

# Electricity Market Design under Long-Term Decarbonisation

Paris, 8 October 2014

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# IEA Electricity Security Advisory Panel (ESAP)

- **Launched in 2014: 1st High Level Plenary meeting in June 2014**
- **Set up a working group on electricity security and market design**
- **Unique platform for stakeholders (system operators, regulators, traders, utilities...)**
- **Exchange experiences and best practices among IEA countries**
- **Support IEA work programme on Electricity Security and market design**

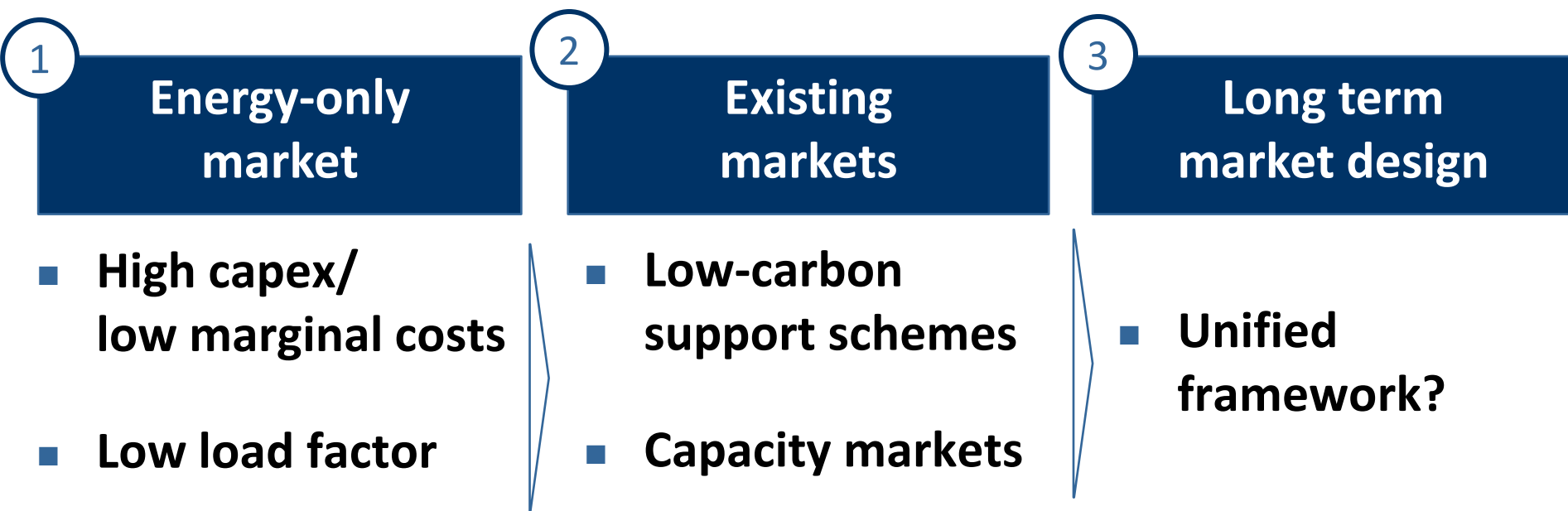
# Workshop electricity market design under long term decarbonisation

- Carbon pricing (Cf. IETA-IEA-EPRI workshop)
- Challenges in competitive markets
- What can we learn from modelling?
- What can we learn from experiences



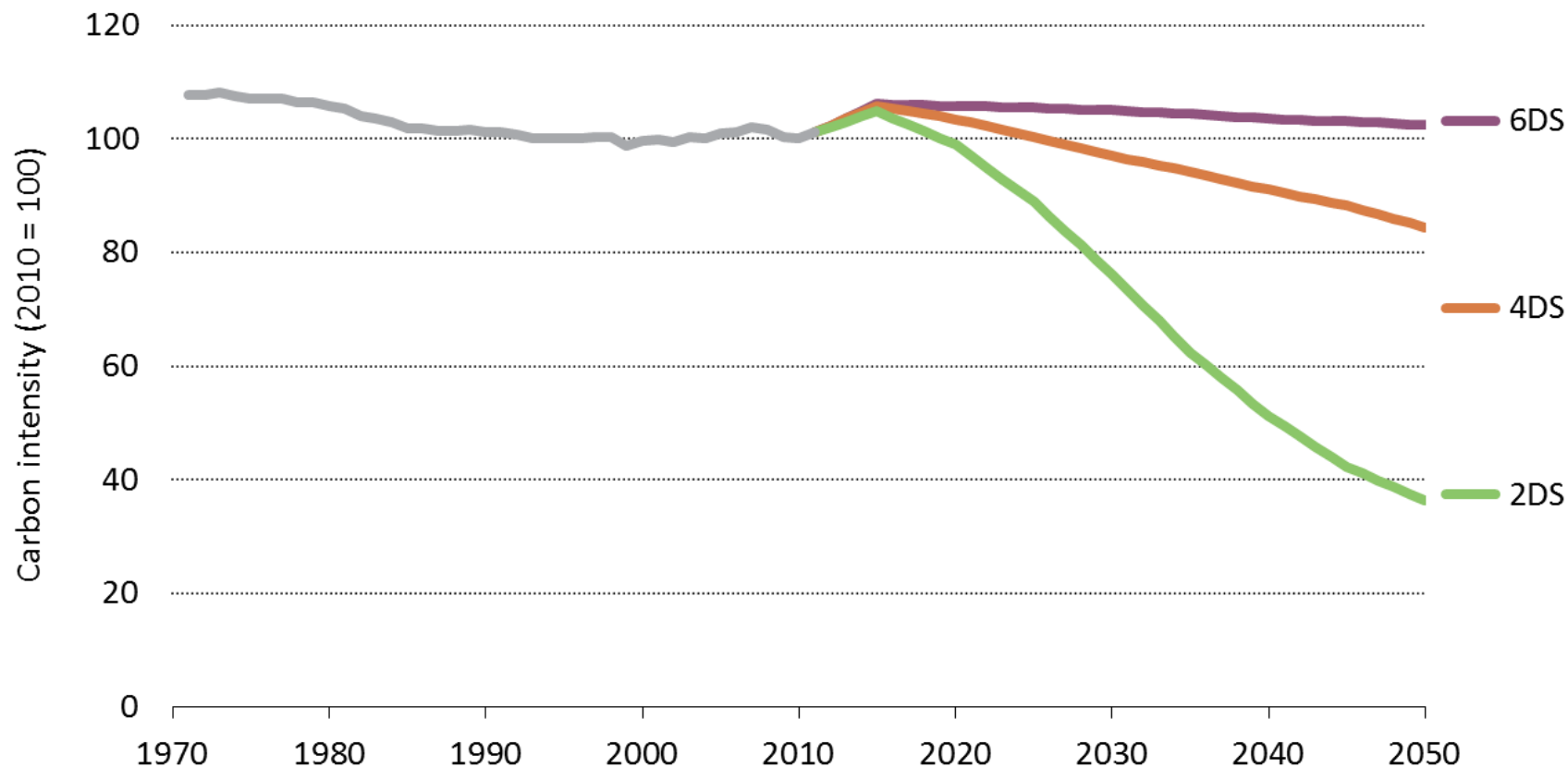
# Workshop electricity market design under long-term decarbonisation

## ■ Long-term decarbonisation objective: 2050



# The world faces a challenge

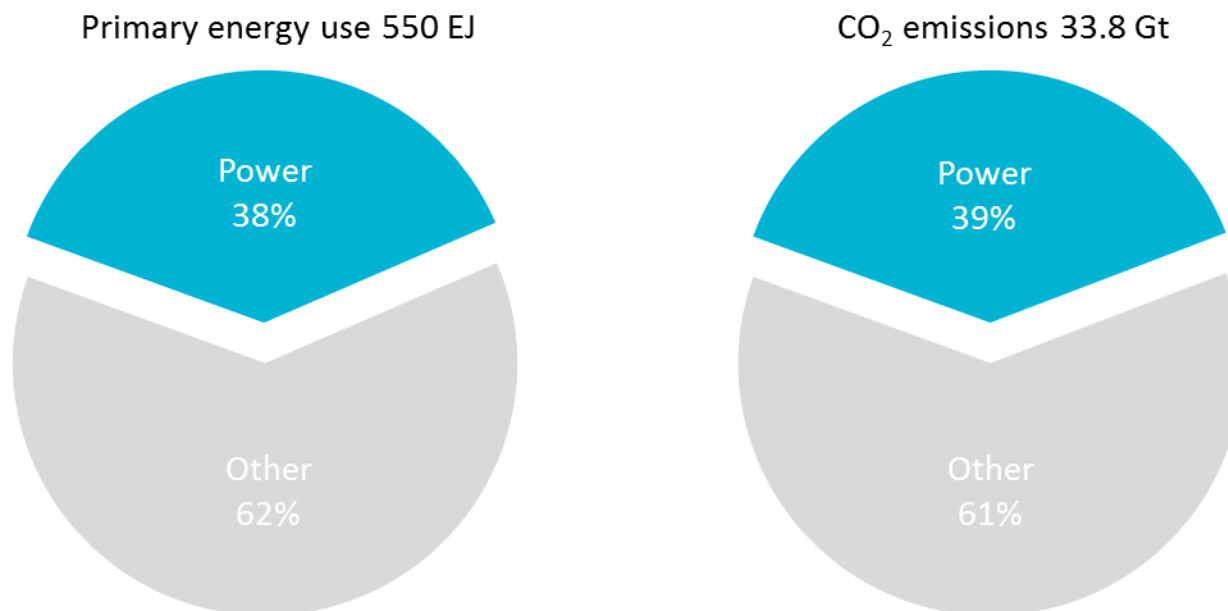
ETP  
2014



*Energy's carbon intensity is stuck AND we need to decouple economic growth from energy use*

# Electricity can power sustainable growth

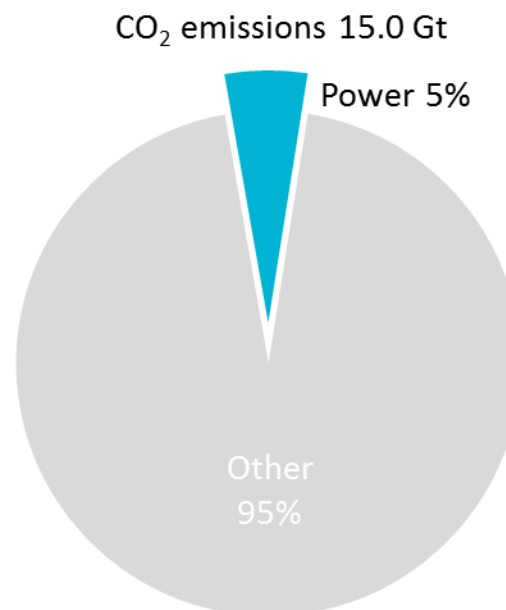
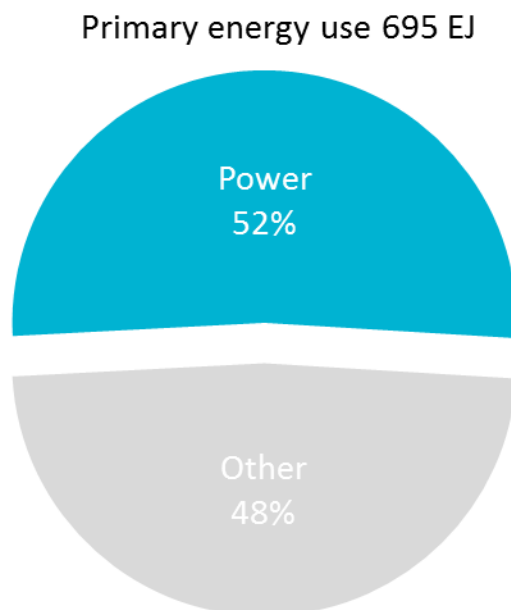
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*But the source of electricity is of utmost importance*

# Electricity can power sustainable growth

2050 2DS



*The 2DS pathway disconnects primary energy used in generation from emissions*

# The electricity sector faces an evolving landscape and many challenges:

- Depressed wholesale prices
- Environmental & regulatory policy
- New technologies
- Influx of natural gas (US)
- Intermittent renewables
- Distributed generation
- Customer requirements
- New entrants

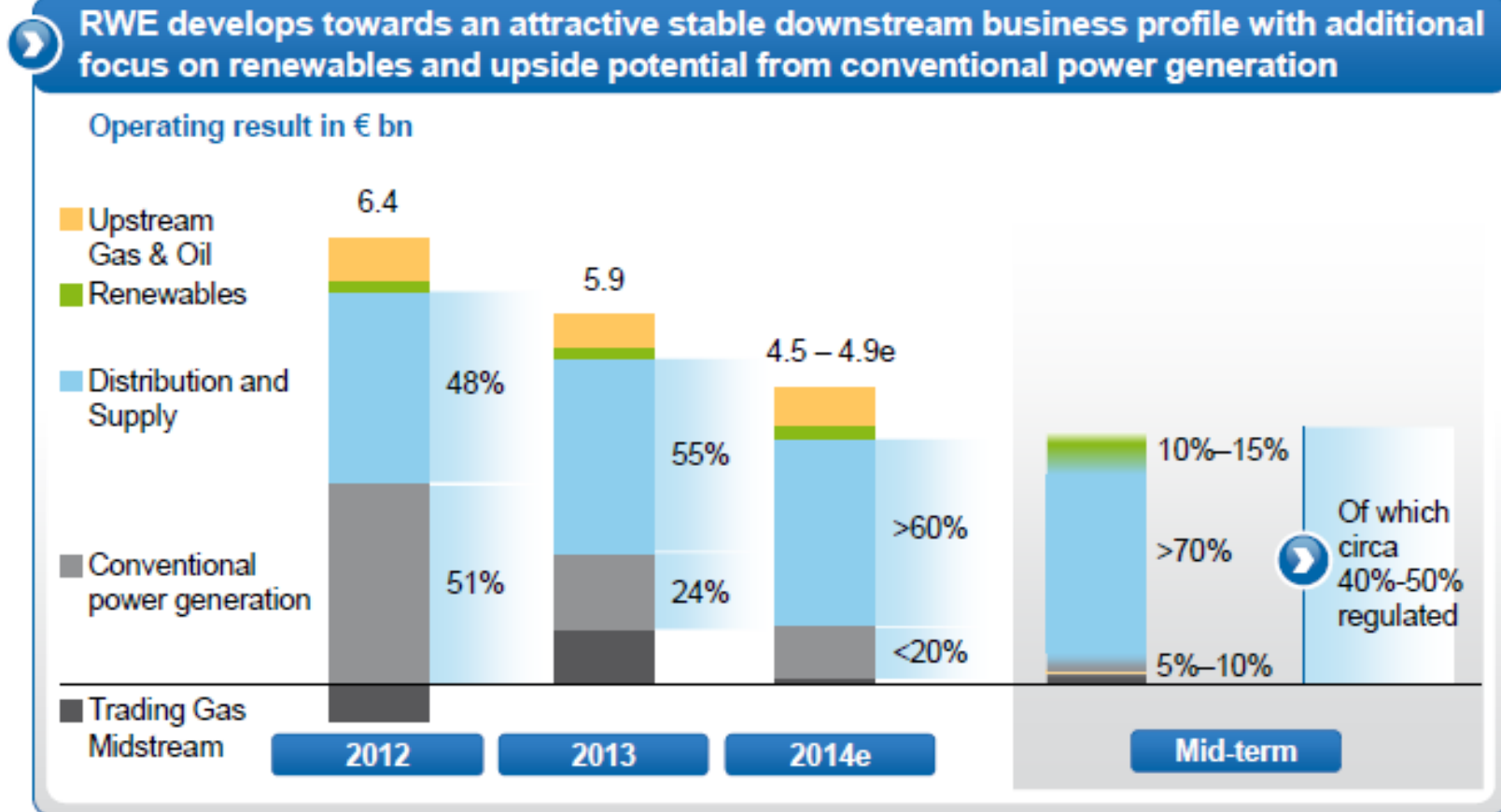
Source: FirstEnergy, RWE



# In detail:

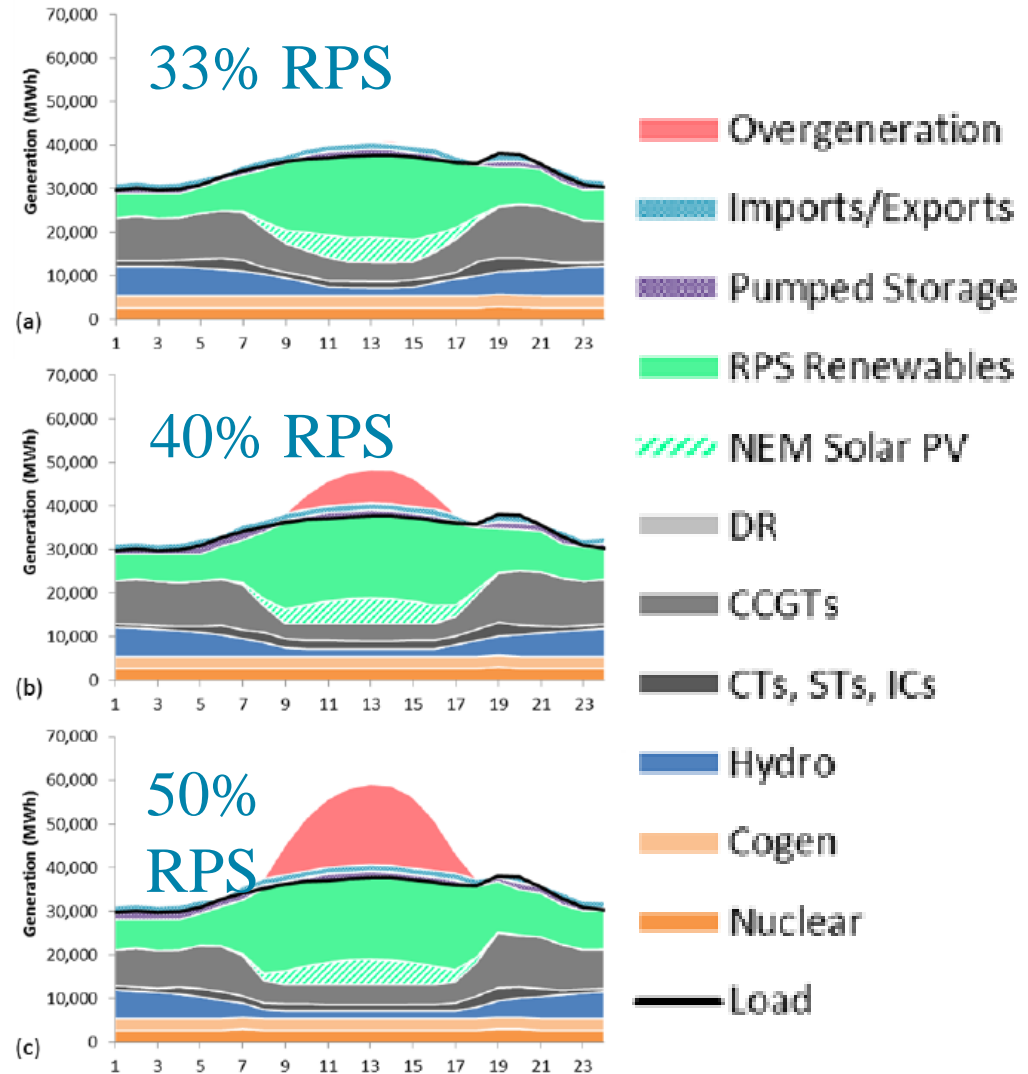
- Declining conventional generation revenue
- Overgeneration
- Little relationship between prices and value/costs

# Utilities of today – challenged by declining conventional generation revenue. Example: RWE

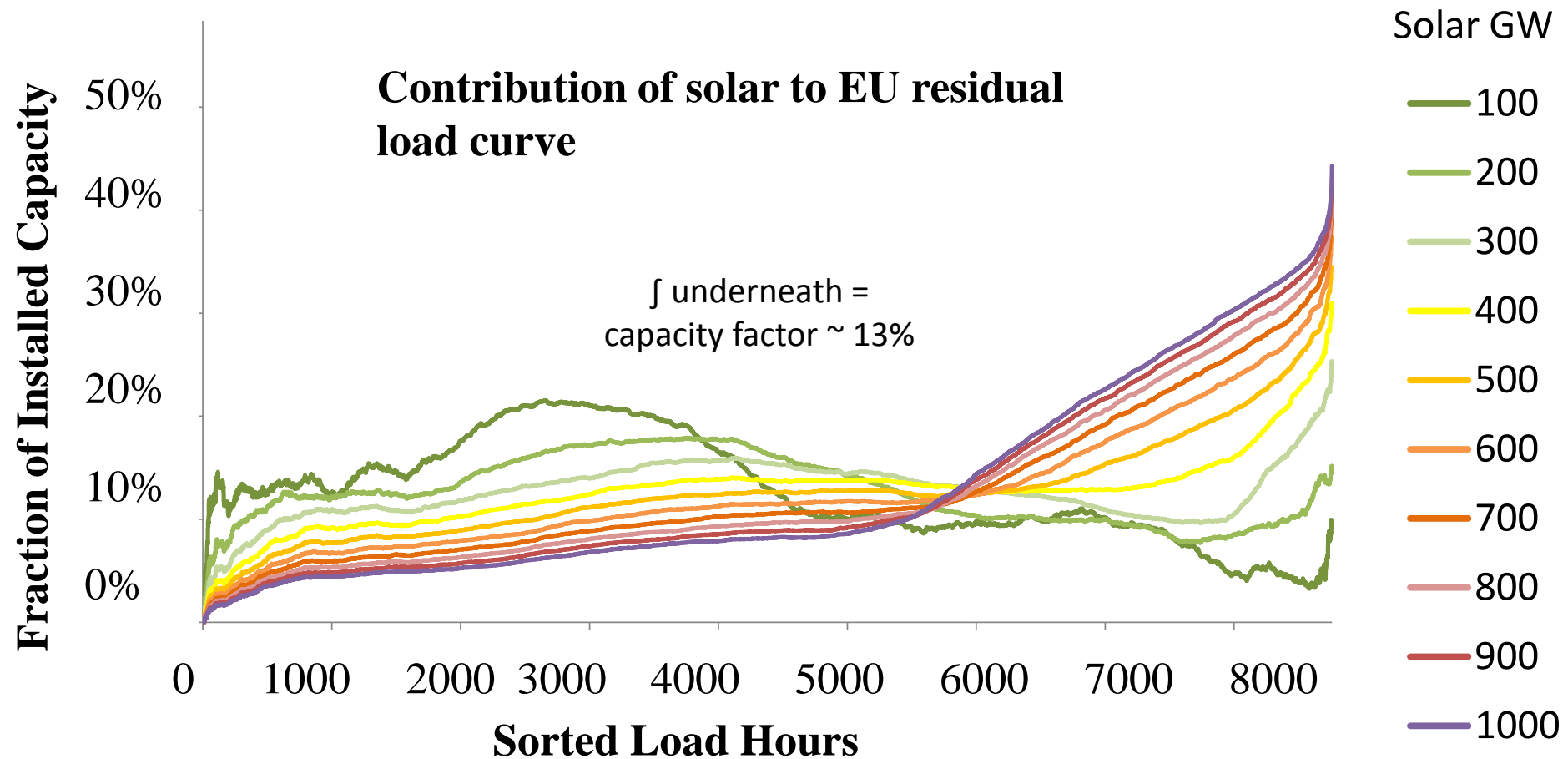


# Overgeneration is the Most Significant Integration Challenge

- Chart shows increasing overgeneration above 33%
  - Overgeneration is very high on some days under the 50% Large Solar case
  - Fossil generation is reduced to minimum levels needed for reliability
- Renewable curtailment is a critical strategy to maintain reliability
  - Reduces overgeneration
  - Mitigates ramping events



# The value of variable renewables decreases with increasing concentration

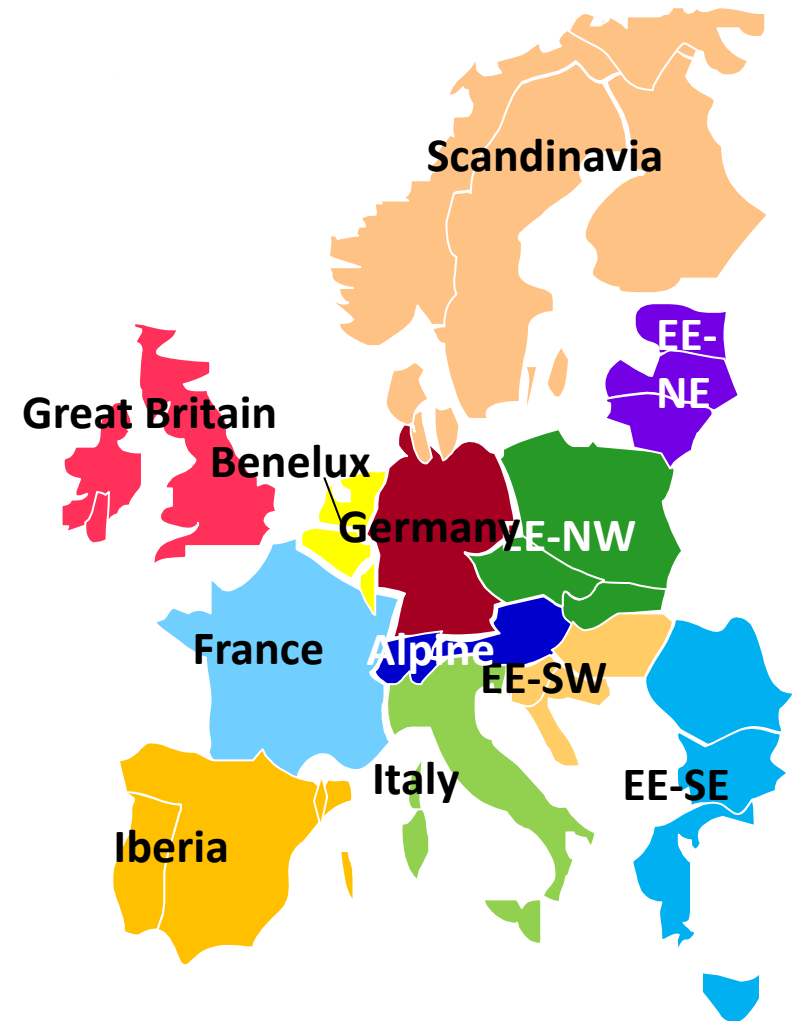


**Solar's percent contribution to capacity decreases as more is added, but pricing supports are constant**

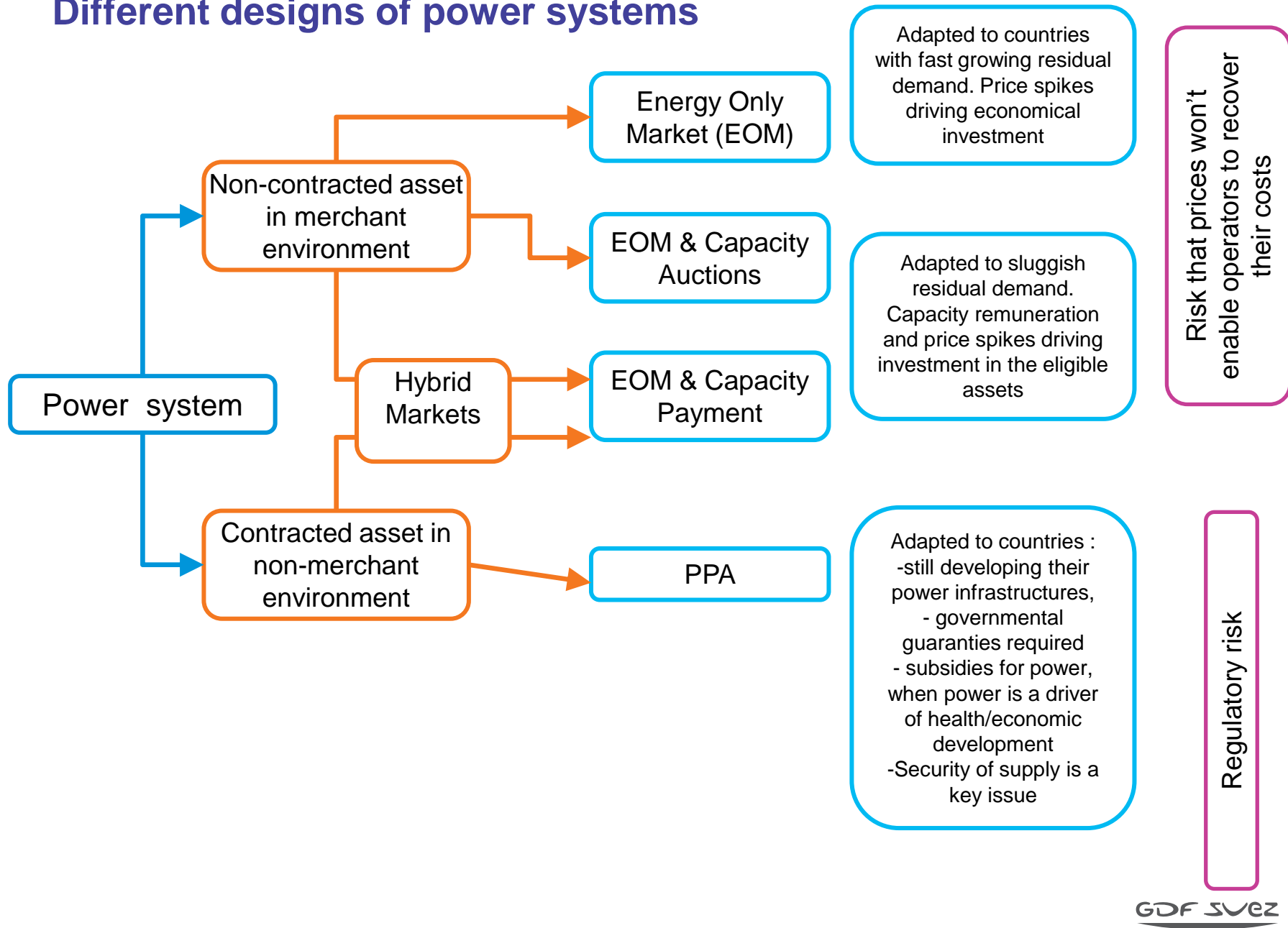


# New EU-REGEN model gives key policy insights

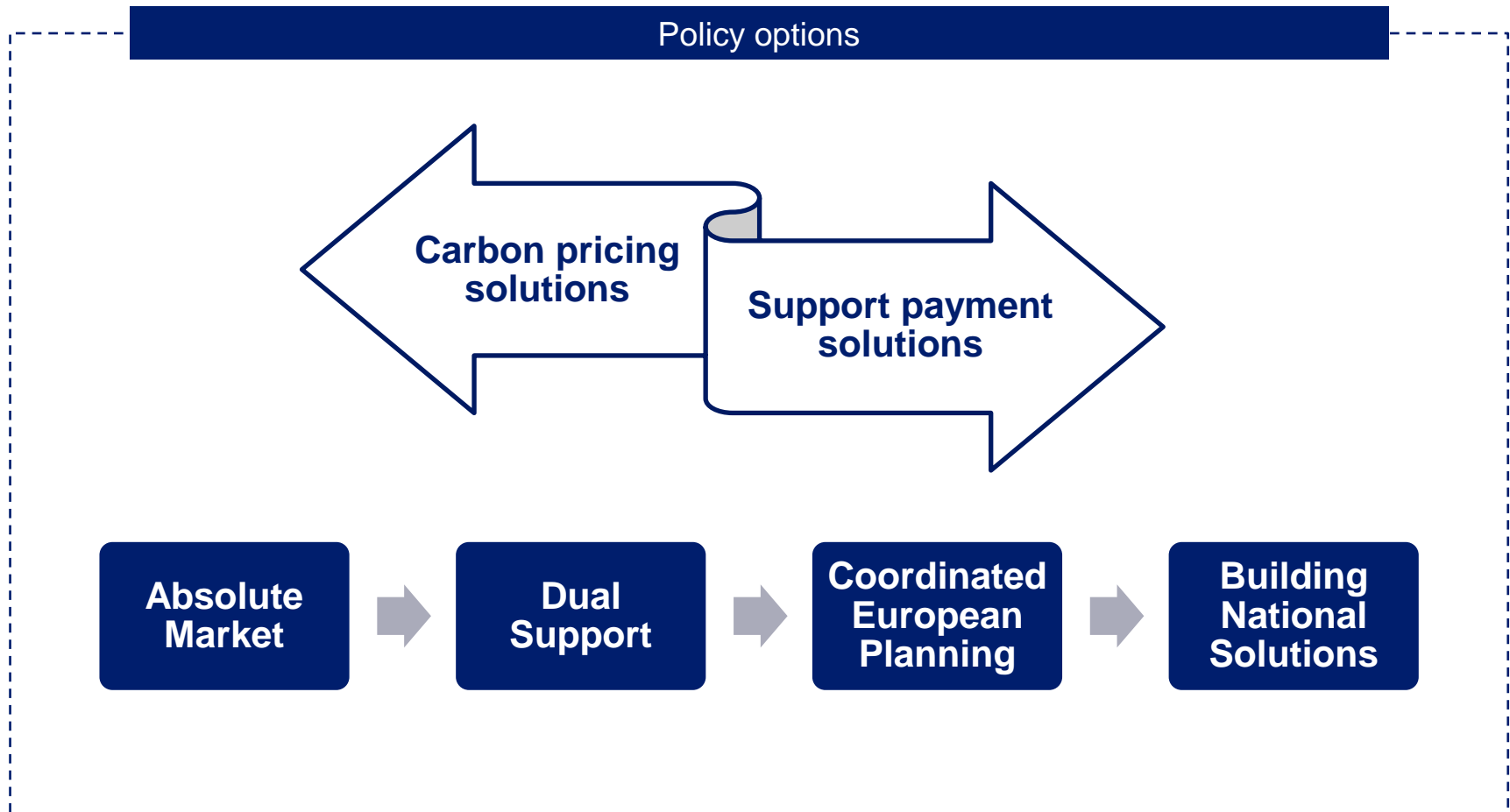
- Jointly developed by EPRI and Ifo Institute, Munich
- Selected model characteristics:
  - Optimized investment/rental with high-resolution dispatch
  - Renewable resources and load based on hourly shapes
  - Continental scope with country-specific detail and cross-border power flows
- Based on US-REGEN model developed with 13 US member companies
- Wide range of applications in energy and environmental policy and technology issues



# Different designs of power systems



# The key choice is to decide where we should be sitting on the carbon pricing vs. direct low carbon support policy spectrum



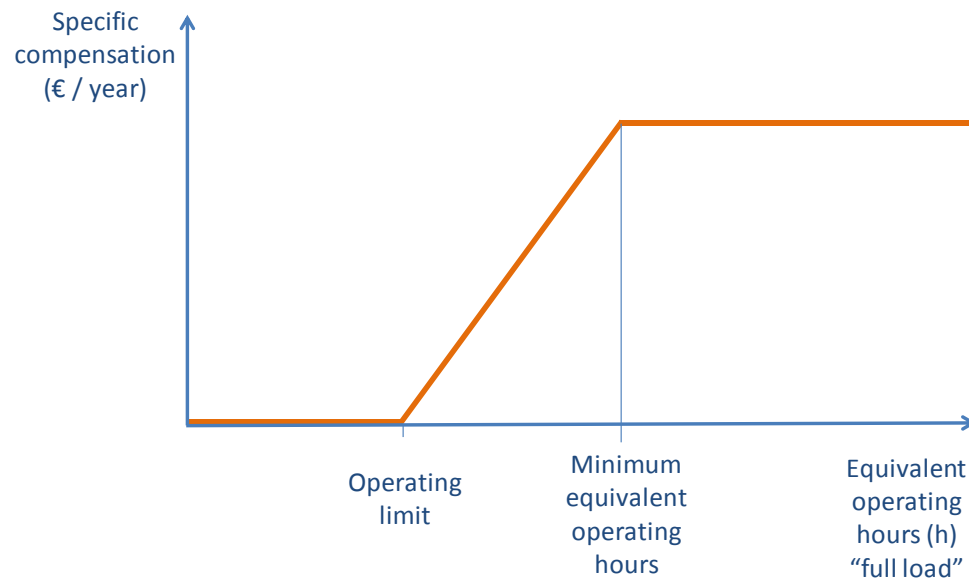
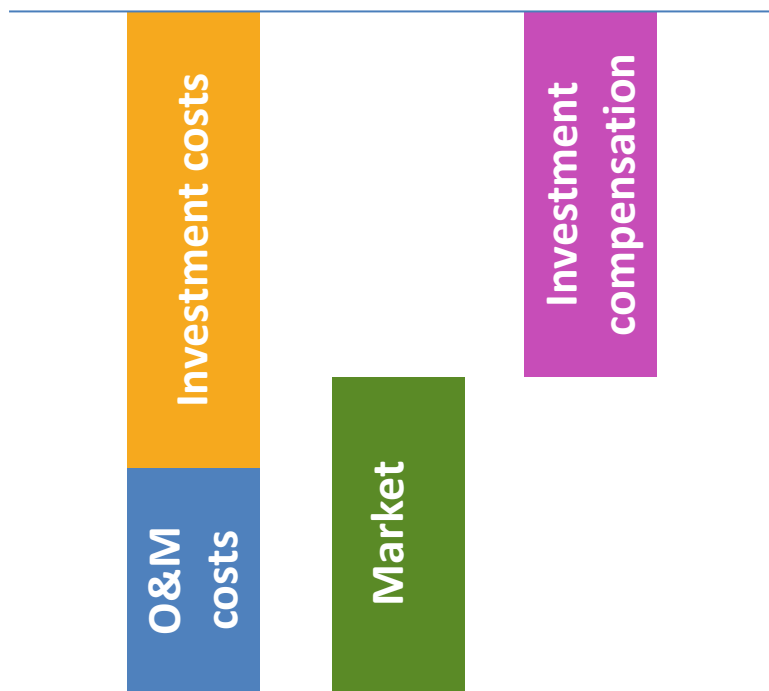


GOBIERNO  
DE ESPAÑA

## New renewable support scheme

Low O&M costs  
(wind, PV...)

Specific Compensation adjustment based  
on the current performance of each facility

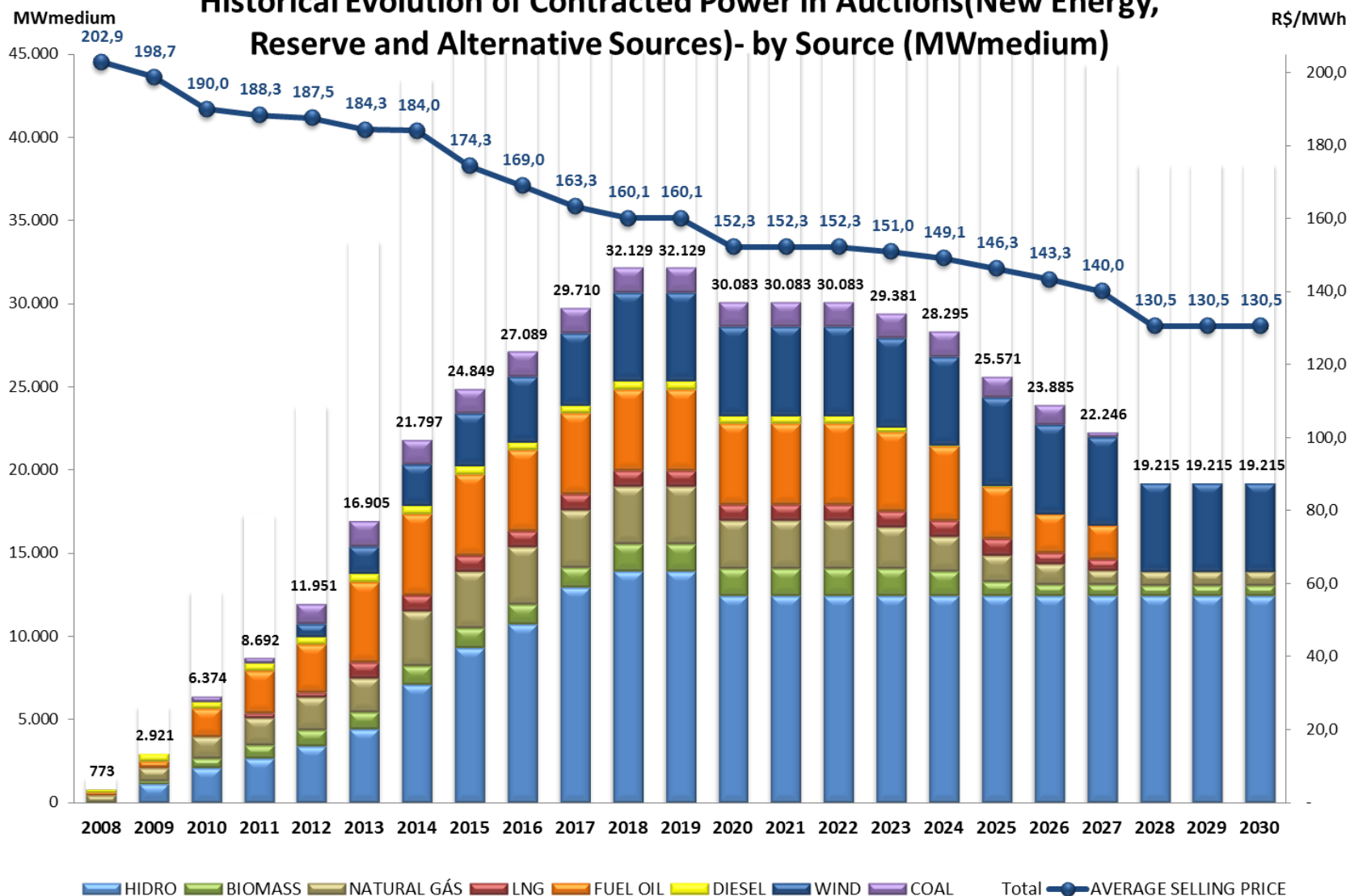




# Auctions' Results

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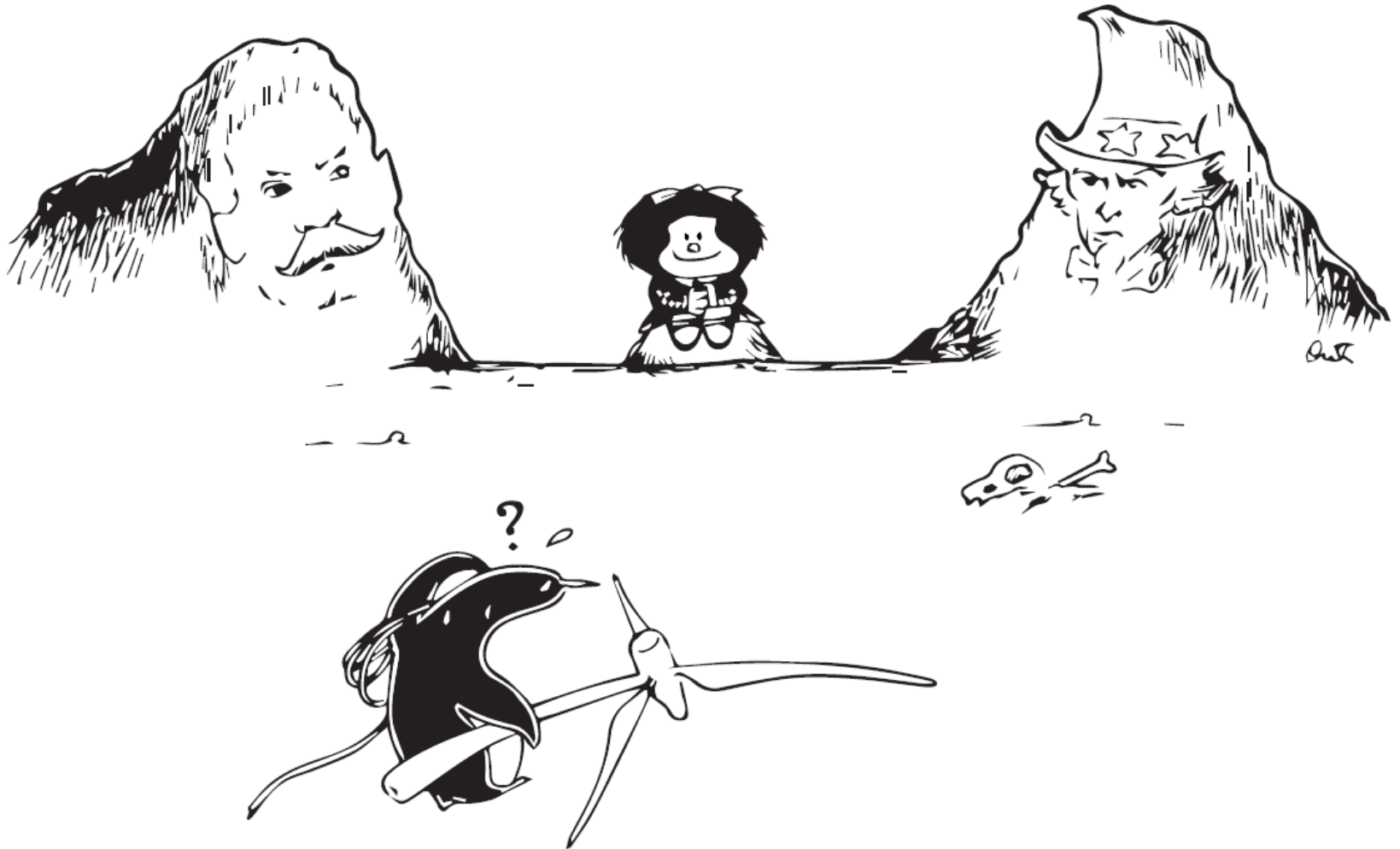
## Historical Evolution of Contracted Power in Auctions(New Energy, Reserve and Alternative Sources)- by Source (MWmedium)





European  
Commission

# Who?



Energy

## Key takeaways:

- The electric grid is part of the solution
- Demand side response must be part of the equation
- Market design must adapt to new technologies
- Available financing depends on risk
- Prices need to better align with value
- No consensus on more or less market intervention