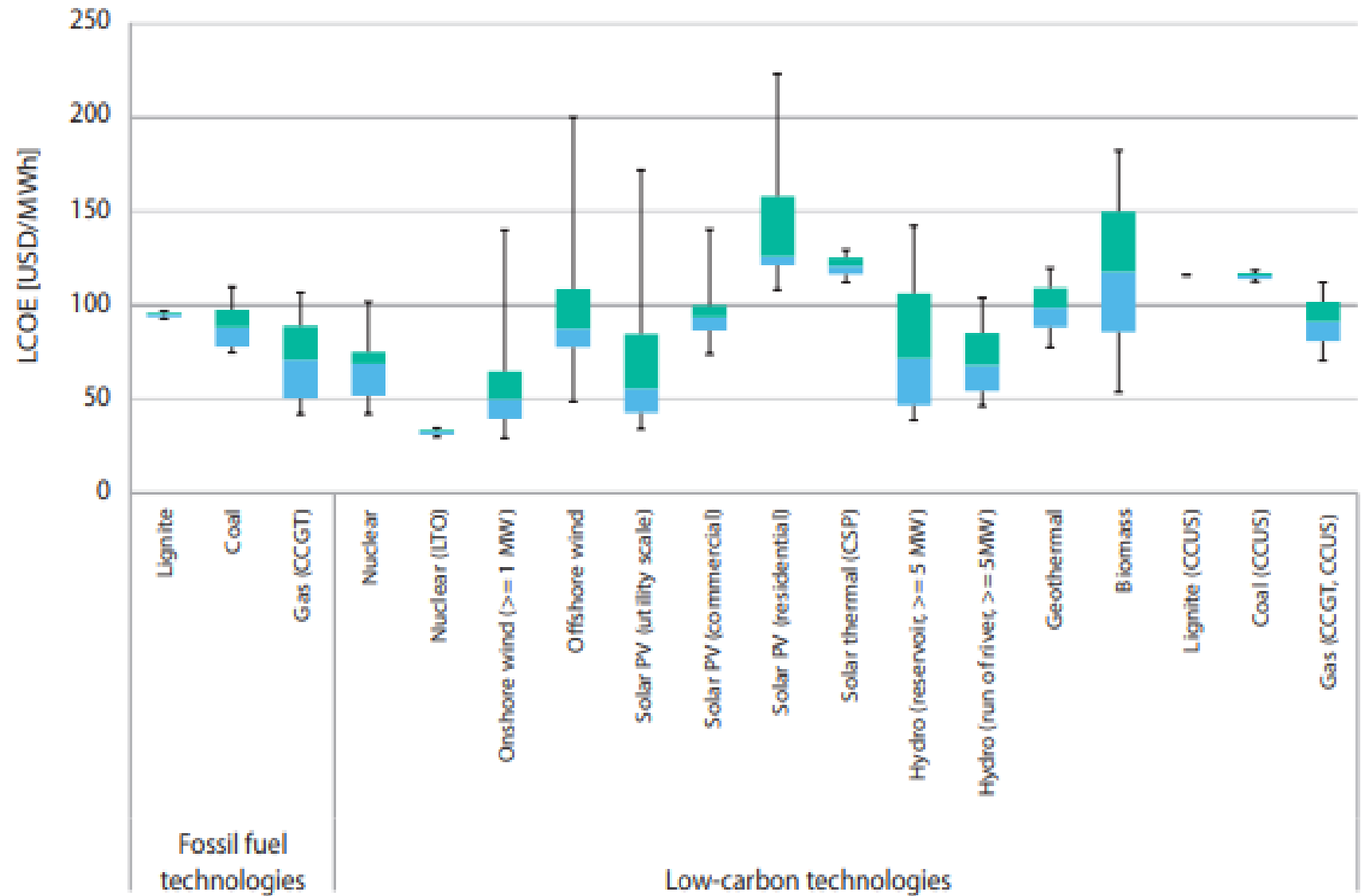


# FUTURE: NUCLEAR TOO EXPENSIVE ?

- Case of Germany 2022:  
150 GWe VRE - 250 TWh/550 – 385gr CO2/kWh  
2005 2025 : 500 Billion Subsidies VRE (20 years lifetime) + 150 Billions for HV Grid  
German Court of Auditor + 450 Billion for HV Grid  
Total 1100 Billion
- Case of France 2022  
60 GWe Nuclear - 300 TWh/450 – 85gr CO2/kWh  
LTO programme (+20 years lifetime) : 50 Billion
- ... ??? New Build – say 10 Billion for 1500 Mwe  
150 GWe 1000 Billion (1000 TWh/y - 80 years lifetime)



# Levelized Cost of Electricity LCOE IEA NEA PCGE 2020



Note: Values at 7% discount rate. Box plots indicate maximum, median and minimum values. The boxes indicate the central 50% of values, i.e. the second and the third quartile.

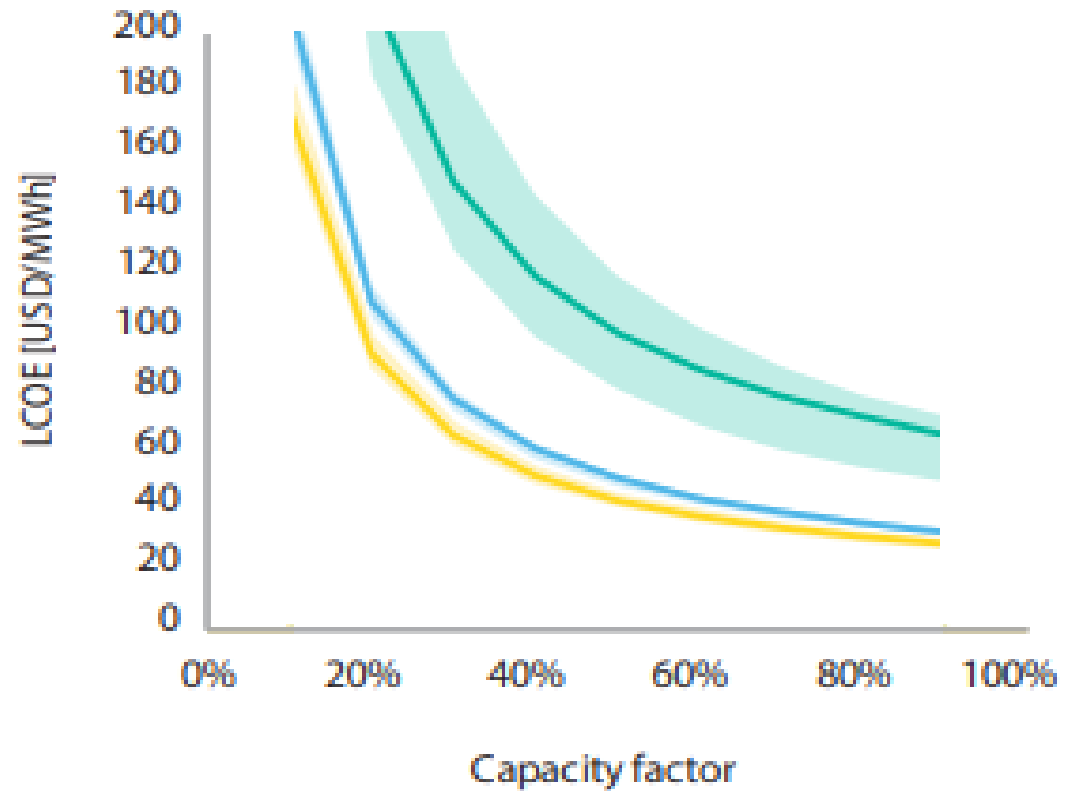
[https://www.oecd-nea.org/jcms/pl\\_60310/long-term-operation-of-nuclear-power-plants-and-decarbonisation-strategies](https://www.oecd-nea.org/jcms/pl_60310/long-term-operation-of-nuclear-power-plants-and-decarbonisation-strategies)

**Table 6.1: LTO LCOE values for LWRs as a function of the LTO period, discount rate, overnight costs and the capacity factor**

Overnight LTO investment costs (USD/kWe)	LWR LTO LCOE (USD/MWh)					
	LTO period = 10 years			LTO period = 20 years		
	Discount rate			Discount rate		
	3%	7%	10%	3%	7%	10%
	<b>Capacity factor = 85%</b>					
450	29.4	31.2	32.6	26.4	28.6	29.7
700	33.4	36.1	38.3	28.7	31.4	33.8
950	37.4	41.1	44.1	31.0	34.7	38.0
	<b>Capacity factor = 75%</b>					
450	31.9	33.9	35.5	28.4	30.5	32.2
700	36.5	39.5	42.0	31.0	34.2	36.9
950	41.0	45.1	48.5	33.6	37.9	41.6
Min	<b>29.4</b>			<b>26.4</b>		
Max	<b>48.5</b>			<b>41.6</b>		

Note: These values have been computed assuming a refurbishment period of two years, fixed O&M costs of USD 85/kWe, variable O&M costs of USD 1.5/kWe, front-end fuel costs of USD 7/MWh and back-end fuel costs of USD 2.33/MWh, consistent with the values for new build projects considered in IEA/NEA (2020). The overnight LTO investment cost includes other plant enhancements beyond LTO and 5% of contingencies. Decommissioning costs are not included as they have largely depreciated during the initial design lifetime.

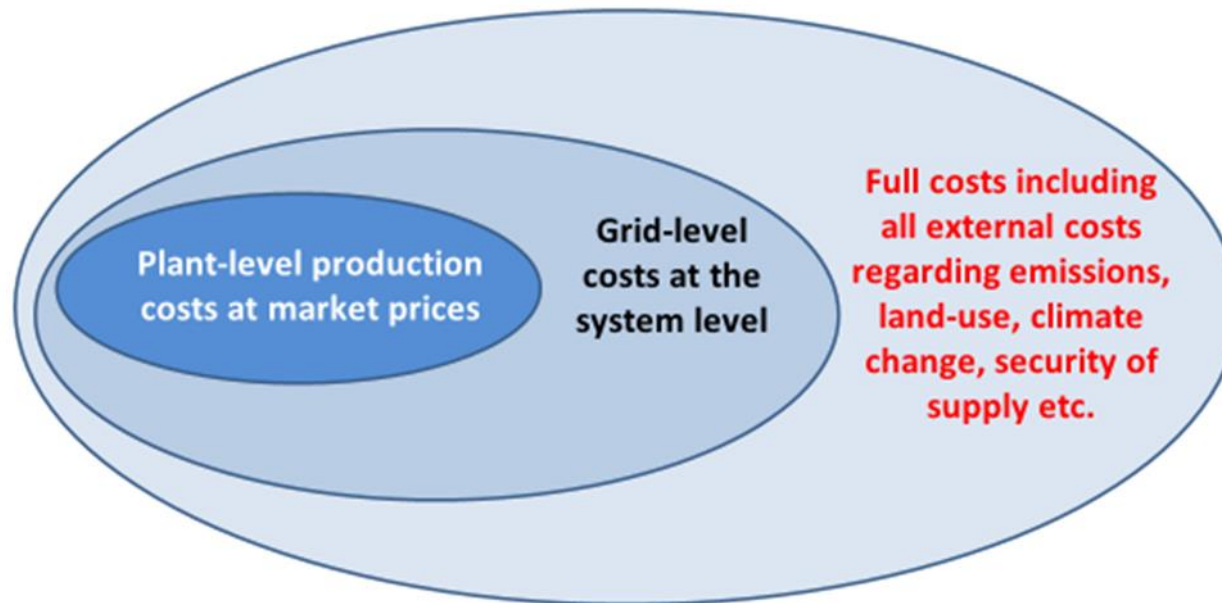
Levelized Cost  
of Electricity  
LCOE  
IEA NEA PCGE  
2020



Legend: ■ New build ■ 10-year extension ■ 20-year extension

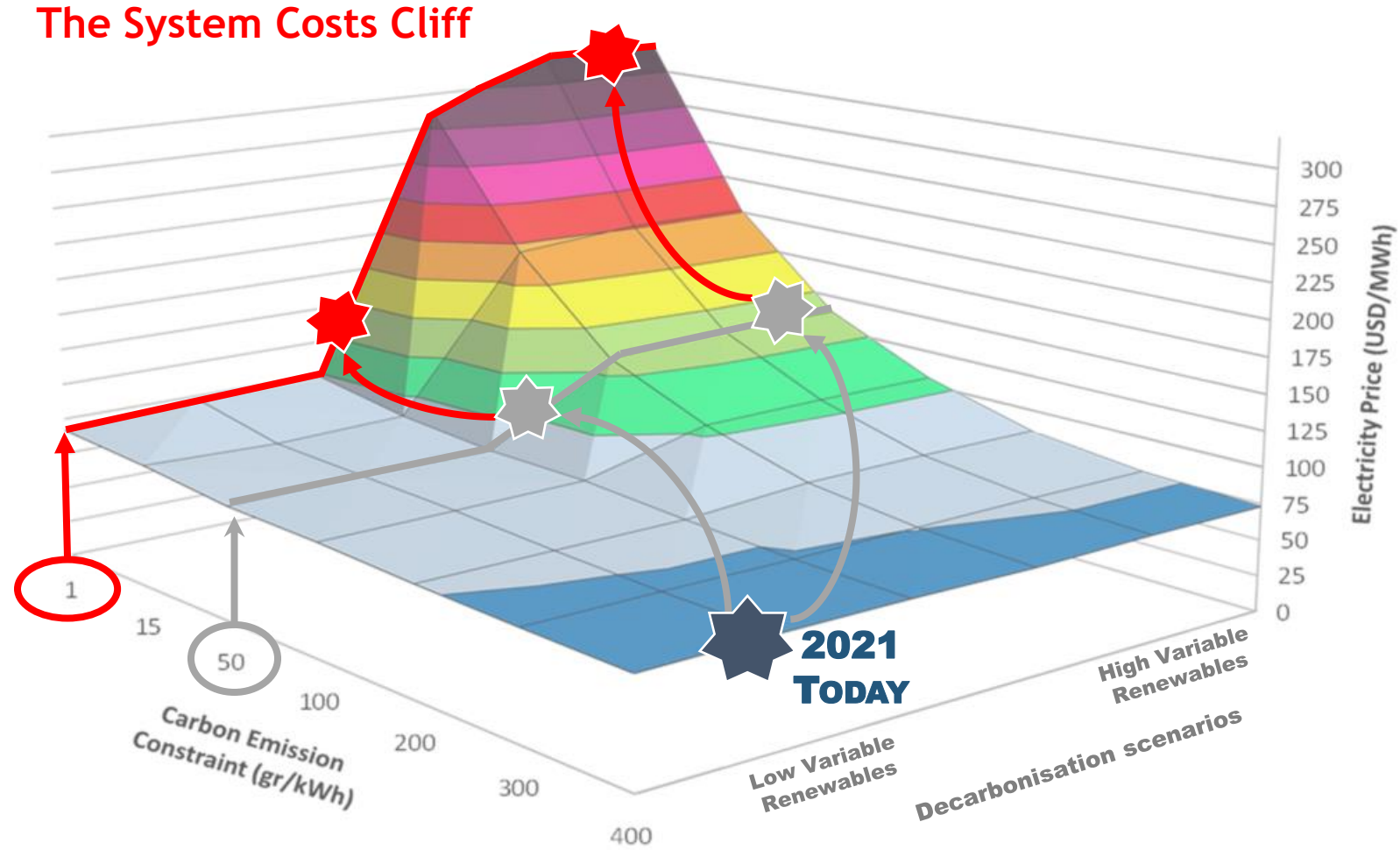
Note: Values at 7% discount rate. Lines indicate median values, areas the 50% central region.

## BEYOND LCOE... Full Cost Approach

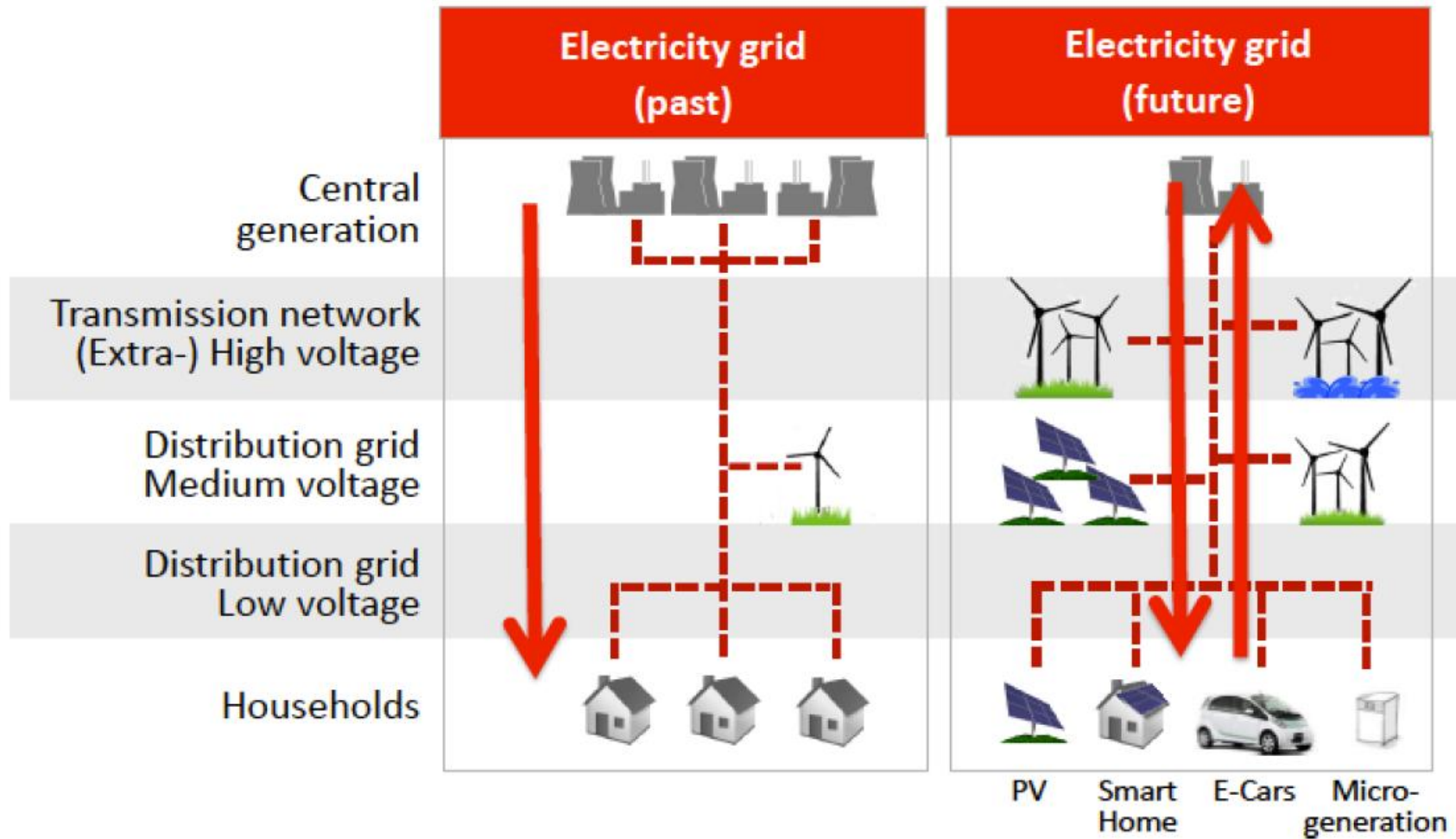


Economics :  
Beyond  
LCOE...

# Charting a Path to Net-Zero Electricity



Source: NEA



**Fig. 1.3. Changing Structure of the Electricity Grid [J. Specht, E.ON, August 2014]**



# EU Energy Policy:

## 2019 - 2023... UVdL and Timmermans Commission

- Increased financing means (Covid): **Budget 1 Trillion + Next Generation EU (Recovery Package) 750 Million Euros**: Financing Instruments for Energy Transition (nuclear excluded)
- EU Green Deal: **Fit-For-55 Package...** : by 2030: **55% CO2; 42.5% RES; 12% EE** vs projection in 2020
- **Taxonomy** for Sustainable Financing... 1st DA approved end 2021 and Complementary DA for nuclear and gas approved in 2022 – for the transition – political deal FR DE... not ideal...
- Gas crisis – supply and prices - **REPowerEU – 300 Billions more financing**... more RES and nuclear excluded...
- Draft proposal EC for the **Reform of the E-Market**
- Draft **NZIA Net Zero Industry Act** – USA **IRA** Inflation reduction Act... Not new money- reshuffling existing tools – to boost European strategic independence by supporting investments in industrial sectors

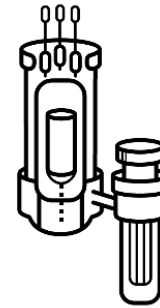
# The Full Potential of Nuclear Energy to Contribute to Emissions Reductions



**Long Term  
Operation**



**Large Gen-III  
Reactors**



**Small Modular  
Reactors**



**Non-Electrical  
applications**

**Complementary nuclear technologies and applications**