# Reforming the European electricity market to meet decarbonization objectives

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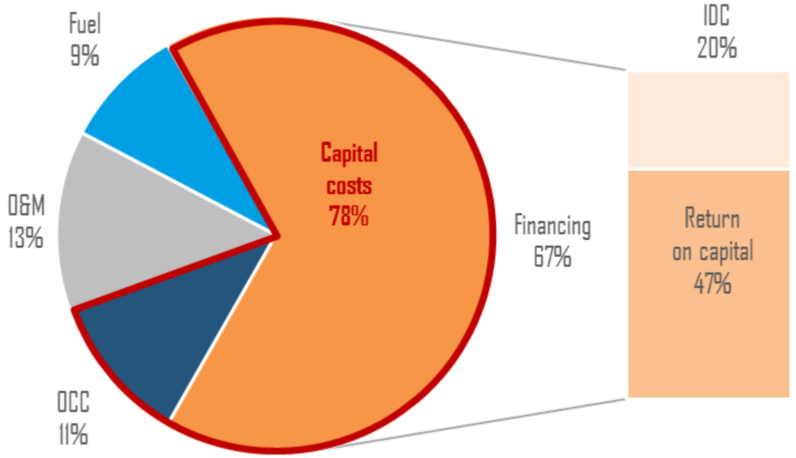
# Nuclear new build as strategic infrastructures projects

- Investments in long-lived, highly capital-intensive low carbon assets such as nuclear power plants inevitably integrated with **societal objectives and in particular climate change mitigation**

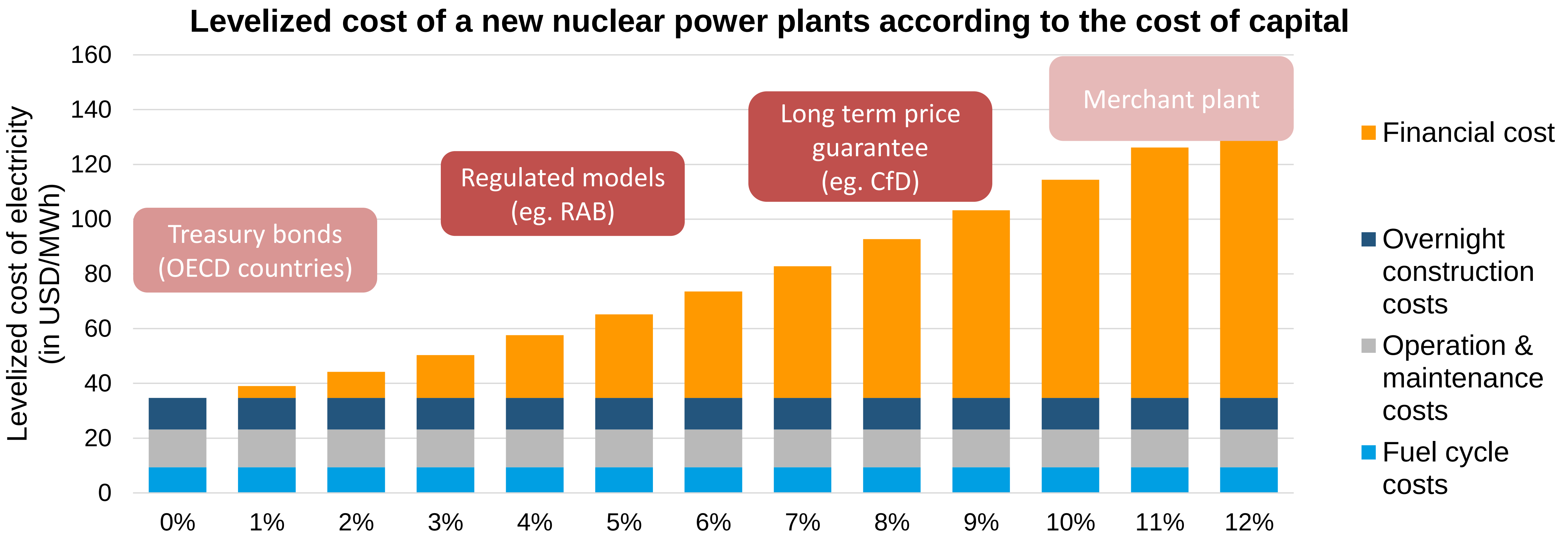
- These investments are akin to strategic infrastructures projects **with large positive externalities that require specific linkages between public and private sectors**

**Typical capital costs represent 78% of nuclear production costs (LCOE)**




*Note: With discount rate at 7%, Return of capital refers to interest during operation, OCC: Overnight construction cost, IDC: Interest during construction*
Source: NEA

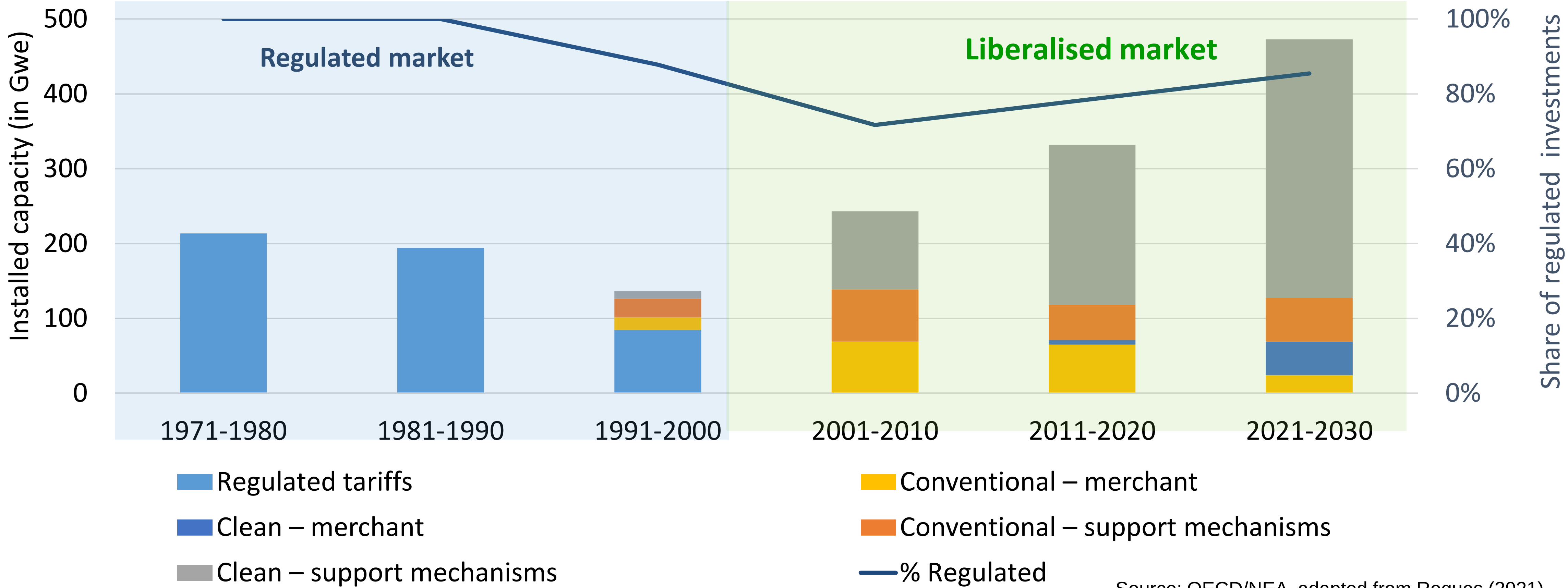
# Nuclear power economics is dominated by the cost of capital




Note: Overnight cost of 4500 USD/kWe, a load factor 85%, 60-year lifetime and 7-year construction time Source: NEA

**Cost of capital reflects risk allocation and mitigation decisions. Market risks and construction risks are the two key categories of interest for nuclear new build.**

# Back to the future: investments in new capacity in the EU electricity system are NOT market driven

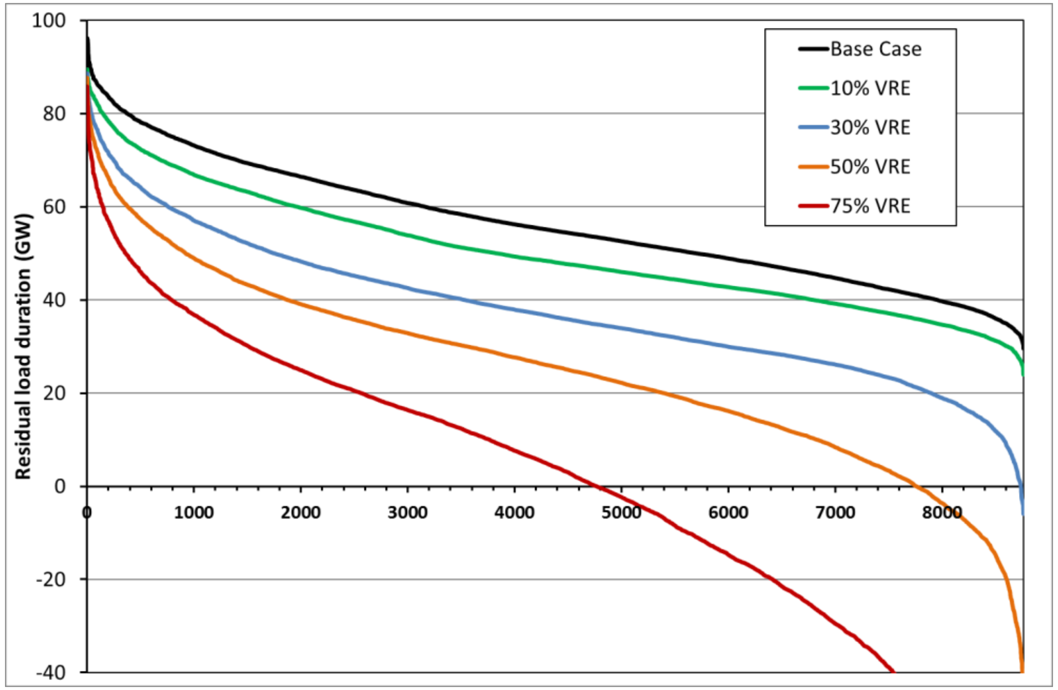



Source: OECD/NEA, adapted from Roques (2021)

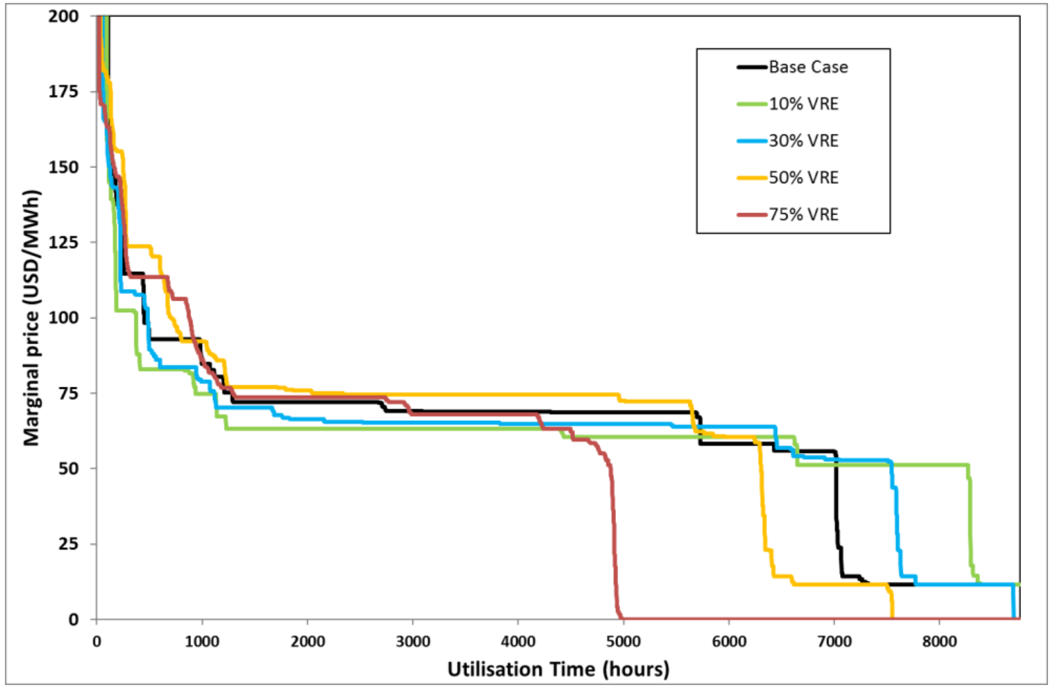
**Most of the investments in deregulated markets have not been incentivized by the markets but rather by specific policy support mechanisms**

# Why we need electricity market reforms in an electricity with larger shares of variable renewables (1/2)

## Residual Load Duration Curves



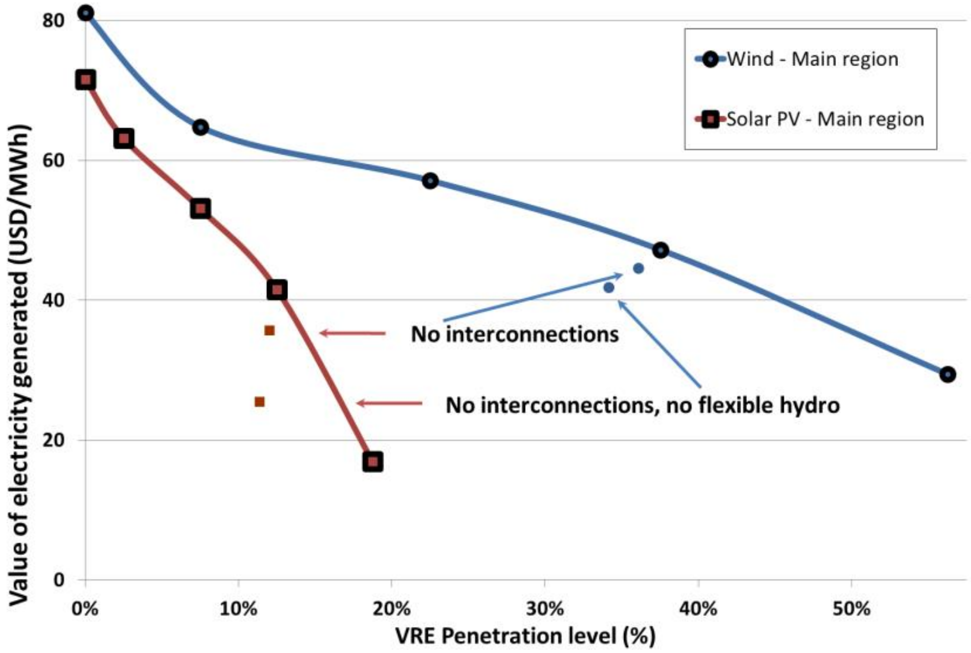

## Price duration curves




**Increase of hours with zero price (over 3750 hours per year at 75% VRE), compensated by an increase in high-price hours (>100 USD/MWh). Price volatility increases uncertainty, investment costs and risks to capacity adequacy.**

# Why we need electricity market reforms in an electricity with larger shares of variable renewables (2/2)

## Variable renewables market value is negatively correlated with their market share




**VRE earn less than average market prices due to auto-correlation during production hours. This effect increase with their share and is larger for solar PV. Flexibility resources improve value.**

# Structural policy and market reforms to meet net-zero

## Electricity market reforms

### Status quo

- Price guarantee schemes (eg. Contract for difference, Power Purchase Agreement)
- CO2 price signal through EU-ETS

### More market to fix the market

- Hybrid electricity market models (e.g. Brazil)
- Expended capacity markets

### Regulated approaches for new capacity

- Regulated infrastructure models (e.g. Regulated Asset Base, RAB)

## Financing framework

### Government financial support

- Sustainable taxonomies and ESG recognition
- Direct: equity, debt
- Indirect: loan guarantee, export credit agencies

Complementary packages of solutions

There is no silver bullet. The right package of solutions will require a clear definition of the policy objectives before turning to the required market reforms and financial support

# 2021-2022 NEA-IFNEC Financing Initiative

## Recent events

- International kick-off workshop, Jan 2021
- 4 seminars with IFNEC, making work relevant for emerging economies.

## Save the date

→ **High-Level Warsaw Conference on Nuclear Financing** (23 November 2021 - virtual)

## Forthcoming publication

→ **NEA report on nuclear financing** (Spring 2022)


*Kick-off Workshop Opening by Adam Guibourgé-Czetwertyński, Undersecretary of State for Climate and Environment of the Republic of Poland*

# Thank you for your attention