Capacity mechanisms: the new game in town?
Issues and pitfalls in implementation

BAEE Policy Workshop: Investment in Generation Capacity - Do we need more, and if so, how do we achieve it?

Brussels, 7 may 2013

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Agenda

- Getting the diagnostic right:
  - Is there a need for new investment, flexibility to integrate renewables, and / or to prevent plant retirements?
- Getting the theory right:
  - why would energy only market not deliver?
- Getting the right mechanism:
  - Pro and cons of different mechanisms
- Getting the implementation right:
  - do we need a coordinated European Approach?
  - What are key implementation pitfalls and likely unintended consequences?

Getting the diagnostic right:

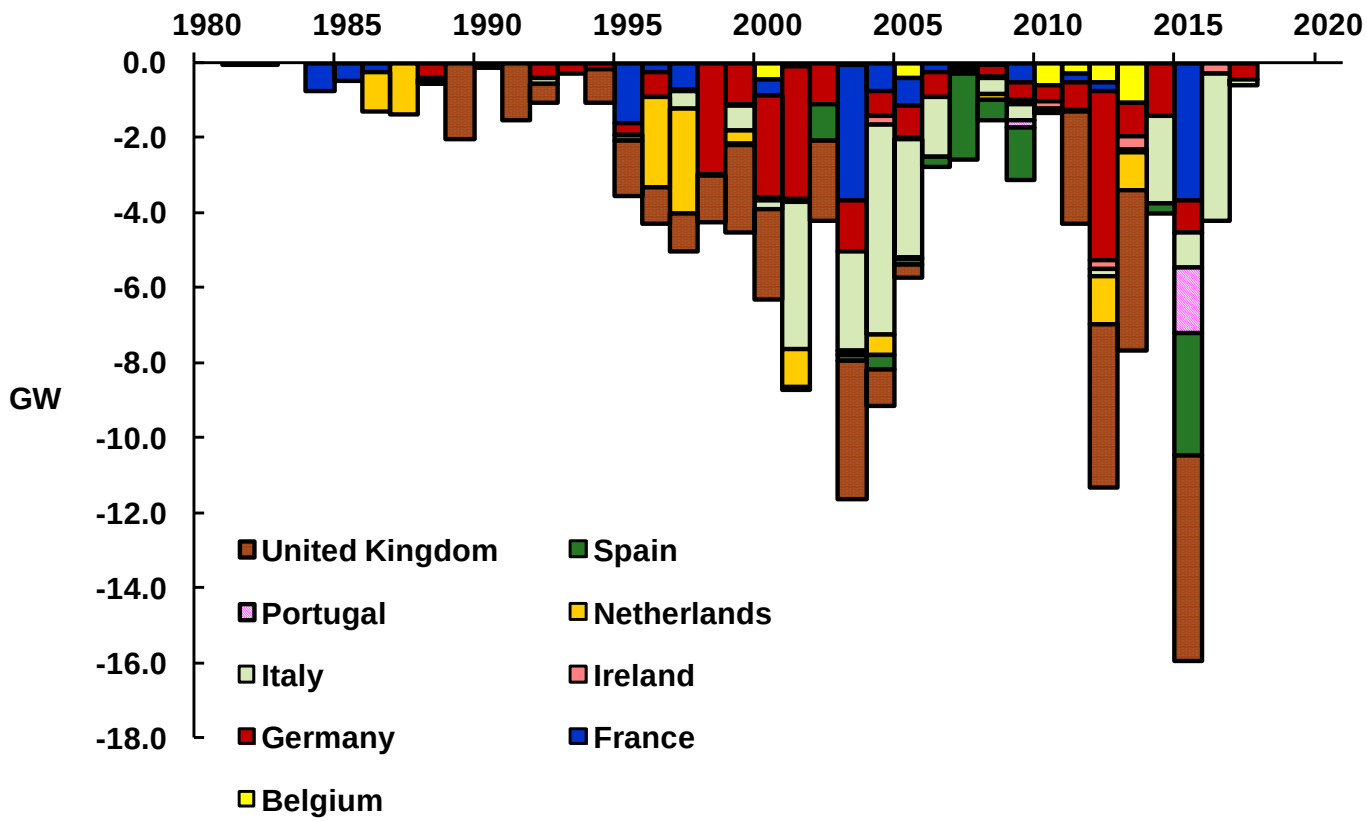
Is there a need for new investment, flexibility to integrate renewables, and / or to prevent plant retirements?

Three factors driving evolution of EU generation mix

Capacity adequacy	Will there be sufficient dependable capacity to meet peak load?
Flexibility needs	How will the system cope with increased intermittent generation from wind and solar? Will there be sufficient ability to flex up and down generation and demand?
Plant profitability and outlook for retirements	Thermal plant profitability and potential retirements are a risk to **capacity adequacy** and **flexibility** Low thermal plant revenues could drive significant retirements

Outlook for plant retirements in Europe

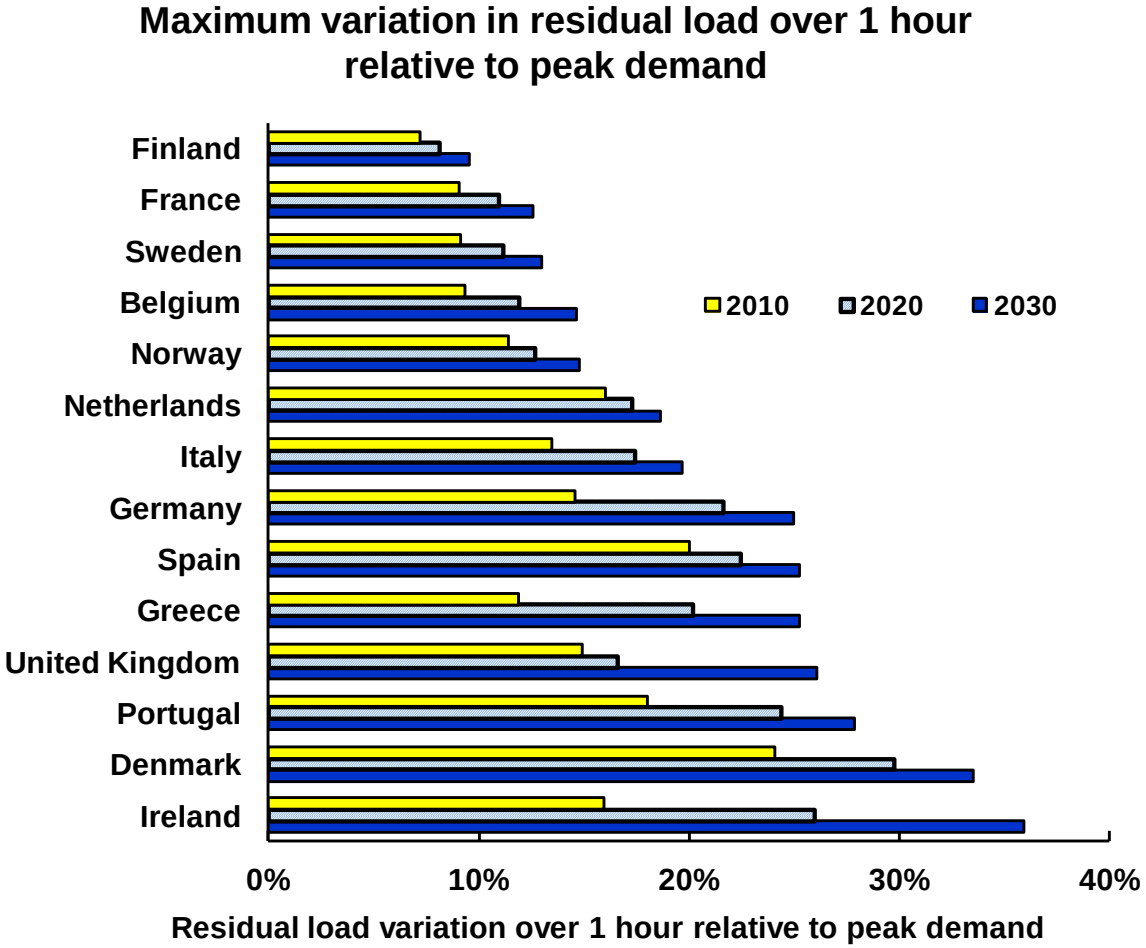
EU 27 - Announced fossil plant retirements (GW)



Source: IHS CERA, IEA

LCPD will drive about 30 GW of plant retirements over the next few years

Renewables effects – growing flexibility needs

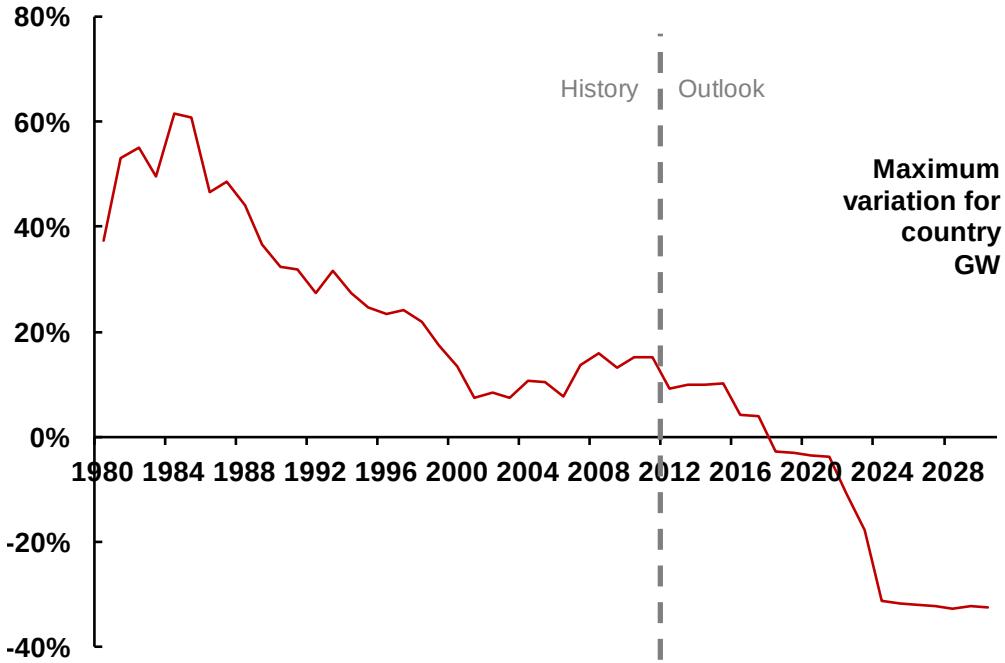


- Maximum potential variation in residual load growth significantly
  - Driven by combined growth in demand, wind and solar installed capacity
- Largest increases between 2010–20 in Germany and France: 7 GW and 2 GW

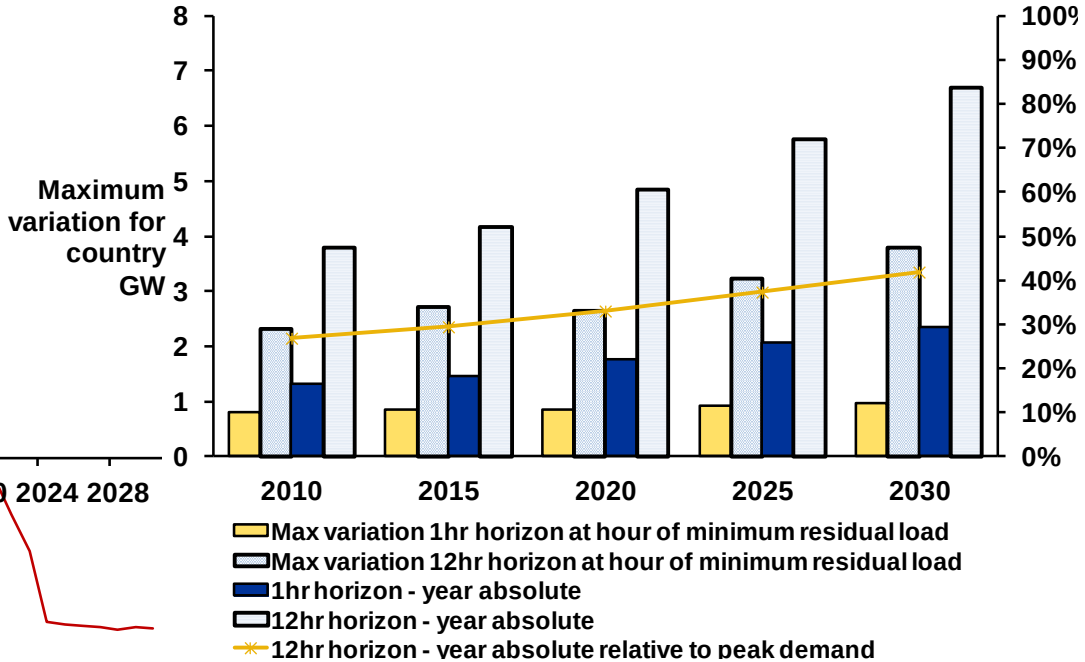
Source: IHS CERA

Belgium – Adequacy and flexibility outlooks

Belgium – Outlook for reserve margins



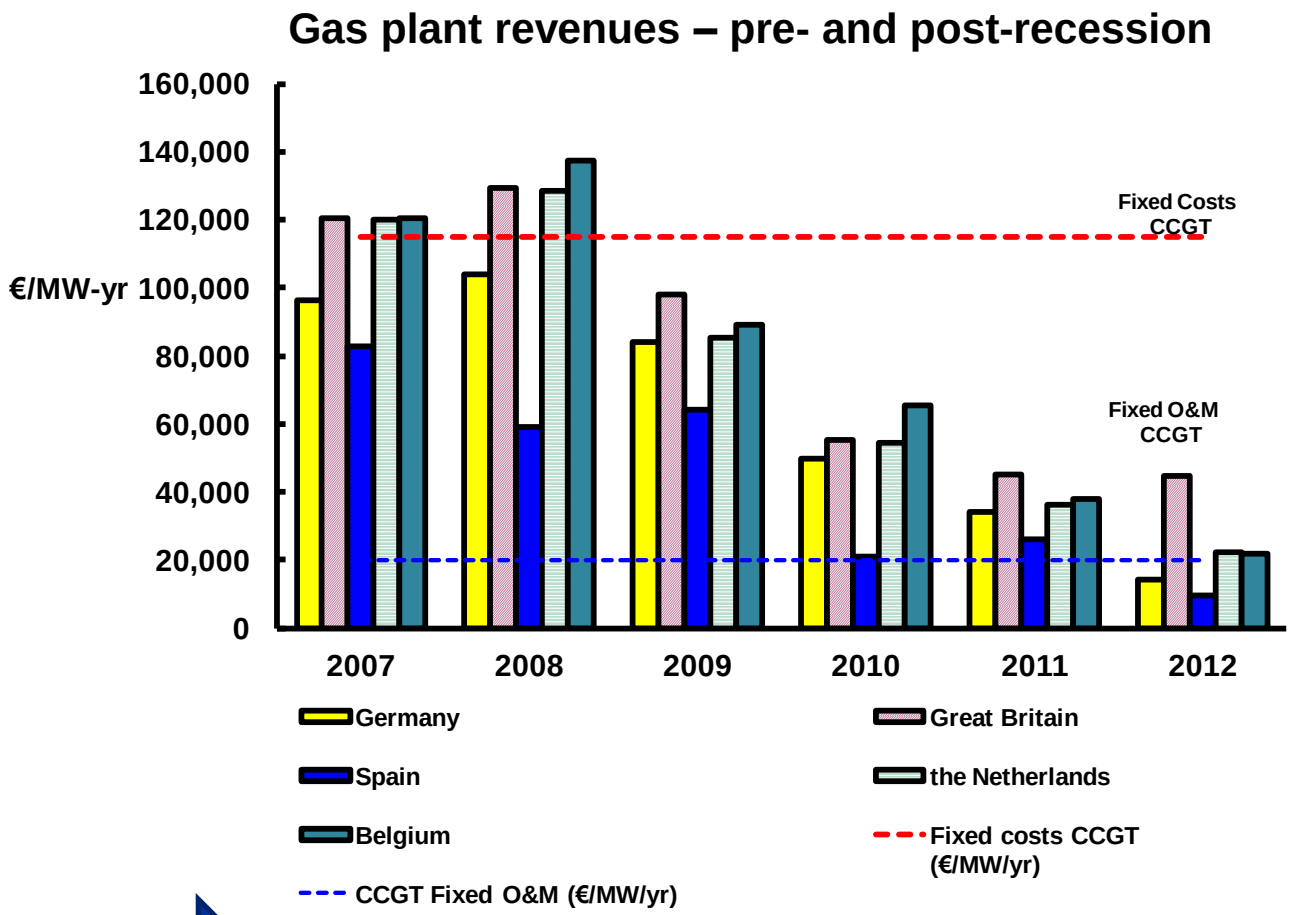
Belgium – Outlook for flexibility need



Notes: Additions and retirements figures are historical to 2013. From 2013 onwards, renewables and nuclear additions and retirements are IHS CERA's outlook as per GRD. Additions of fossil from 2013 onwards are based on plants under construction or planned likely. Retirements of fossil from 2013 onwards are based on announcements.

Source: IHS CERA, IEA.

Low revenues of thermal plants risks closure of plant needed in future

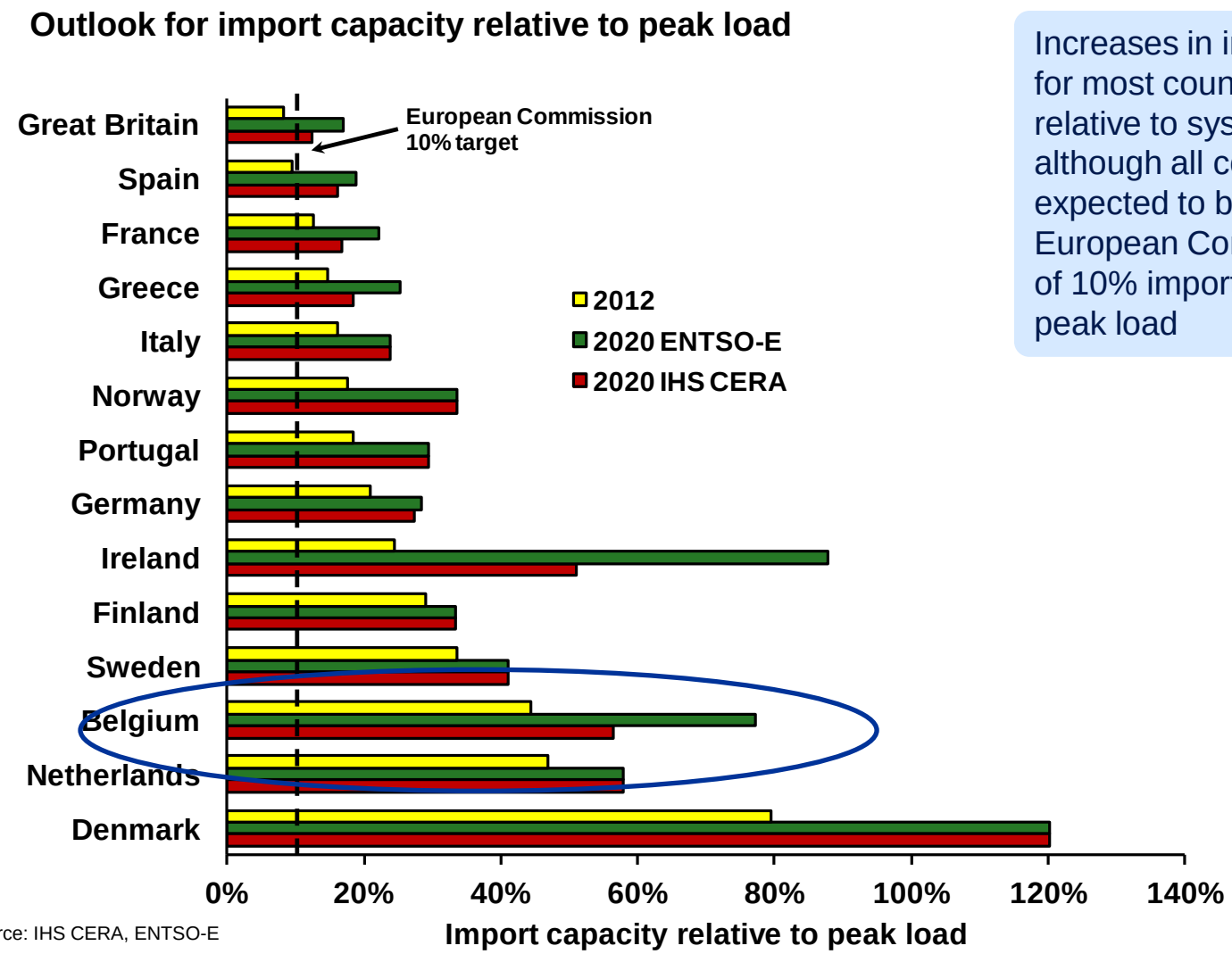


- Estimated gas plant revenues of CCGTs have fallen in all countries, although remain high in Italy because of high Italian wholesale power prices
- Values now below capital recovery, often below fixed O&M costs

125 GW gas plants not recovering fixed costs in Europe

Source: IHS CERA. Revenues calculated from wholesale spot prices excluding estimated short-run marginal costs. Excludes CHP revenues and revenues from ancillary services.

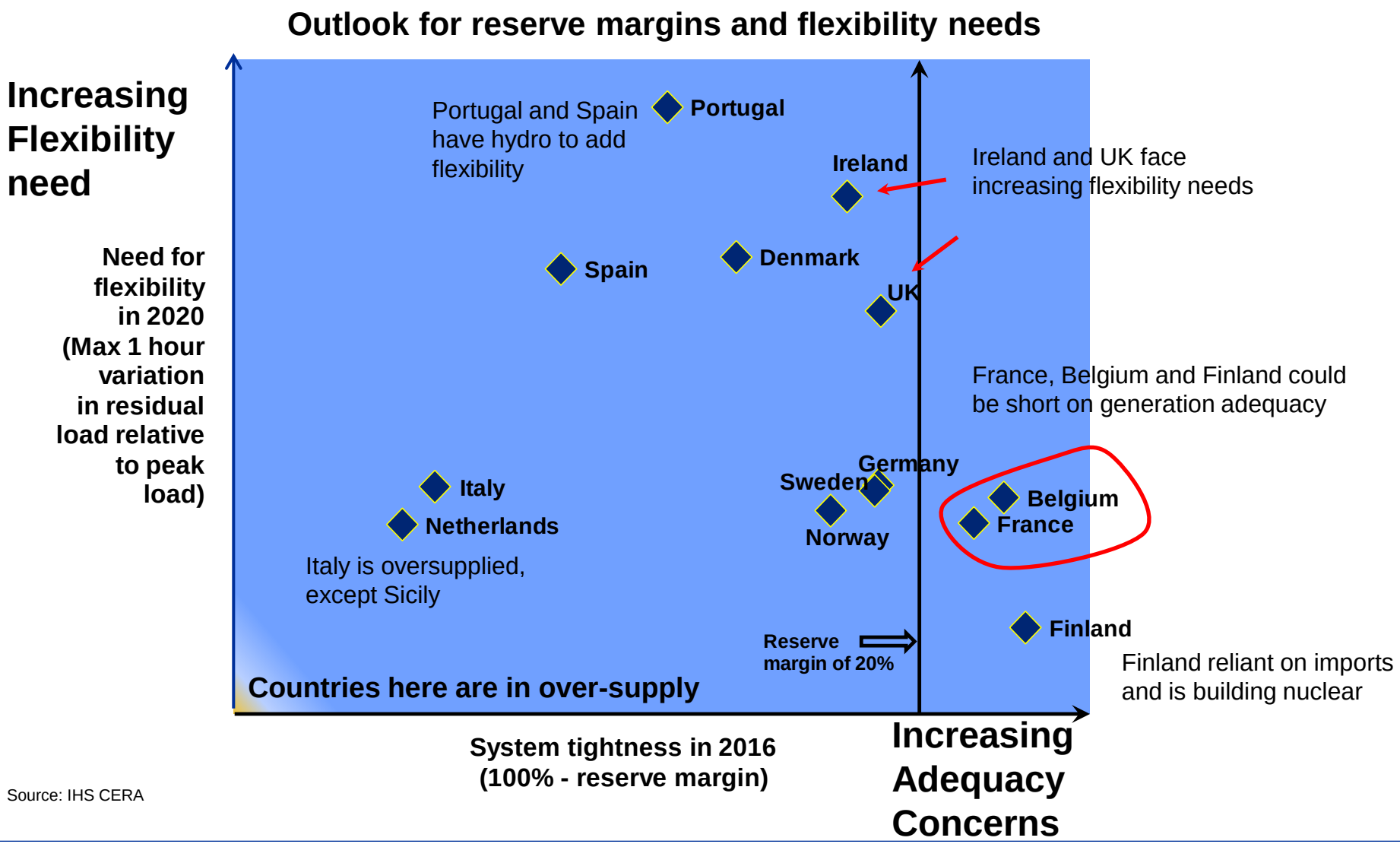
Adequacy concerns – the role for more interconnection



Source: IHS CERA, ENTSO-E

Increases in interconnection for most countries are limited relative to system size, although all countries are expected to be above European Commission target of 10% import capacity to peak load

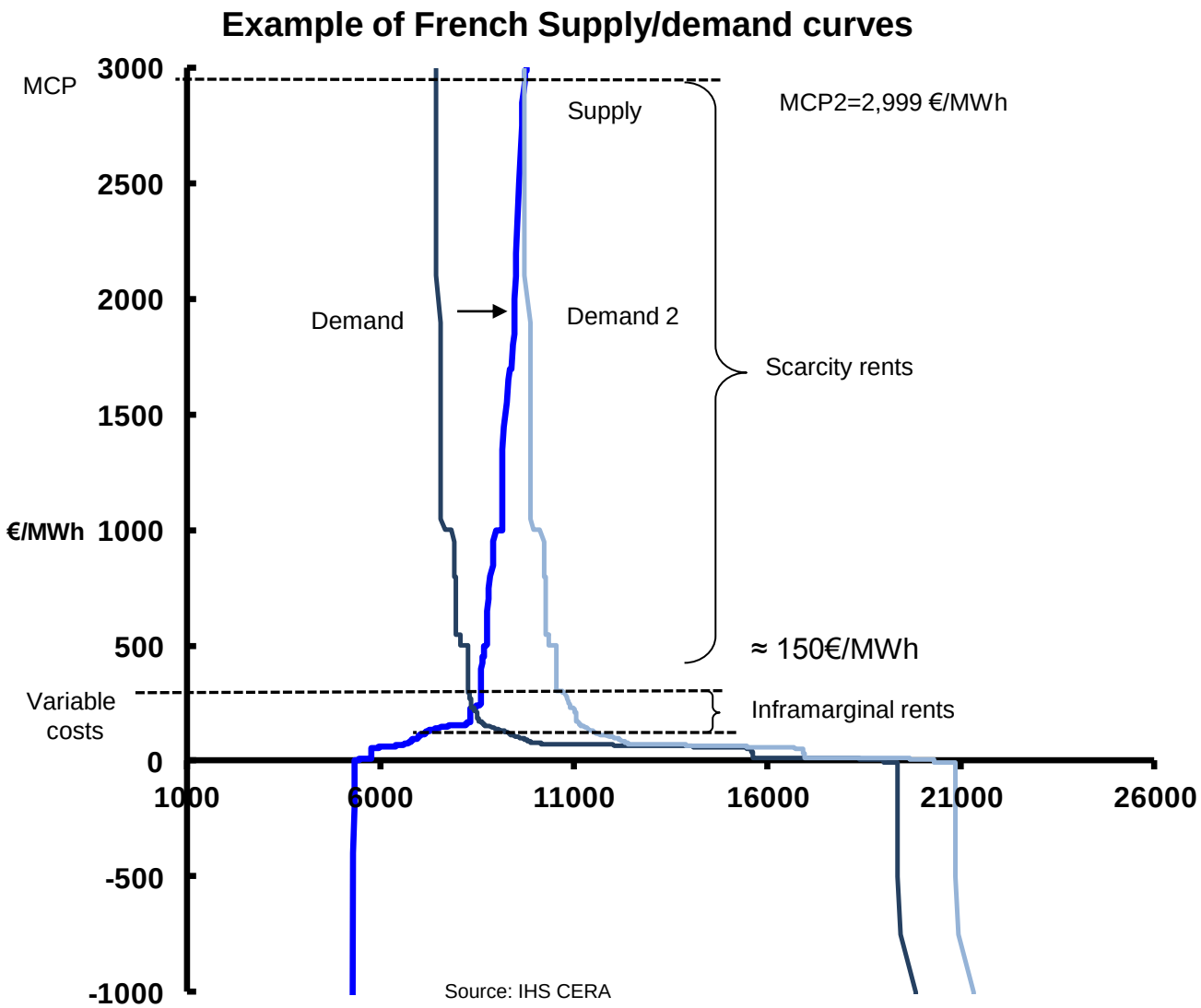
Adequacy & flexibility needs: a contrasted picture



Source: IHS CERA

Getting the theory right:
why would energy only market not deliver?

In energy only markets, fixed cost recoveries relies on few hours of scarcity and high prices



- When demand reaches maximum capacity levels prices rise very rapidly reflecting the inelasticity of both supply and demand on the short run
- For a peaker that has the highest marginal cost (i.e. 150€/MWh) : Short run profit > 0 only when P > MC
- An investor in a peaker must cover fixed costs during a few super-peak hours when all generators are running at full capacity and P > MC of all generators

A host of market flaws identified as the root cause of missing money/adequacy problem

Market flaws identified as the root cause of missing money

Regulation/ design	• Suppressed spot prices from price caps and offer caps set to limit the exercise of market power • Suppressed prices due to regulated generators operating in competitive markets
Threat of prosecution	• Suppressed spot prices due to the threat of market power prosecution of generators bidding under scarcity conditions
TSO actions	• Actions by system operators that prevent prices from increasing fast enough and far enough to reflect the value of lost load (i.e. 5% voltage reductions)
OOM market paymnets	• Suppressed prices due to out-of-market payments to some generators
Lack of demand-side response	• Inability to price reliability in the marketplace because of a lack of real-time central control of power flows to specific consumers. • Inability to clear the market from the demand side due to a lack of metering and real-time billing

What is the "missing money" problem?

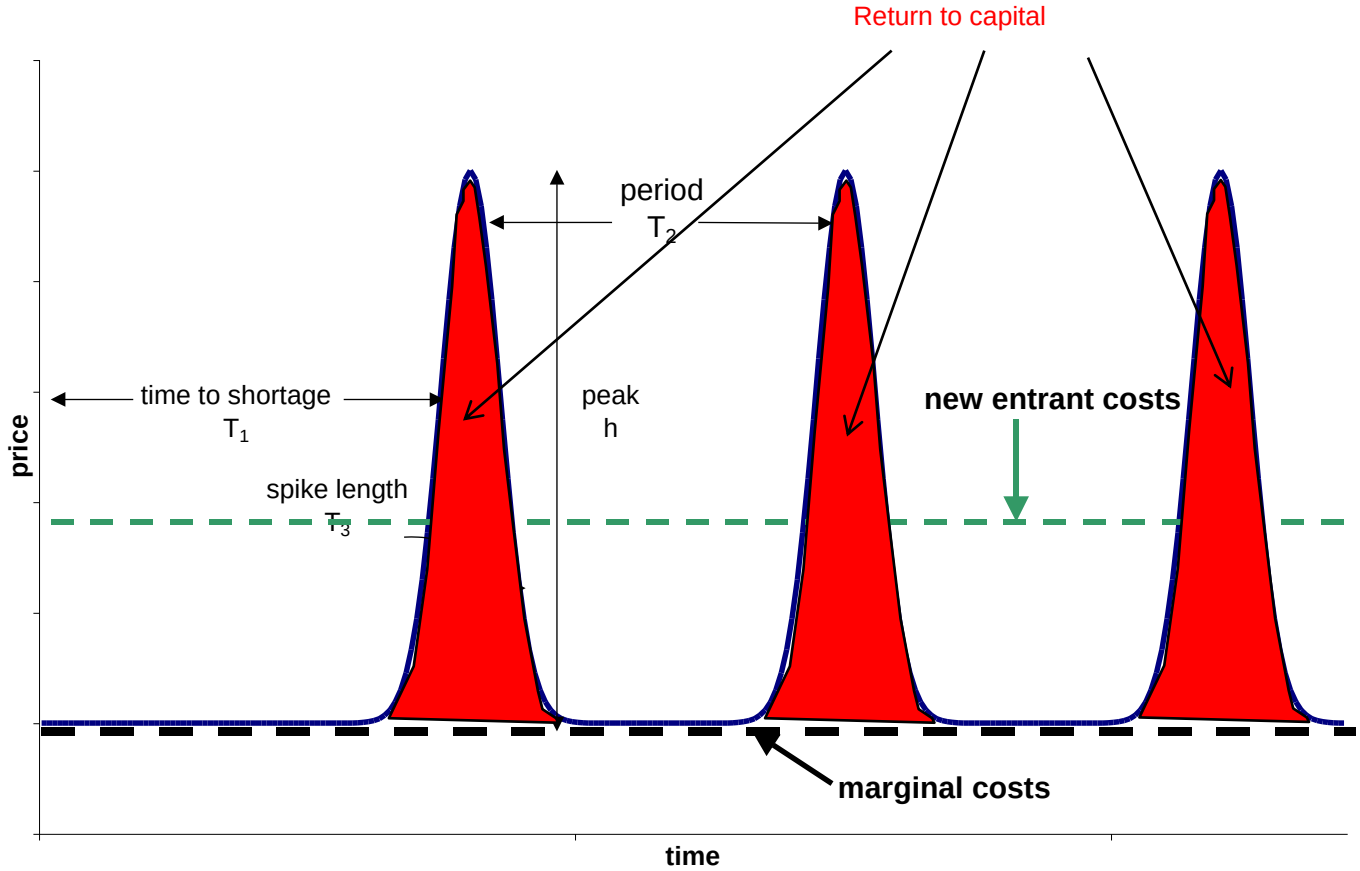
« The missing money problem is not that the market pays too little, but that it pays too little when we have the required level of reliability »

Stoft, S (2002)

Energy only markets rely on volatile price signals which lead to boom and bust cycles

- The timeliness of investments is important to guarantee generation adequacy at all times
- In an energy only market, investors wait for prices to rise above new entrant costs
- This will lead to boom and bust cycles and over-reactions

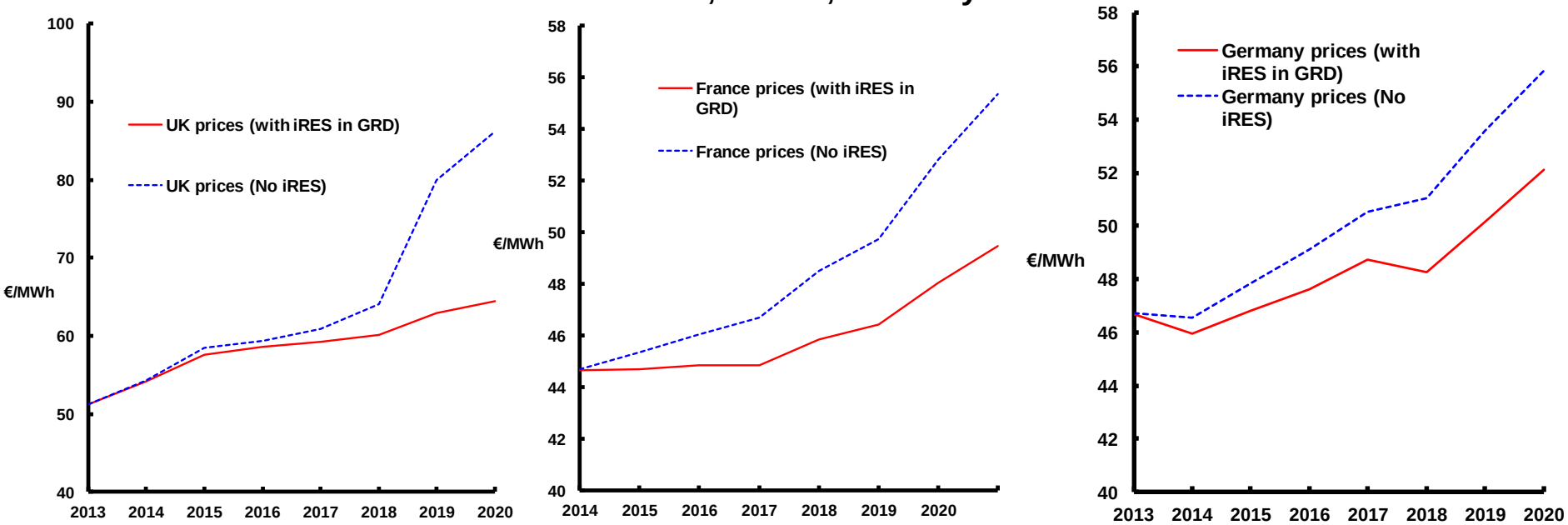
Investment signals and Boom and Bust cycles in the power industry



Source: IHS CERA

Renewables suppress scarcity price signals

Modelled power prices with and without RES additions: UK, France, Germany



Average revenues (2013-2020) €/MW-yr	France	UK	Germany
CCGT energy revenues (without RES)	69,463	45,653	46,278
CCGT energy revenues (with RES)	4,502	10,617	3,453
Missing money	64,961	35,035	42,855

Source: IHS CERA

Adequacy vs. flexibility: which role for capacity mechanisms to help integrate renewables?

- Backing up renewables requires:
  - That sufficient capacity is available at any time to cover demand net of renewables production.
  - That available plants have economic incentives to operate in a flexible way.

- By providing additional remuneration, capacity mechanisms can contribute solving the intermittency backup problem:
  - Capacity Markets' primary purpose is not to increase flexibility, but to guarantee generation adequacy in the long term.
  - Ancillary services and balancing mechanisms should provide adequate remuneration to flexible plant.

- Capacity mechanisms are a *necessary* but *not sufficient* feature of a sound market framework to integrate renewables.
- They need to be supplemented by ancillary services and balancing markets reform to ensure that *flexibility* is better remunerated.

Getting the right mechanism

The capacity mechanism options

Strategic reserve

- An independent agent, often the network operator, contracts or tenders with peaking units for reserve capacity

Capacity payment

- Fixed or variable payment awarded to all / part of the capacity declared/actually available

Capacity obligation

- Each supplier has an obligation to meet the anticipated load of its customer portfolio augmented by a predefined margin

Capacity auction

- The TSO launches several years before delivery an auction and selects at least cost resources to satisfy projected peakload demand

Reliability option

- Auctioning of forward capacity options (contract for difference) – exercise of the capacity option gives right to reimbursement between energy market spot price and strike price

Capacity mechanism choice – the key trade offs

Price vs. Volume

Policymakers can set price and let the market invest or set volumes and invite bids from the market

Centralised vs. Decentralised

Contracts can be awarded centrally or though bilateral arrangements

Targeted vs. Market wide

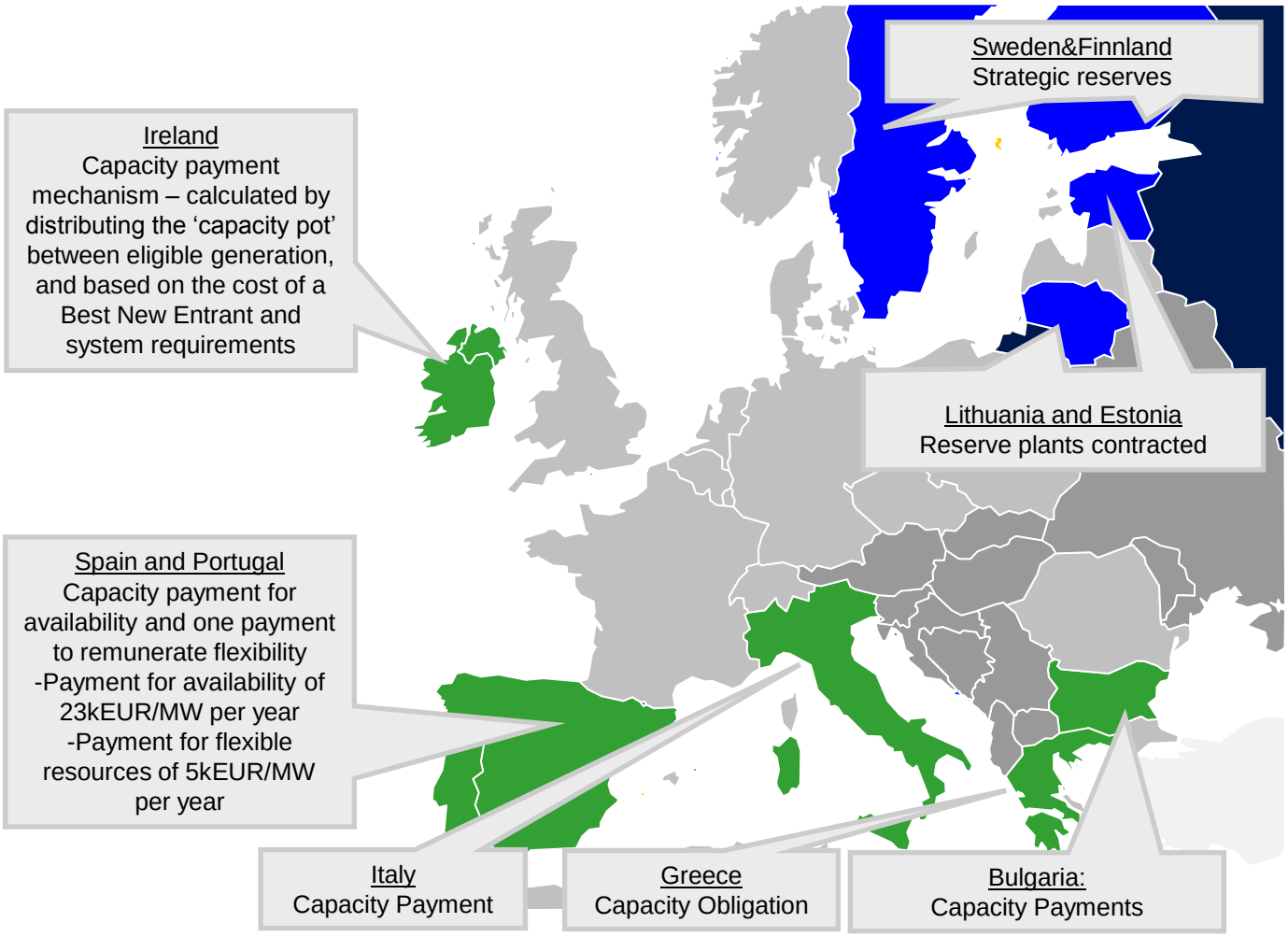
The mechanism can reward a sub-set or all resource

Categorisation of stylised mechanisms

STRATEGIC RESERVE	Targeted	Centralised	Volume
CAPACITY PAYMENTS	Targeted or Market-wide	Centralised	Price
CAPACITY OBLIGATIONS	Market-wide	De-centralised	Volume
CAPCITY AUCTIONS	Market-wide	Centralised	Volume

In practice, many schemes are hybrids

The picture today for capacity mechanism in Europe



- Capacity market
- Capacity payment
- Strategic reserve
- Regulated market restrictions
- Reliance on energy markets for investment

Article 3 Directive 2003/54/EC (Directive on internal market in electricity) [repealed by 2009/72/EC]

'Member states may impose on undertaking operating in the electricity sector, in the general economic interest, public service obligations which may relate to security, including security of supply'

The outlook capacity mechanisms in Europe - 2018

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Mechanisms in design – Belgium

Proposed strategic reserve

Scope	Type	Organisation	Lead time	First delivery	Administration
Strategic reserve	Price/Volume	Centralised	-	2014	TSO

July 2012
Decision of Belgium government to close Doel and Tihange

September 2012
Whatelet report

2013
Legal requirements

2013
First tenders for new capacity

2014
Start of the strategic reserve

Delivery

2014

Strategic reserve issues under discussion

- **Timing** – Legal procedure to implement strategic reserve for old plants could be longer than the launch of the tenders for new capacity
- **Organization** – Who will manage the mechanism (tenders and strategic reserve)
- **Price dynamics** – How will the strategic reserves be offered to the market to avoid distortions (price, activation signal, market)?
- **Revenues** – What will be the remuneration of the plants in the strategic reserve for capacity and for the energy offered ? Who will pay for the reserve?

The European Commission's involvement

November 2012: Consultation on generation adequacy

- Focus on investment incentives, adequacy measures, and designs
- Outline of legal framework – Electricity Directive & state aid control
- Draft assessment criteria

March 2013 Consultation on state aid guidelines

- Increased scope of existing environmental guidance to cover energy
- New additions on generation adequacy and network investment
- Repeated concern about necessity, technology neutrality and wider impact

Summer 2013: Draft revised state aid guidelines

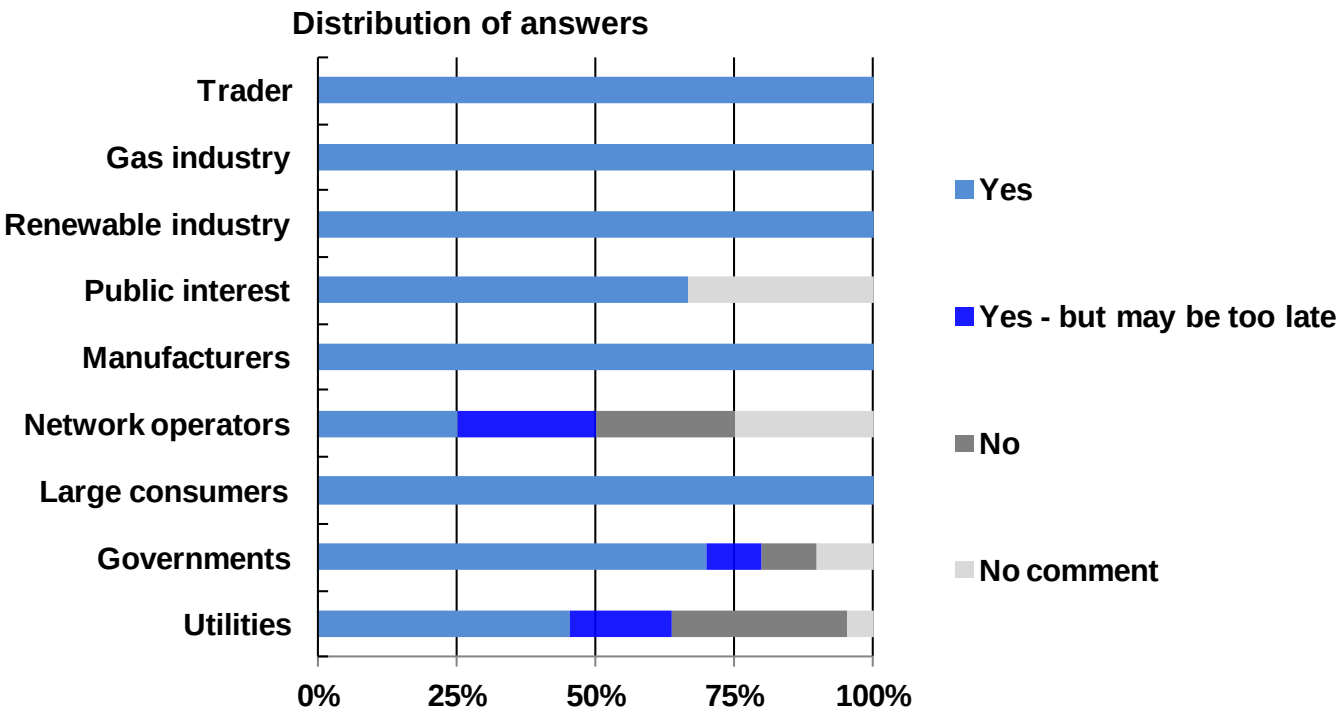
- New additions on capacity mechanism design

2013 onwards – assessment of national schemes

- Enforcement of state aid control powers

The EC Consultation - The necessity debate

Should capacity mechanisms be introduced if and only when other steps are insufficient?

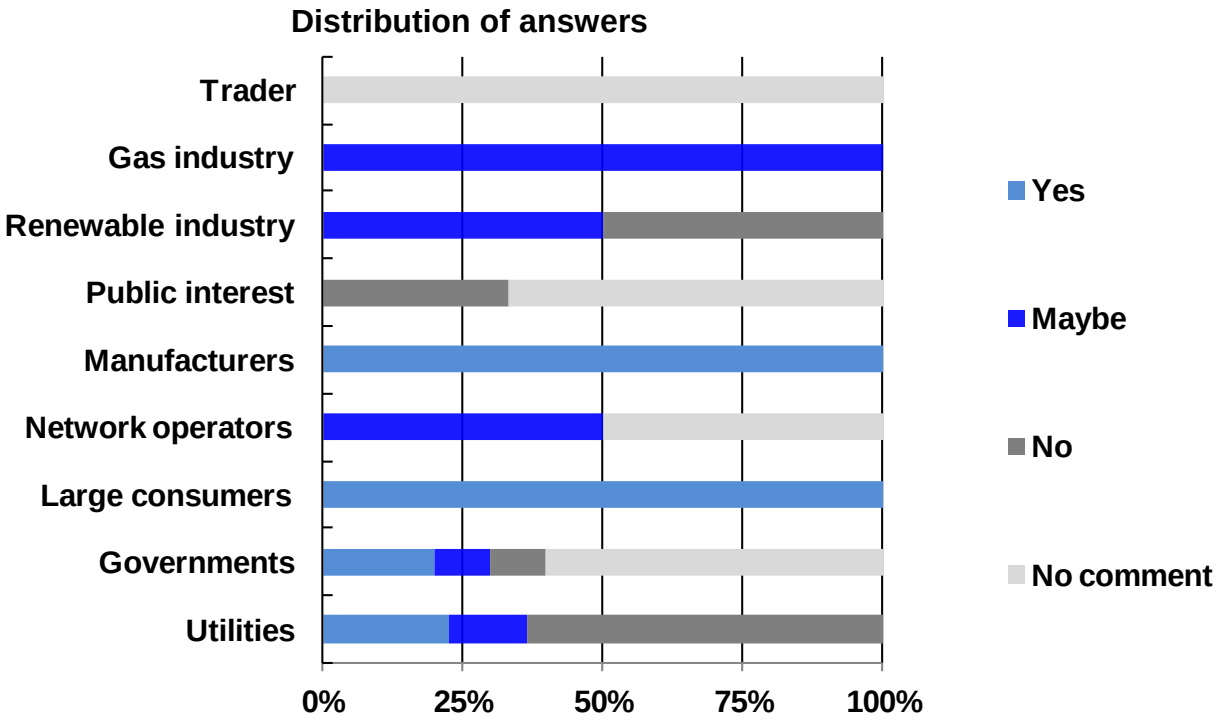


Majority in favour of getting energy markets to work – but recognition that may take too long by TSOs, some governments and utilities

Answers to questions 12 and in European Commission (2012), 'Consultation paper on generation adequacy, capacity mechanisms and the internal market in electricity', November. Based on 126 responses.

The EC Consultation - The flexibility debate

Should capacity mechanisms be used to encourage flexibility?

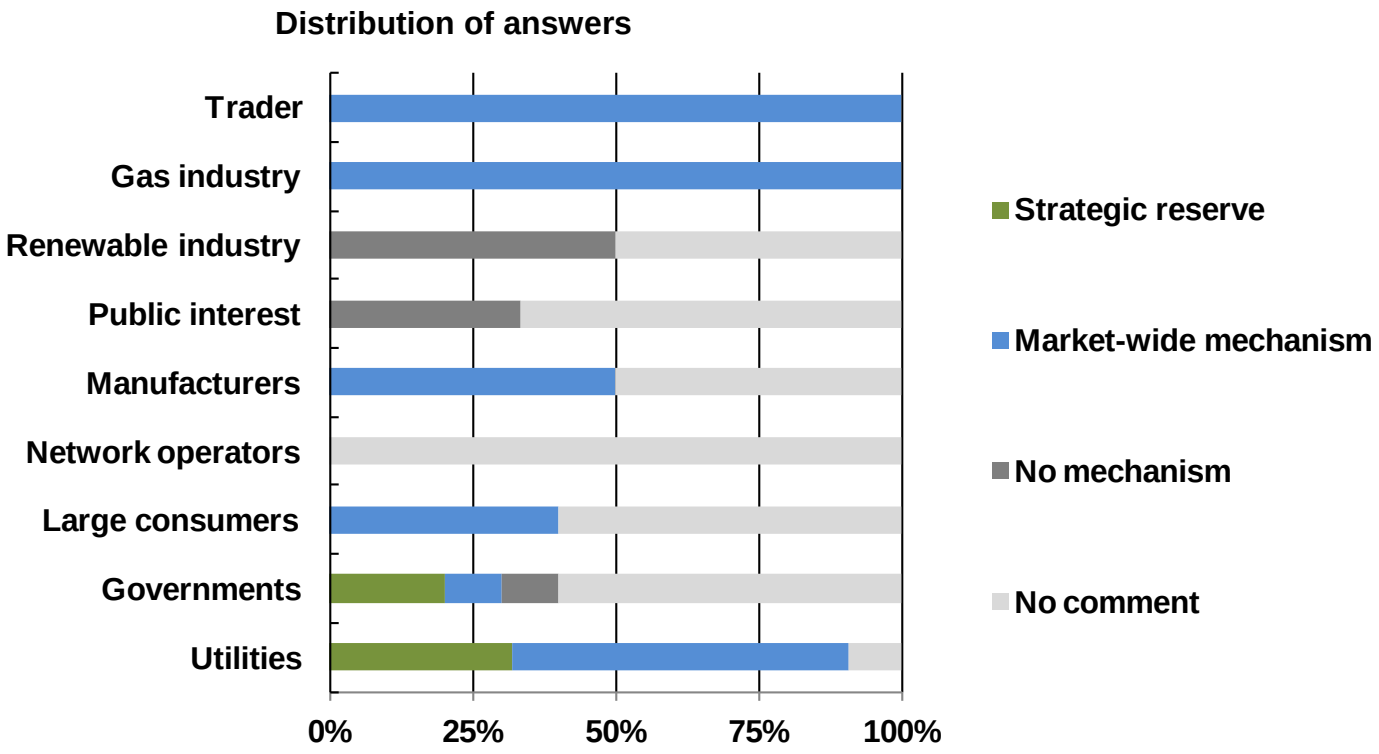


General view that mechanisms could target flexibility but push back from utilities

Answers to questions 13 a) and 15 b) in European Commission (2012), 'Consultation paper on generation adequacy, capacity mechanisms and the internal market in electricity', November. Based on 126 responses.

The EC Consultation - The cost debate

What is the least cost capacity mechanism?



Few willing to commit, but preference for market-wide among utilities, consumers and traders

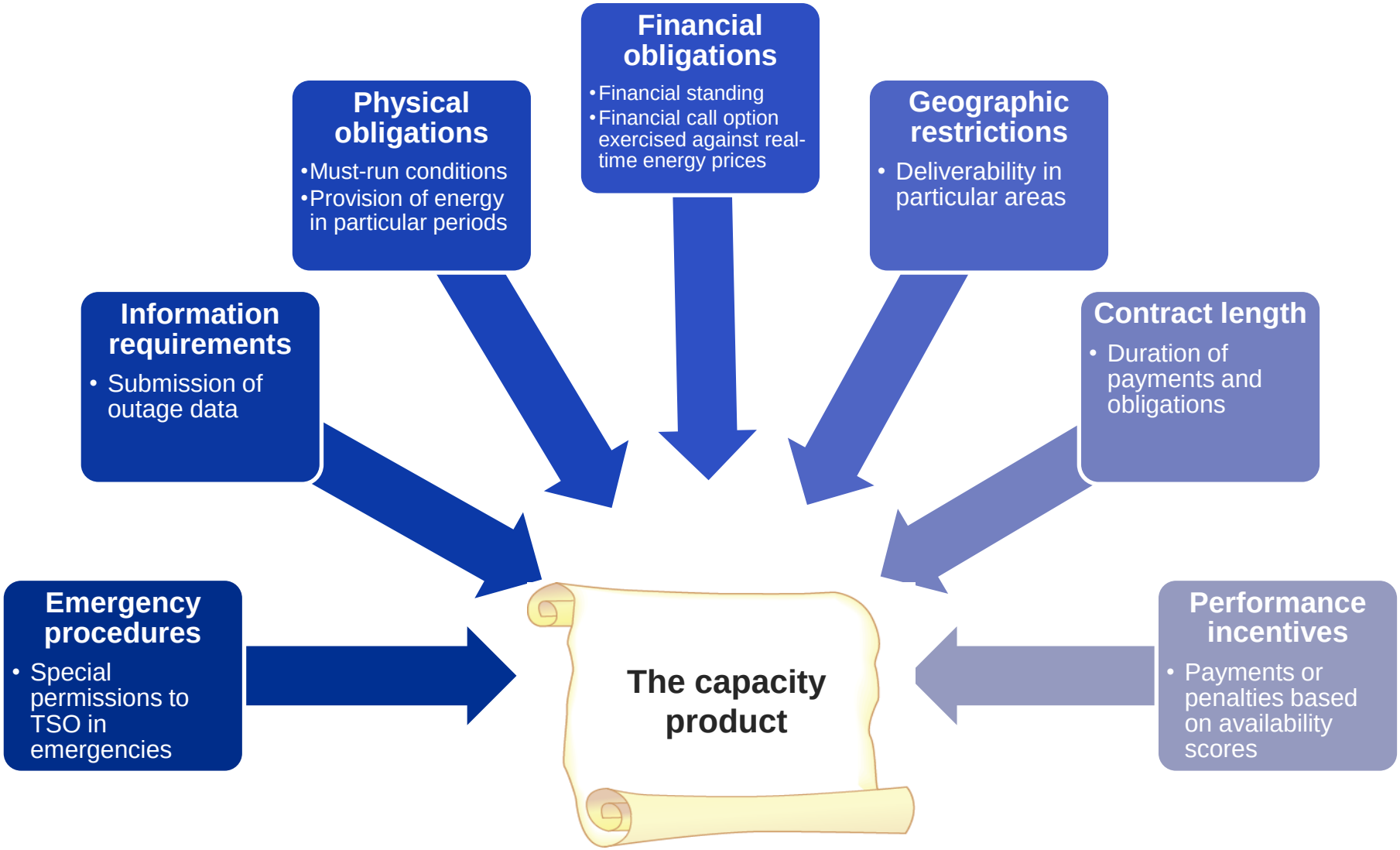
Answer to question 16 in European Commission (2012), 'Consultation paper on generation adequacy, capacity mechanisms and the internal market in electricity', November. Based on 126 responses.

Getting the implementation right

High level design objectives shape the capacity product

Objectives	Key product features
System Adequacy	- Availability requirement in peak-load hours - Summer peak vs winter peak - Calendar year vs winter centered - Thermo-sensitivity of demand - Incentives for efficiency - Risk of double-counting DSM reduced
System Flexibility	- Eligibility/certification of non flexible generation - Flexibility requirements (ramping, min load,.) - All year round product - Risk of shortages less linked to demand - Associated M&V and penalties
Short-term retirement risk	- Permanent vs transitory arrangements - Conditions for eligibility (e.g. age, location)

The components of the capacity product



Implementation overview

The forward capacity market process

Resource qualification → Forward capacity exchange → Secondary trading → Obligations M&V → Financial settlement

The capacity payment process

Resource qualification → Determine Payment level → Obligations M&V → Financial settlement

The strategic reserve process

Resource qualification → Reserve procurement → Dispatch rules → Obligations M&V → Financial settlement

Scope for significant difference across schemes—even with same high-level design

Modeling the effect of CRMs on energy markets

1) How will CRMs impact thermal plant profitability?

- Retirements
- New investments

2) How will CRMs impact energy price level and volatility?

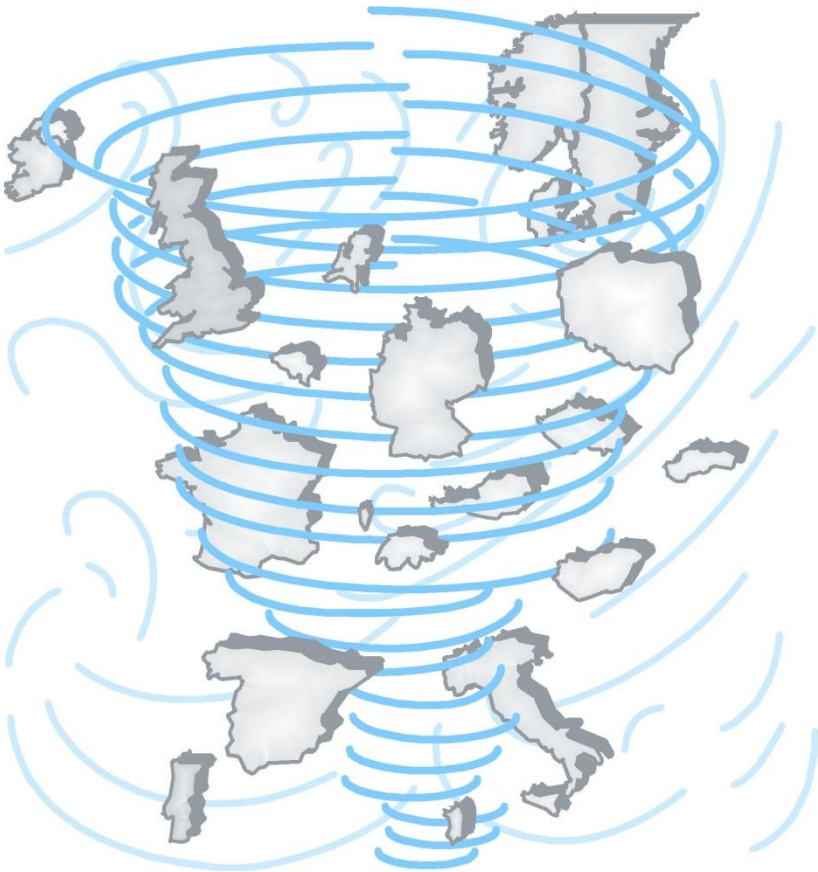
- Interaction between capacity and energy markets
- Price and volatility
- Flexibility

3) How will CRMs affect cross border trade/flows?

- Distortions (i.e. Import/export variations)
- Unintended consequences

Neighboring market issues

- **What will be the energy price effects of capacity mechanisms on neighbouring markets?**
  - What will be the size and timing of price impacts?
  - Will capacity mechanisms lead to trading dead bands?
- **What will be the impact on interconnection flows, and the utilisation of interconnectors?**
  - What impact will changes in relative prices have on interconnector flows?
  - For example, Netherlands has seen rising net imports, driven by a rise in imports from Germany, even though Dutch reserve margins are above 50%
- **How will capacity mechanisms change the location of new investments?**
  - Will changing price signals discourage investment in neighbouring markets?



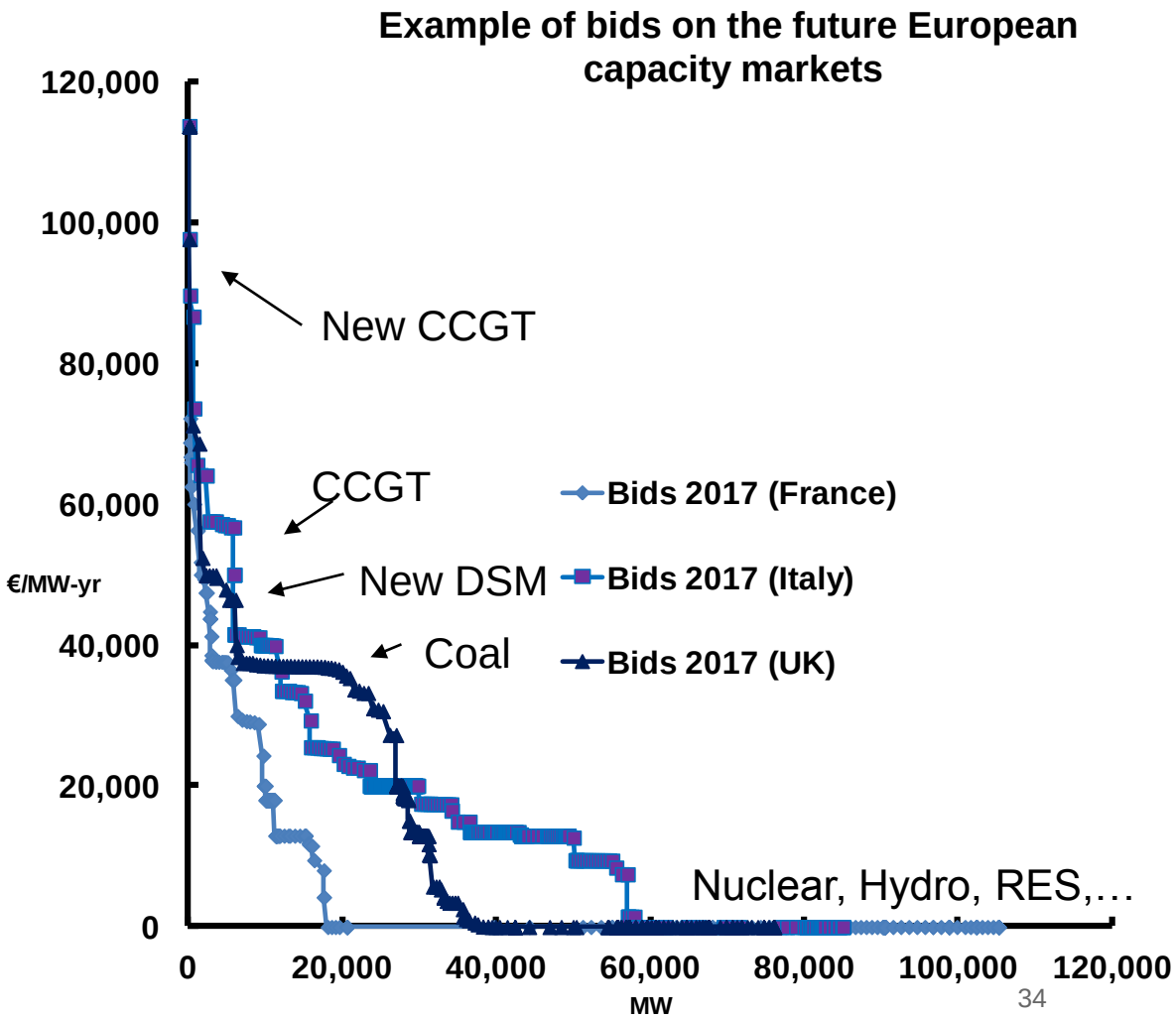
What are the lessons on the US Forward Capacity Markets experience?

- In both PJM and New England a large increase in net imports, demand response and less retirements

- Initial and current conditions are quite different between Europe and US:
  - Market integration
  - CCGTretirements,/Shale gas
  - iRES integration

- Forward CRM can allow competition among existing and new, generation and demand-side resources.

- Centralized CRMs are complex and intrusive



The Source for Critical Information and Insight™

IHS CERA Multiclient Study

Keeping Europe's Lights On:

Design and Impact of Capacity Mechanisms

HIS CERA modelling approach: Definition of Capacity Mechanisms Scenarios

Capacity Mechanism Sets

Harmonized EU CRM | **Preferred CRM Options** | **Current situation** | **Energy-only**

Case 3: EU Reform
-EU: Harmonized capacity remuneration mechanism

Case 2: National Reforms
- Current arrangements as well as IHS view of most likely arrangements for countries discussing reform.

Case 1: Status quo
- Current arrangements of capacity mechanism without further changes

Case 4: Energy-only
- All countries use Energy-only market

Scenarios for implementation:
Up to 3 Country Specific Design Alternatives:
Investigates un-coordinated design implementation parameter choices by individual countries.

Conclusions

Some concluding thougths about capacity mechanisms

- **The missing money in "energy only" (EO) markets is real and growing**
  - EO markets rely on unsustainable scarcity pricing for fixed cost recovery
  - Renewables are not the cause of missing money but rather amplify pre-existing structural flaws
  - Flexibility is best rewarded through well functioning ancillary services and intraday markets
- **CRMs are no silver bullet but are necessary given the evolving cost structure of the generation mix**
  - CRMs are self-fulfilling prophesies – talking about them creates need for them.
  - Market compatible CRMs need not increase revenues but instead modify the structure and risk profile of these revenues
  - Market compatible CMRs are technology and vintage neutral – ie apply to all generation and DSM
- **Bad design an/ or implementation can lead to unintended consequences and distortions**
  - Experience has demonstrated import / export distortions likely without regional coordination
  - Interface with energy and ancillary services markets necessary to prevent double remuneration and gaming opportunities
  - CRMs which do not interfere with scarcity pricing are best to simulate demand response

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