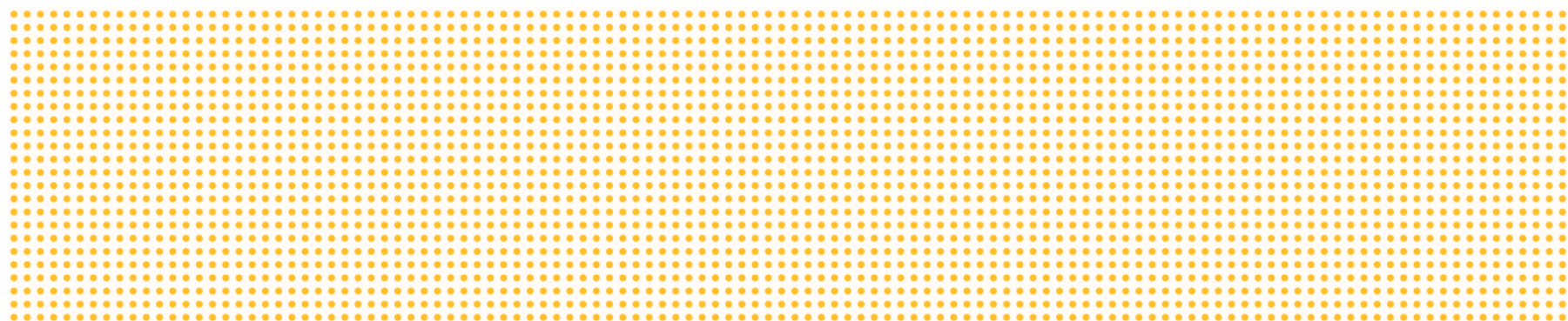


# Future Structure of the German Electricity Market: necessity and design of capacity mechanism in a high RES electricity system

Den Haag, November 2, 2012







# Agenda

1. The German Situation
2. Quantitative Analysis: Simulation Results
3. Capacity Mechanisms
  - a. Reliability Contracts
  - b. Strategic Reserve
4. Outlook



## The German government has formulated ambitious targets.

1. ... Our citizens can trust that electricity is available any time, in any quantity, and at an affordable price. ... In Germany, we do not want to be dependent upon electricity imports. We want to be able to produce our net consumption on our own.  National Security of Supply
4. ... We will have decommission all nuclear power plants by the year 2022-  Decommissioning Nuclear
7. ... Compared to 1990, we want to reduce green house gas emissions in 2020 by 40%, by 2030 by 55%, by 2040 by 70% and by 2050 by 50%. ...  Reduction GHG
14. ... We want to increase the share of renewable energy source generation from currently 17% up to 35% by 2020. ...  Increasing RES

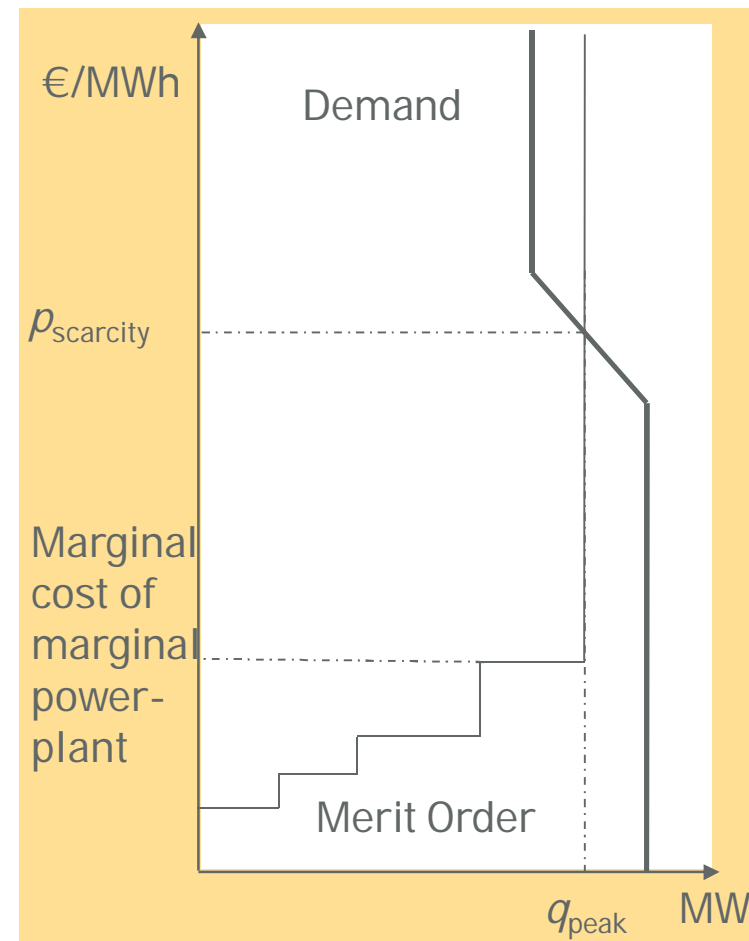
Source: Eckpunktepapier der Bundesregierung, Kabinettsbeschlüsse vom 6.6.2011

## Central question: can powerplants earn their cost of capital in a liberalised electricity market?

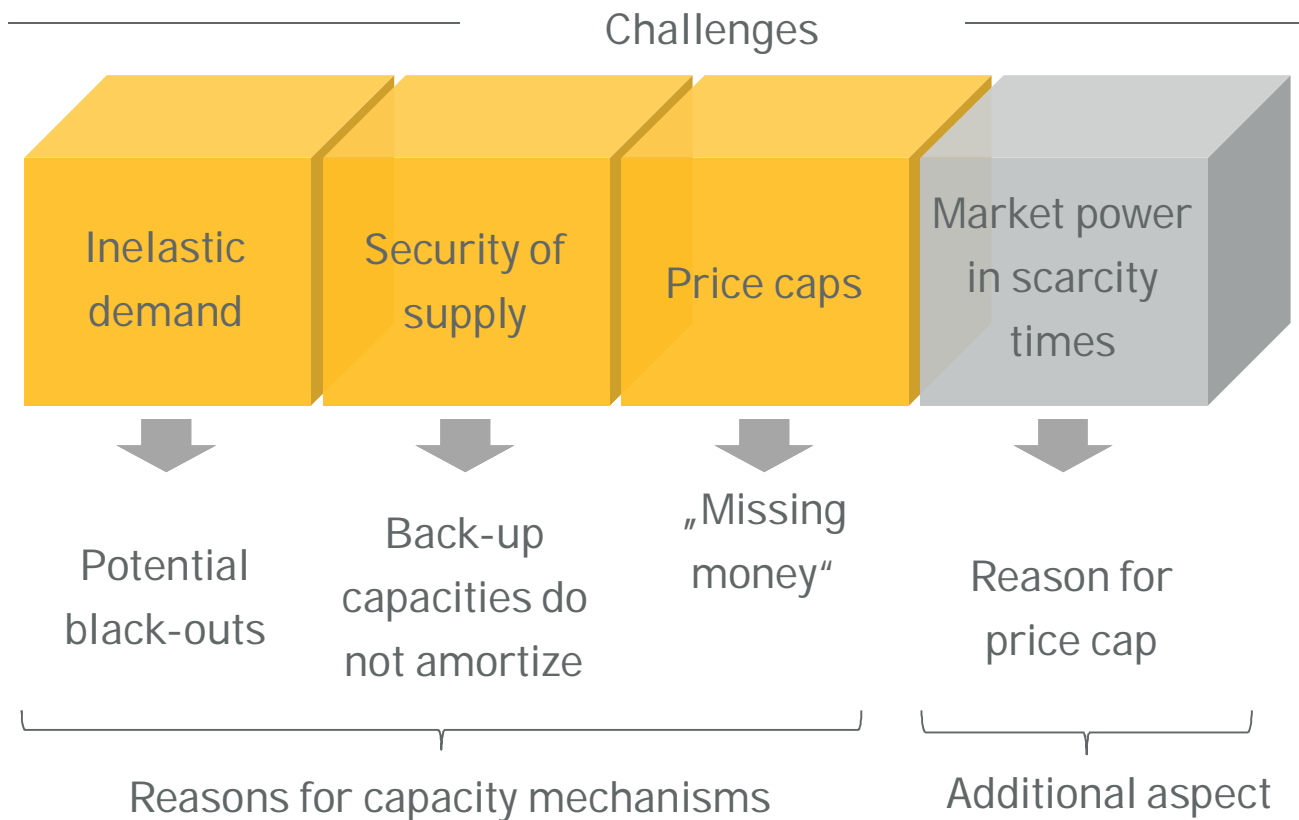
1. Any single powerplant will only be built if it pays off for the investor.
2. Powerplants in Germany (and the Netherlands) recoup investments only by selling energy (energy-only market) .



In an energy-only market, investors need scarcity prices



# A liberalised electricity market shows several challenges.



The Energiewende does not impose these challenges but increases them!

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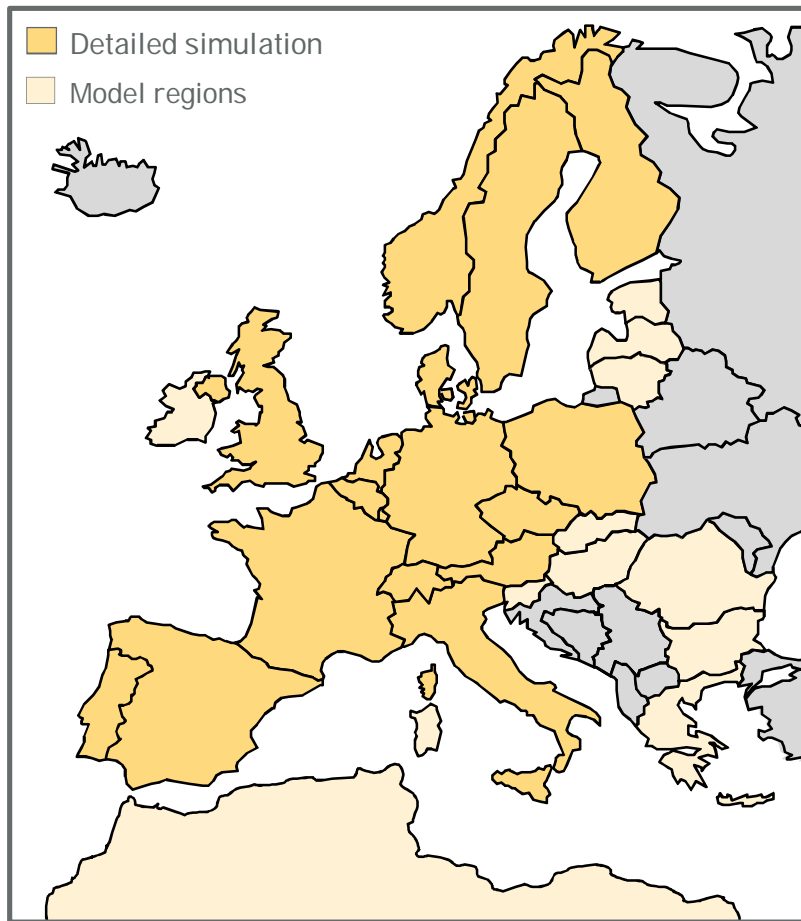
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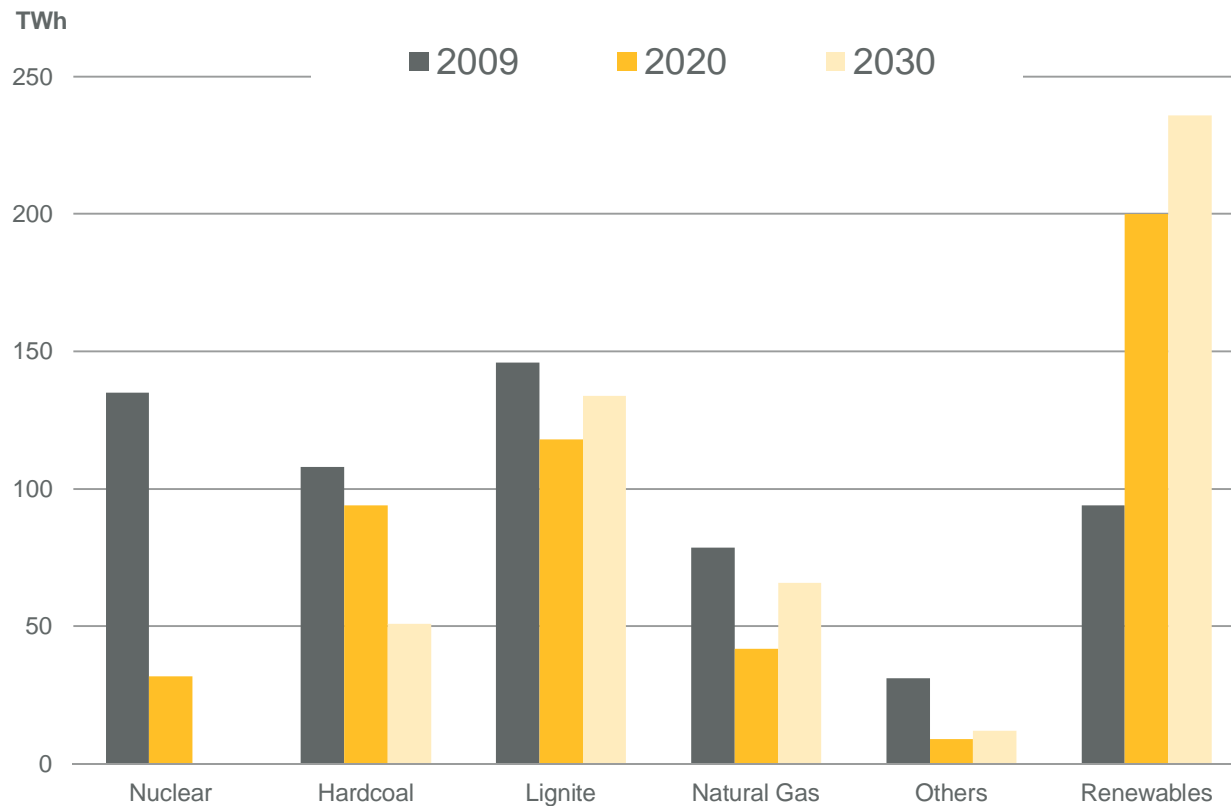
Our quantification is based on simulating the German electricity system within the European context.



### Assumptions

- Germany and adjacent regions
- National security of supply
- High level of security of supply
- „Copper plate“ within Germany (no congestion)
- Calculations for 2020 and 2030
- Constant level of peak load (based on 2009)
- Integrated analysis of reserve markets
- Exogenous share of RES (38% 2020, 44% 2030)

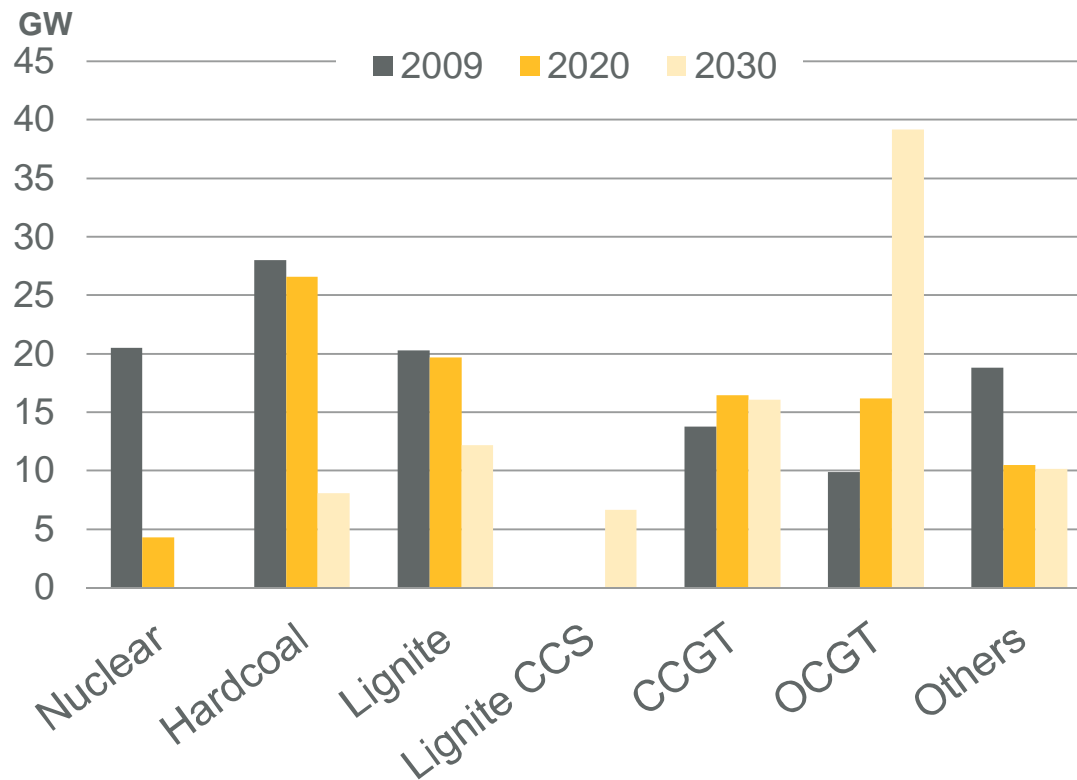
Electricity production in the target scenario mainly stems from lignite and renewables.





To meet the security of supply target, in the cost minimizing solution, a large amount of gas turbines is needed.

Net capacity of conventional power plants



Gas capacity

- 2009: 23,7 GW
- 2020: 32,7 GW
- 2030: 55,2 GW

Thereof: Gas turbines

- 2009: 9,9 GW
- 2020: 15,8 GW
- 2030: 39,2 GW

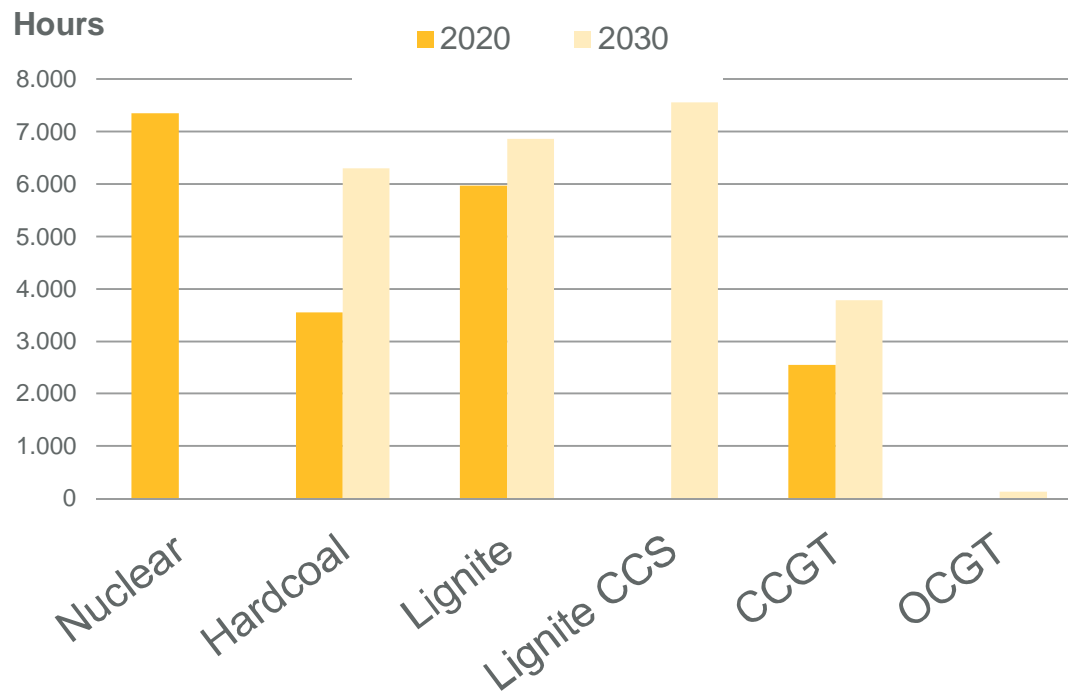
Timing: Additions

- small before 2020
- significant 2020-2025



The gas turbines have very low load hours.

Load hours by technology



Reason: "Double precaution"

- Precaution taken for the coincidence of peak load and low RES in-feed
- In a "typical" wind year, this coincidence does not materialize; thus, gas turbines are of merit even in peak hours



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## Security of supply contracts: components

### Capacity obligations

Generators selling capacity in a capacity auction have to ensure physical capacity.

Generators receive capacity payment

- secures physical capacity

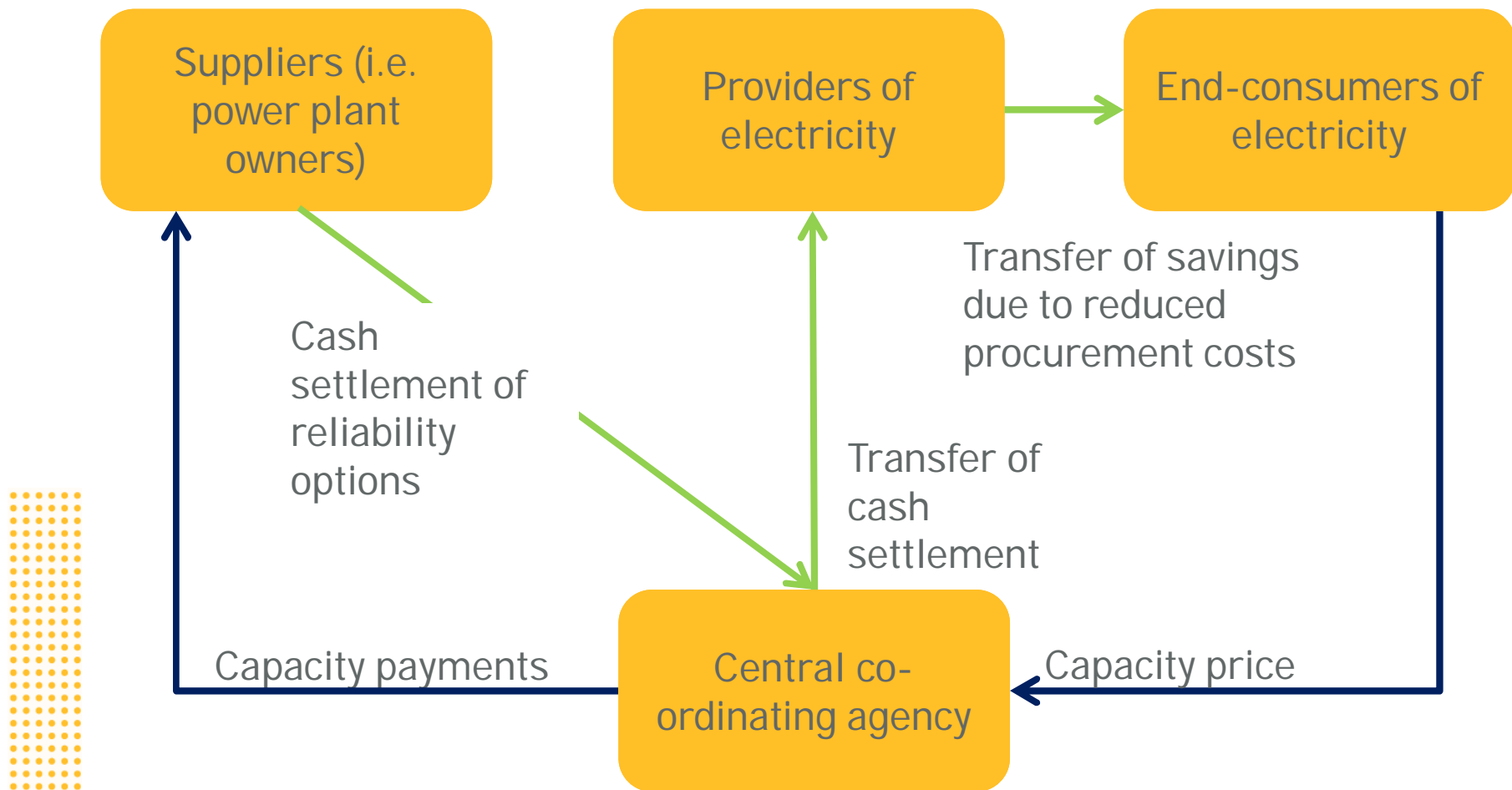
### Reliability options

When the spot market price for electricity exceeds the exercise price, the providers of capacity are obliged to pay the difference between the spot market price and the exercise price to the central co-ordination agency.

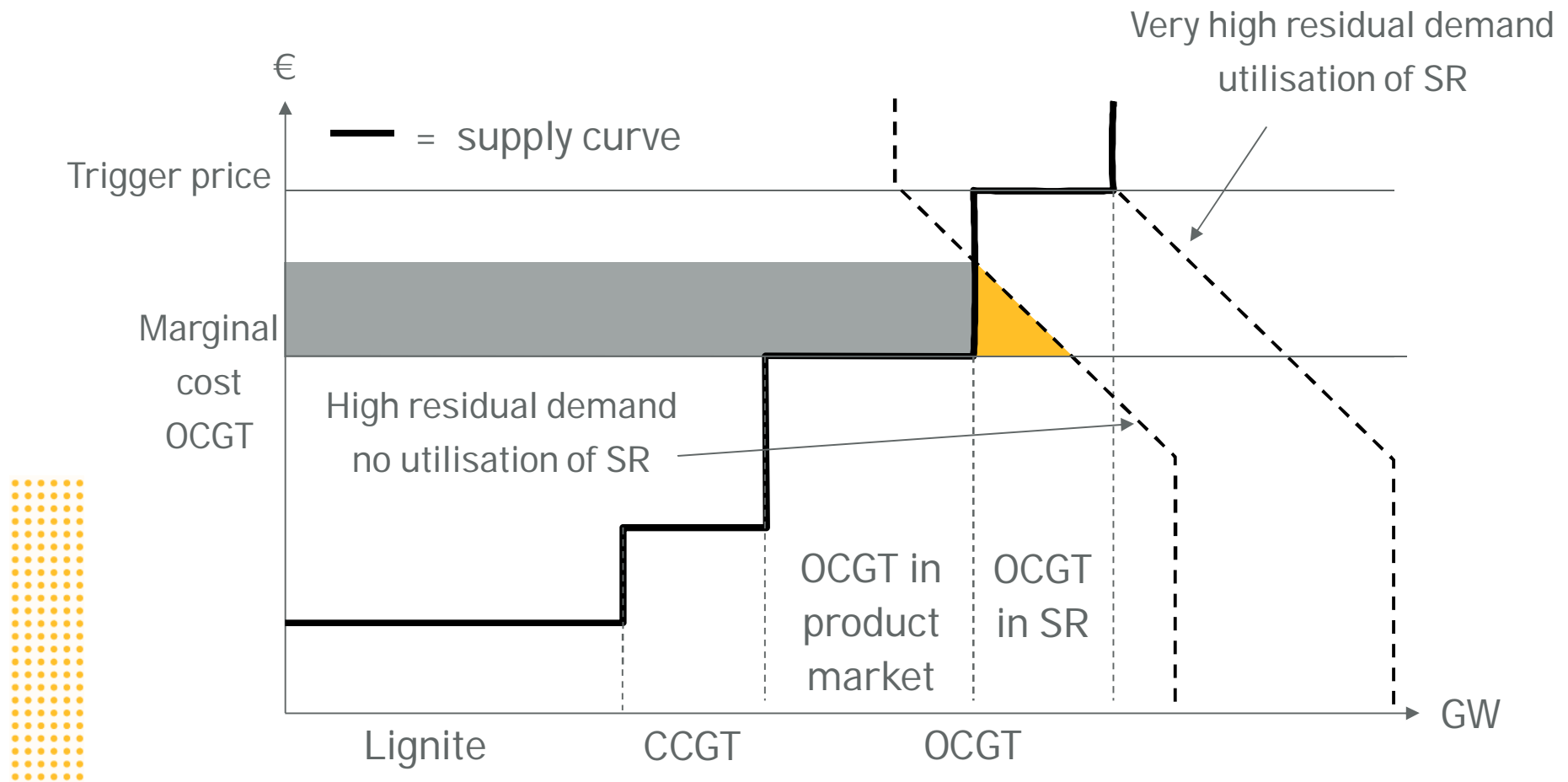
Example: spot price: 250 €/MWh  
exercise price: 200 €/MWh  
payment from option: 50 €/MWh

- reduces risk of consumers
- reduces incentives of abuse of market power

## Cash flows of security of supply contracts



A strategic reserve (SR) leads to an inefficient dispatch and artificially reduces consumer rents.



## Assessment of mechanisms

### Strategic Reserve (SR)

- To solve the long run problem, the SR reserve needs to be huge
- For any SR, it needs to be determined, when and if how it bids into the spot market
- To sustainably withhold large production capacities from the market is politically hard to sustain
- This leads to an inefficient dispatch

### Security of Supply Contracts

- We adjust the ISO NE mechanism to Germany
- Well known benefits are that dispatch is undistorted and that market power in the spot market is reduced, while risk is reduced
- Well known disadvantage is the high level of complexity
- Main challenges are the potential need for regional capacity markets and the execution of market power in these regional markets

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## Current and future issues

- Optimal short term answers to regional shortages (remuneration of redispatch, markets for redispatch, ...)
- Impact Analysis: how to design the market in detail



## You have any questions or suggestions?

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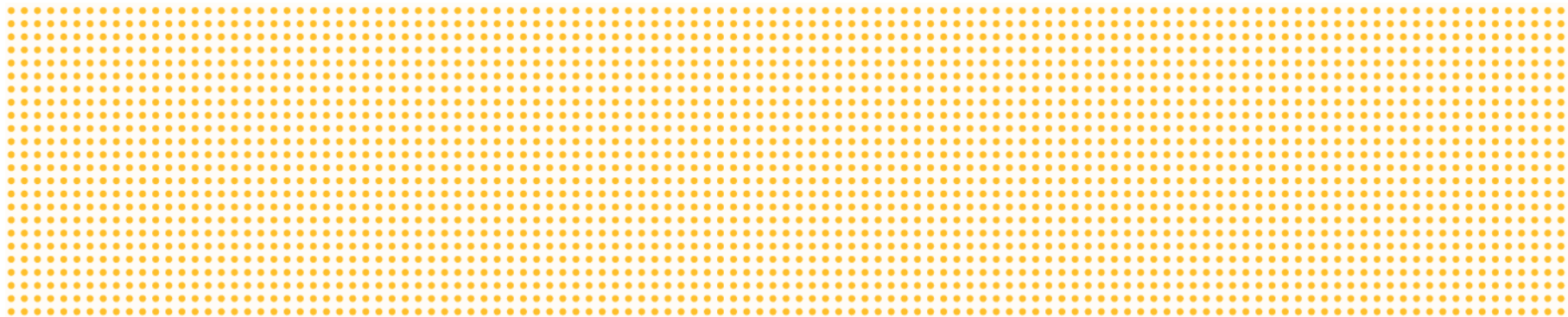
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# The simulation model DIMENSION combines long-term investment decision with high resolution dispatch.

