

# CONTROLLABLE RENEWABLE ENERGIES: AN ALTERNATIVE TO NUCLEAR POWER

Presentation of results



For Greenpeace Energy e.G.

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# ENERGY BRAINPOOL

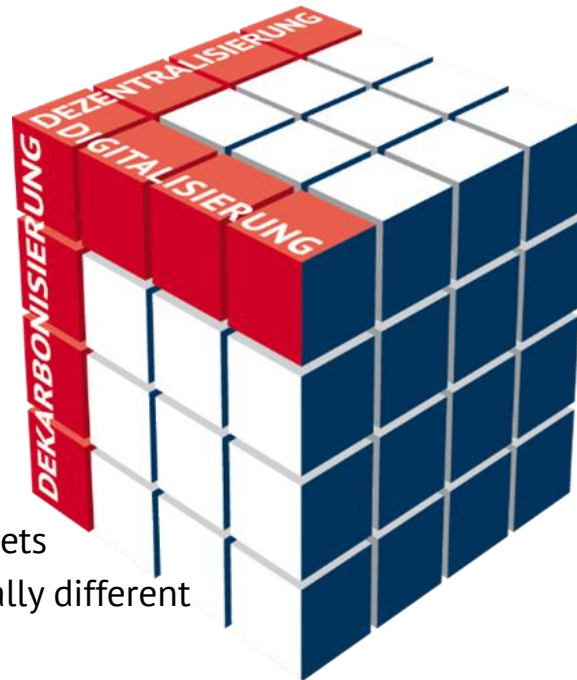
In cooperation with our customers our experts develop solutions for the Energy Market 3D.

## Who are we?

- Independent and neutral
- 20 team members
- 2 managing directors
- Founded in 2003

## What are the issues?

- Risks are increasing
- Transformation of energy markets
- Structure of prices fundamentally different
- New business case are unclear



## What are the next steps?

- Transformation of heat and mobility sector
- Demand for new capacity
- Investment and financing
- Variety of opportunities

## How can we support you?

- Training and simulations
- Analyses and scenarios
- Individual consulting
- Workshops
- Studies



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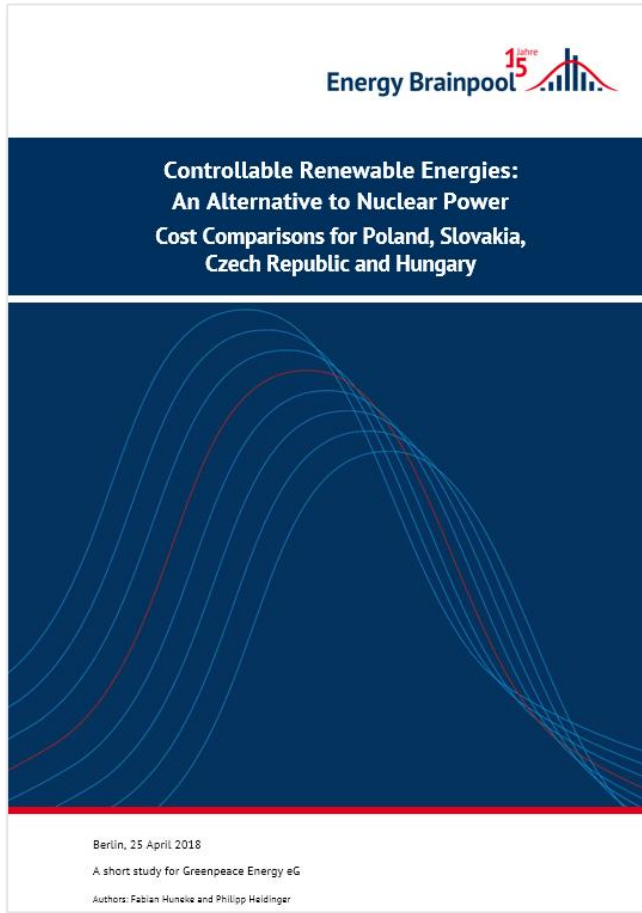


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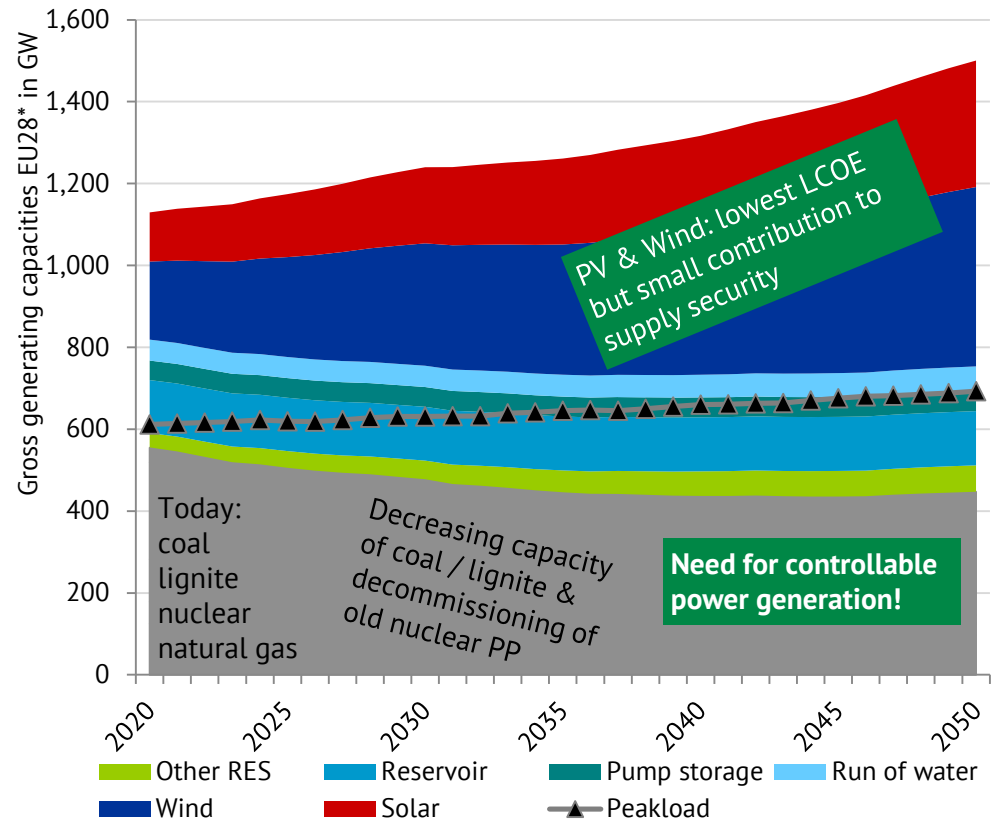


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# REASON FOR THIS STUDY

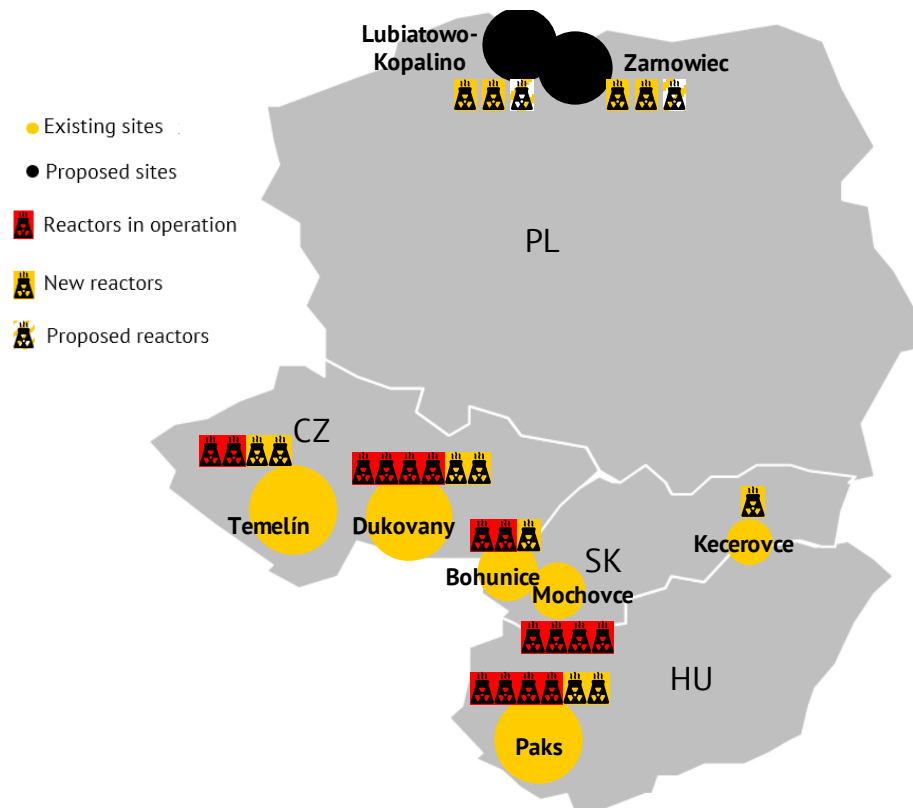


→ Initial point: Rising need for controllable power generation in the next decades



# NUCLEAR POWER PLANTS (NPPs) IN THE V4-COUNTRIES

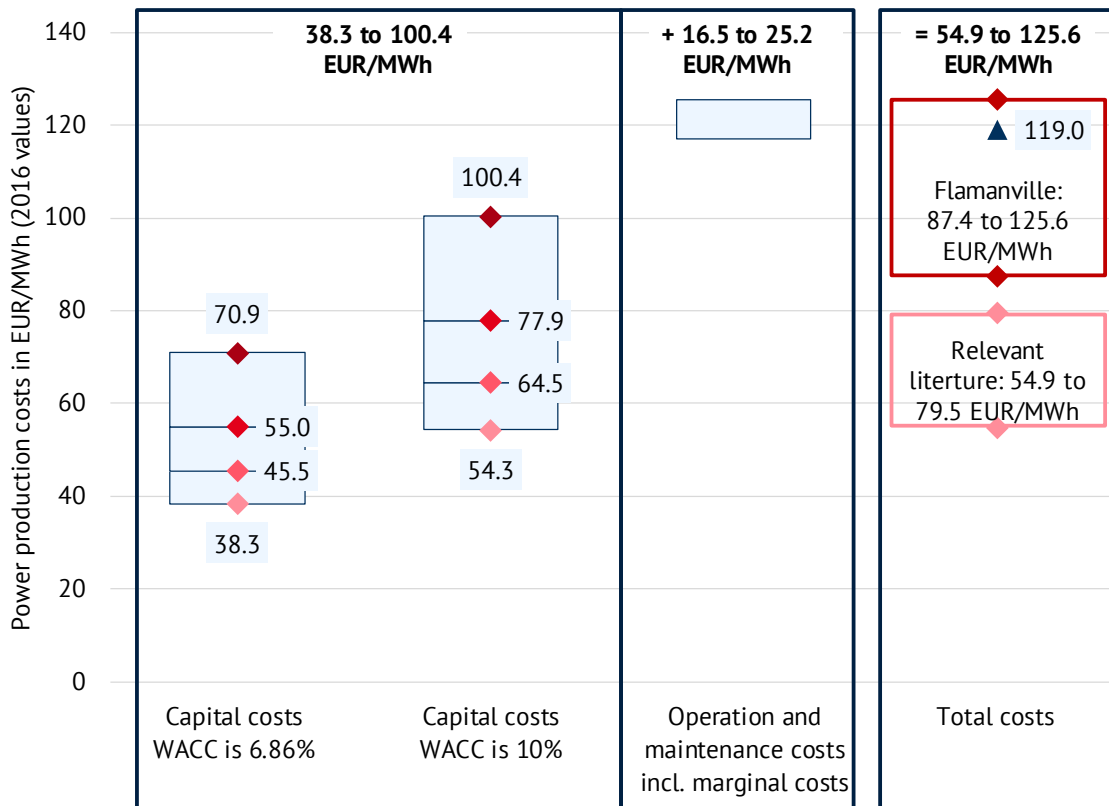
## Current status of planned NPPs



- Overall, the Visegrad countries (V4) are planning nuclear power plants with a total net output of **15.6 gigawatts**.
  - New NPPs could operate until **2065-2095**.
  - Interesting fact: This corresponds to the German nuclear power plants taken off the grid in 2011-2022.
- Key question in this study:  
Besides environmental issues, is this investment **economically feasible**?  
What is an alternative solution?

# COST EVALUATION OF NPPs

The average cost of electricity produced in a NPP is largely unknown.



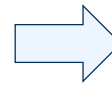
- The fixed costs from the capital tied up in the construction of a new nuclear power plant account for the largest share of its electricity generation costs.
- CAPEX target values for the Flamanville 3 nuclear power project increased from EUR 4 billion (2008) to EUR 10.5 billion (2015)
- Hinkley Point C receives financial support of 119 EUR<sub>2016</sub>/MWh
- Planned electricity generation costs in V4 countries appear "very ambitious"...

◆ Flamanville (current) ◆ Paks (budgeted) ◆ Temelin (budgeted) ◆ Relevant literature ▲ Hinkley Point C subsidy

# HOW DOES AN ALTERNATIVE LOOK LIKE?

1 : 1 comparison of NPPs and CRE on the basis of LCOE for baseload-production

**Fluctuating** renewable energies (FRE)

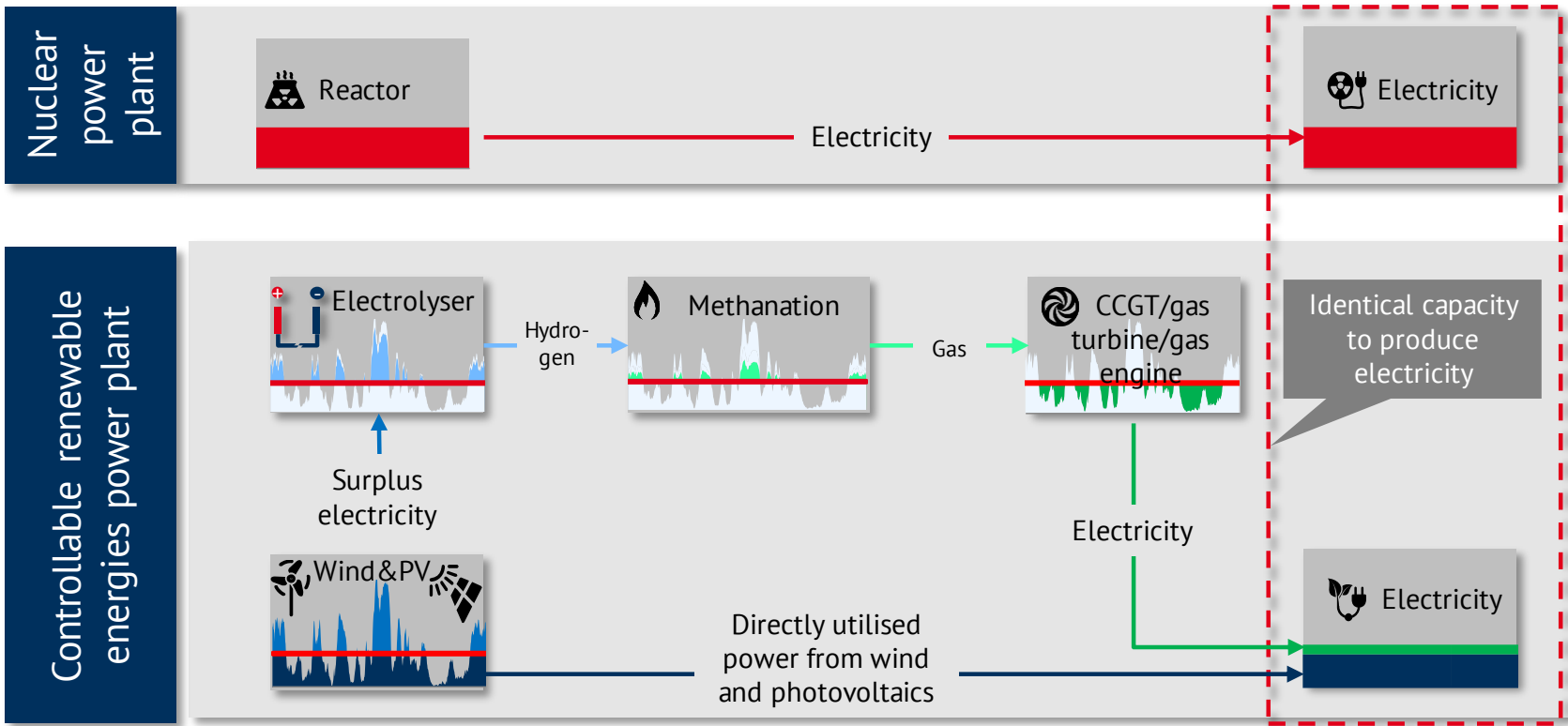


**Controllable renewable energies (CRE)**



# ATOMPROJEKTE OSTEUROPA VS. ERNEUERBARE

1 : 1 comparison of NPPs and CRE on the basis of LCOE for baseload-production



# COST EVALUATION OF CRE

## LCOE for a controllable renewable energy system

- Scale of CRE-System: replaces the NPP-capacity and generation
- Optimized share of components: hourly pv-/wind-profiles, national WACC, slightly decreasing CAPEX of wind/pv

\*) Due to very limited experience with wind power in Slovakia, actual wind potential has not been sufficiently studied and a very low level of potential has been assumed in these calculations.

Country Year	Intermittent electricity				Controllability			Total costs EUR/MWh
	Required output from renewables	Share of wind	Share of PV	Power production costs of intermittent renewables	Gas power plant capacity	Electro-lyser capacity	Additional costs of controllability	
	MW	%	%	EUR/MWh	MW	MW <sub>el</sub>	EUR/MWh	
HU 2027	12,118	74	26	72.56	2,400	2,866	56.11	128.67
SK 2027	19,019	59	41	89.74	2,400	3,699	77.49	167.23*
CZ 2035	24,167	72	28	74.06	4,800	6,201	45.01	11.08
PL 2035	30,872	79	21	69.83	6,000	8,470	41.90	111.73
V4 2027	85,678	77	23	67.09	15,600	16,808	53.08	120.17
V4 2035	84,233	71	29	60.36	15,600	21,534	39.66	100.02

In nationally optimized scenarios, CRE is predominantly competitive with nuclear power plants

In transnational optimized scenarios, seE tend to be cheaper than new, current nuclear power plants in Europe





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