A Kick to Generation Investment, through the Reform of Balancing Mechanism, Capacity Markets or Both?

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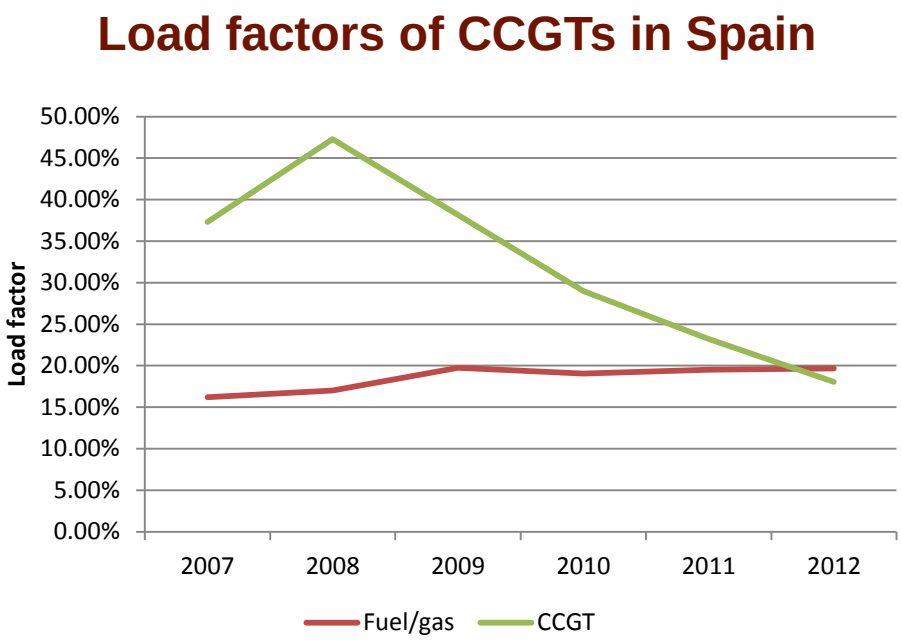
Problem of conventional generation investment

Growing renewable capacity has two opposing impacts on conventional generators :

- Renewable capacity with low variable costs reduces spot prices, reducing the load factor and profitability of existing thermal generators.
- High intermittency of renewable capacity increases the volatility of spot market prices and the need for increasing flexibility and ancillary services provided by conventional generators.



Two broad solutions

Existing market mechanisms

- Did not focus on the correct remuneration of flexibility
- Need to be revised to ensure that they provide appropriate signals to induce a sufficient amount of investment in the conventional plants needed for flexibility.

Two broad solutions

- Improving spot and real-time market design to value flexibility correctly
- Capacity Mechanisms

IMPROVING SPOT AND REAL-TIME MARKET DESIGN

How it can help?

Real-time marginal cost of energy

- Determined by flexible generators that are used in the balancing mechanisms to counter the intermittency of load and renewable resources

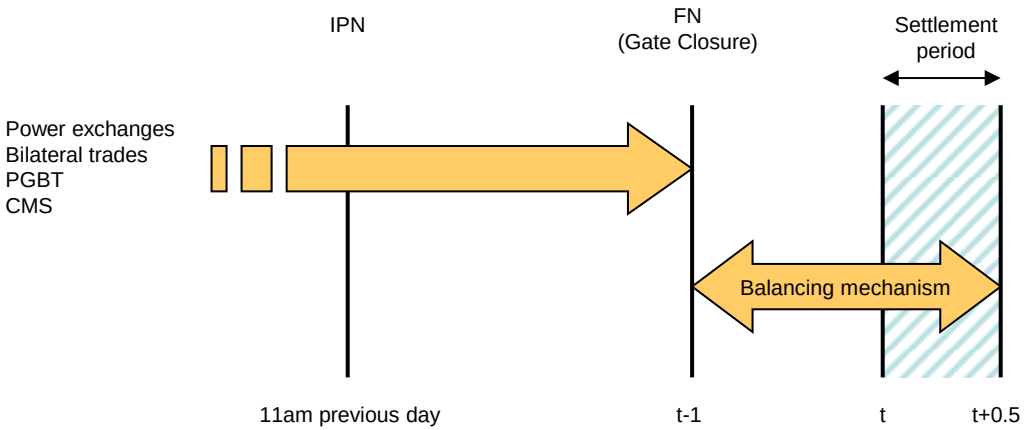
Ensure that ID, DA and forward prices align to the real-time marginal cost

- Ensure that imbalance charges reflect costs appropriately, especially in periods of scarcity
- Remove obstacles to arbitrage between the balancing markets and the ID, Day-Ahead and eventually forward markets allowing all prices to align on the real-time marginal cost

Other market measures

- Create efficient short-term markets for operating reserves linked with energy and balancing markets
- Require all generators, including intermittent sources, to be balance-responsible

Balancing Mechanism reform in the UK



Current Balancing Mechanism timeline

- Trades between market participants end at the gate closure
- NGET collects balancing bids and offers from market participants
- NGET using balancing bids and offers for system and energy balancing
- NGET calculates the “cash-out” price based on accepted bids and offers
- Generators’ imbalances are settled ex-post at the “cash-out” prices
- Cash-out prices are essentially the real-time electricity price assessed ex-post

Significant Code Review of the Balancing Mechanism

- More marginal cash-out price
- Single or dual cash-out prices
- Improving allocation of reserve cost
- Attributing a cost to non-costed actions

More marginal cash-out price

Current situation

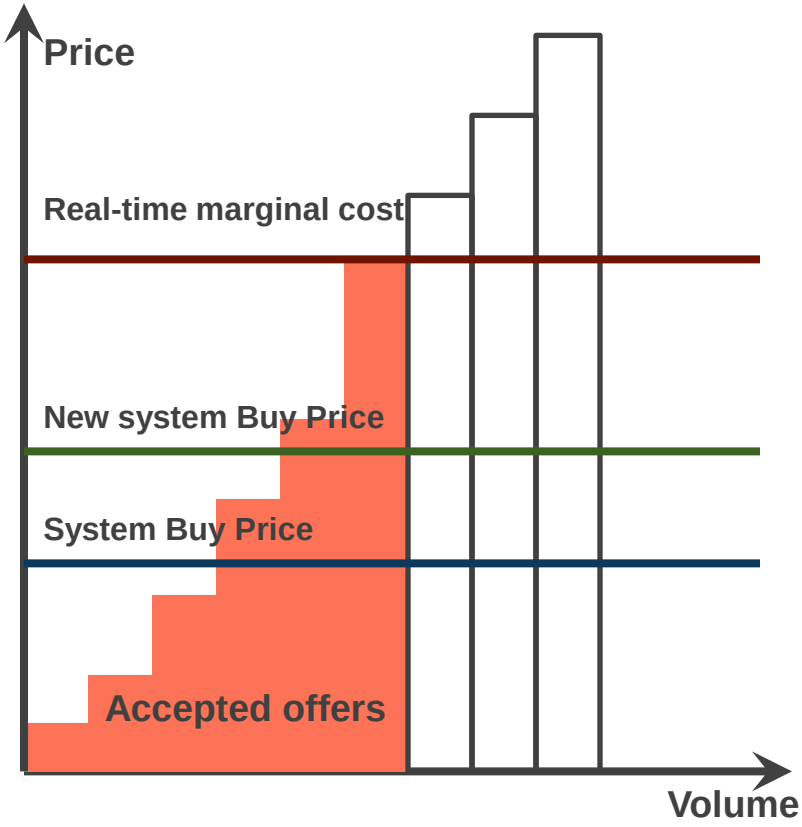
- Cash-out prices are calculated by averaging a number of most expensive trades made by the SO to balance demand and supply.

Reform proposal

- Making the calculation based on a smaller volume of trades.

Expected impact

- Cash-out prices closer represent the real-time marginal cost of energy



Improving allocation of reserve cost

Current situation

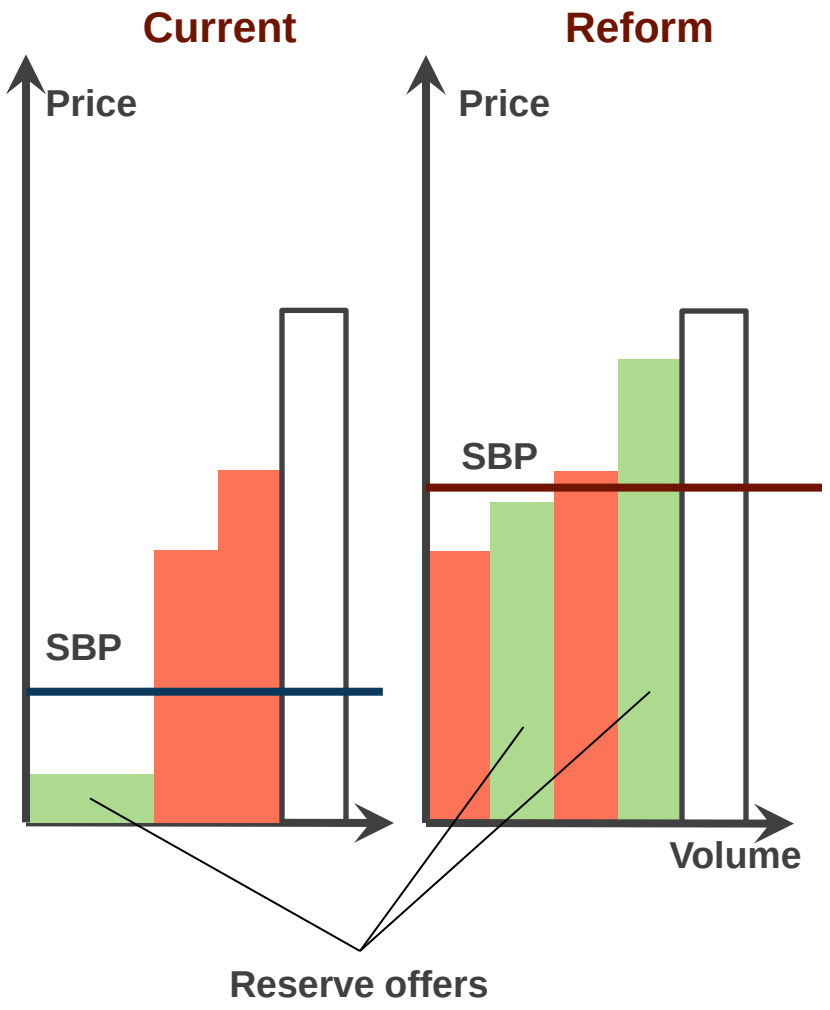
- Some necessary actions taken by the SO, such as the need to provide reserve, can depress or distort the cash-out price.

Reform proposal

- Improving how costs are targeted to improve balancing incentives.

Expected impact

- Cash-out prices closer represent the real-time marginal cost of energy



Attributing a cost to non-costed actions

Current situation

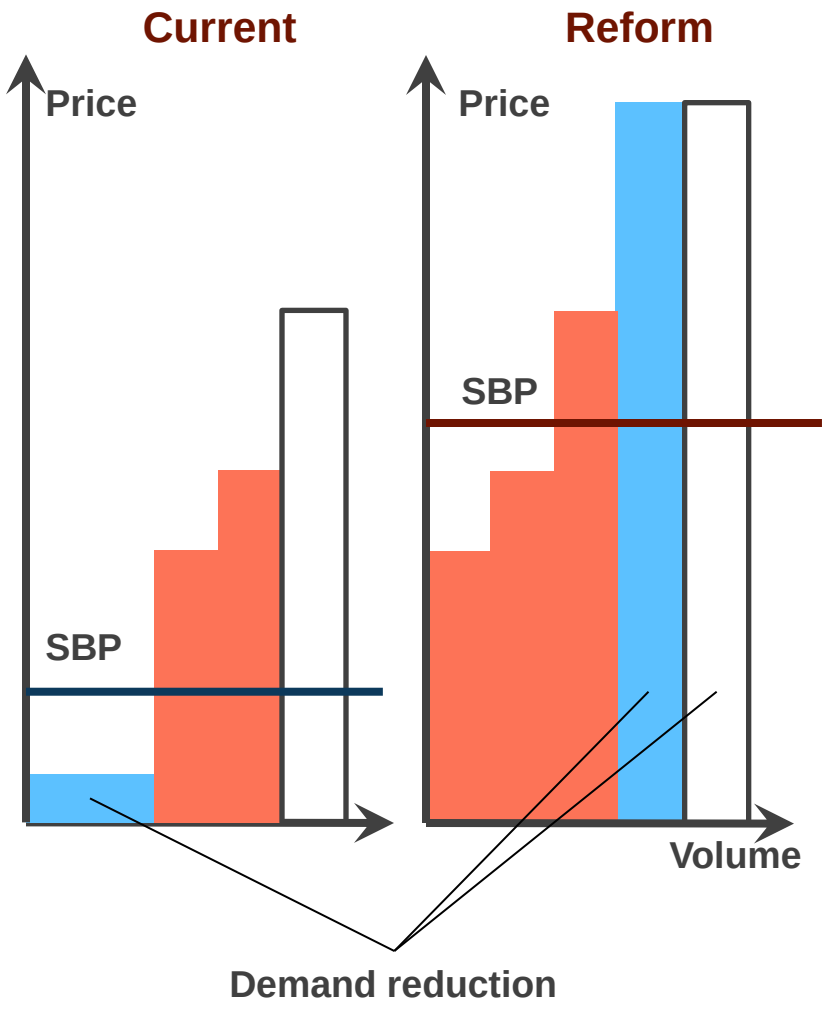
- Cash-out prices do not reflect the cost of all actions taken by the SO (e.g. demand reductions when consumers are disconnected are not included in the calculation)

Reform proposal

- Included the cost of disconnections into the cash-out price calculations.

Expected impact

- Cash-out prices closer represent the real-time marginal cost of energy



Single or dual cash-out prices

Current situation

- Parties who produce or buy more than they need receive less than the charge for those who produce or buy less than needed.

		System Imbalance	
		Negative ($SBP > P_{DA}$)	Positive ($SSP < P_{DA}$)
Market participant Imbalance	Negative	SBP	P_{DA}
	Positive	P_{DA}	SSP

Reform proposal

- Same payment and charge regardless of the market participant's imbalance

Expected impact

- Incentive to generators to help the SO balance the system
- Removes obstacle to arbitrage between the market transactions and imbalances
- Higher cash-out price faced by operators on average

Anticipated impact of the SCR

Positive impacts on the market

- Cash-out prices better reflect the actual real-time marginal cost of electricity taking into account all the dynamic constraints of the generating, DSR and operating reserve resources
- A better arbitrage between the cash-out prices and the spot energy prices allowing the spot prices to better align with the expected cash-out price
- Higher spot prices that better reflect real-time market conditions and scarcity and that provide a better investment signal for conventional plants

Possible secondary effects

- Potentially larger role of the SO in balancing due to increased arbitrage between market transactions and balancing
- Interaction with transmission constraints resolution that NGET also does in the Balancing Mechanism (may accelerate transition to the zonal system)

Balancing market measures beyond SCR

Operating reserves markets

- Introduce short-term operating reserve markets at a timescale similar to that of the energy markets (German minute reserves)

Balancing responsibility for renewables

- All generators including renewables should face balance responsibility. While renewable generators create demand for flexibility, they are often not made responsible for it and it is the TSO that procures it on their behalf.
- If imbalance risk is put on renewables, bilateral markets for flexibility between renewables and conventional generators would develop naturally in form of insurance and options products

CAPACITY MECHANISMS

The "missing money" problem

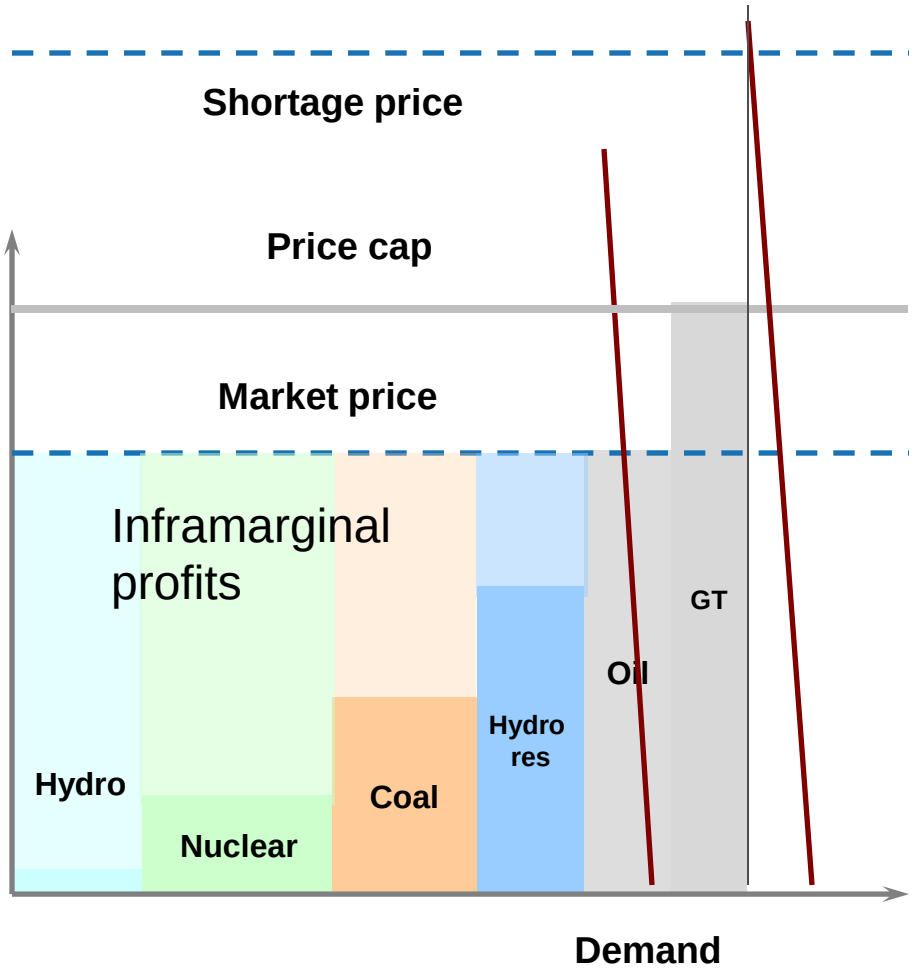
The need for a Capacity Mechanism is generally driven by the "Missing money" problem

- Perception that energy (and AS) markets alone are insufficient to induce investment in sufficient generating capacity to ensure long-term security of supply

"Missing money" problem in electricity markets due to market design flaws suppressing the market prices at times of shortage

- Price and bid caps, market power mitigation measures
- Lack of demand response
- Lack of scarcity pricing mechanisms

Missing money – simplified view

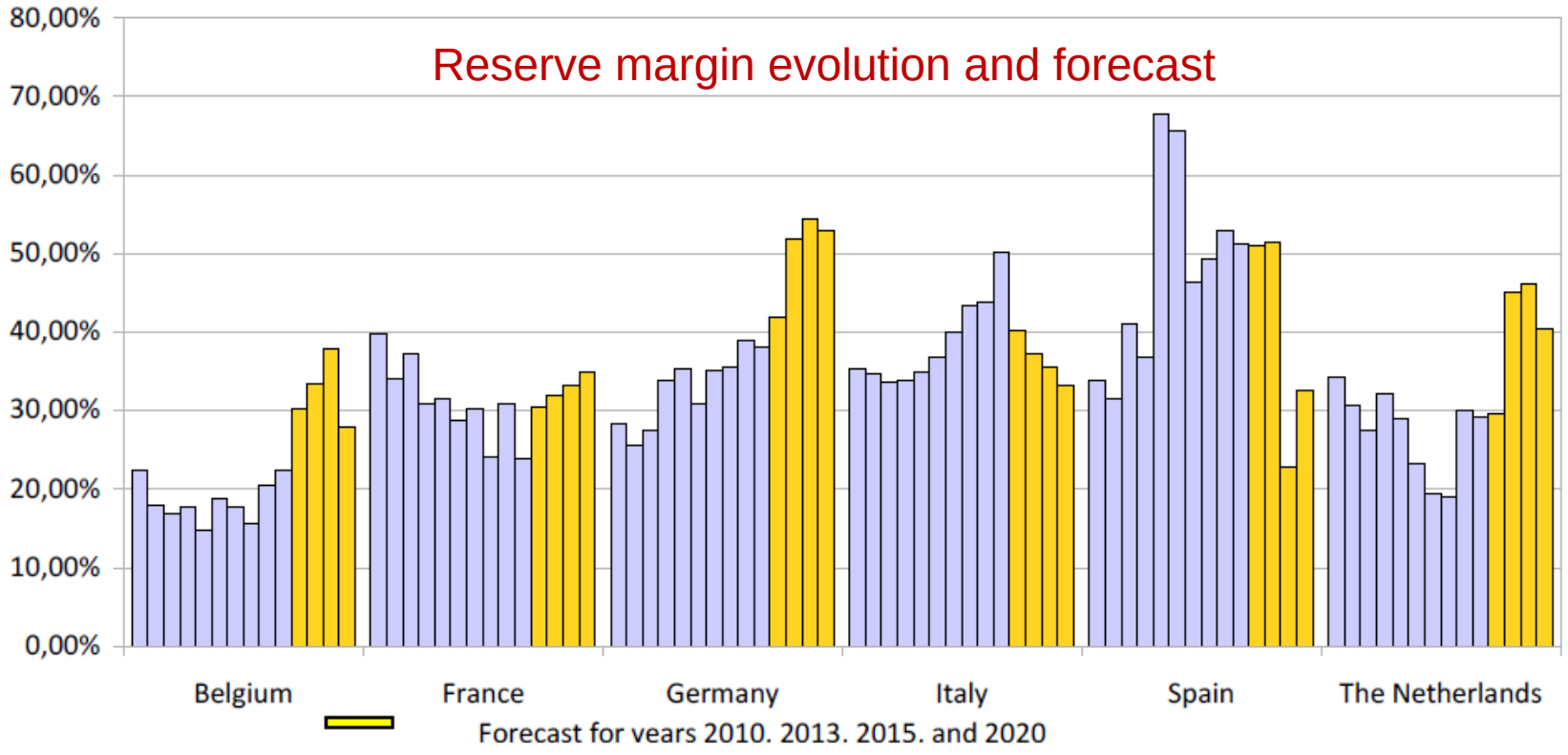


- Assume a long-run equilibrium has been reached (installed capacity is "optimal")
- A price cap is introduced at the level of the GT variable cost
- The price cap gives no opportunity for the GT to earn profits to cover fixed costs
- Other generators may still be able to cover (part of) the fixed cost via the infra-marginal rent

Presence of “missing money” problem

Empirical tests for the “missing money” problem:

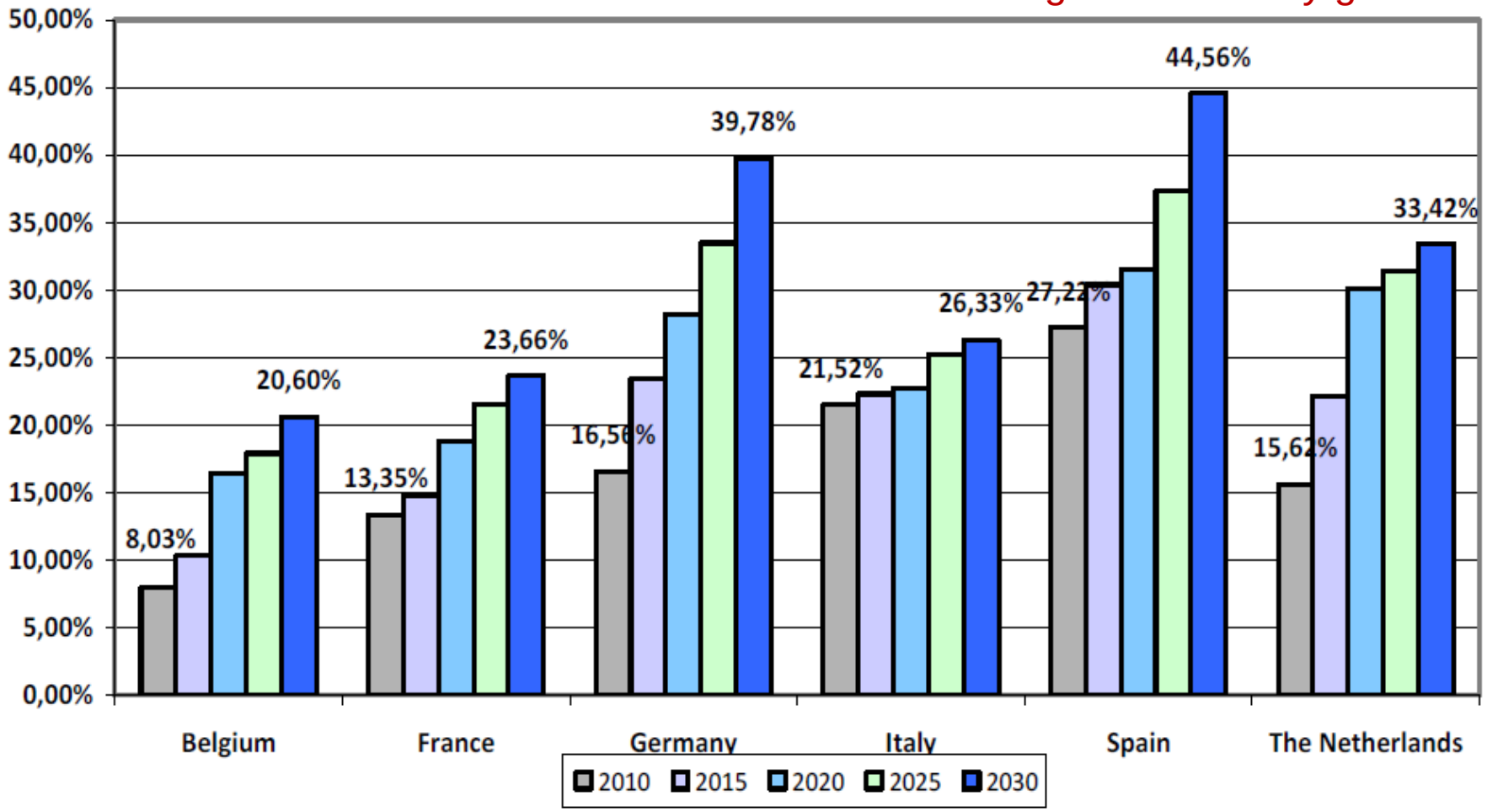
- Excess capacity and not decreasing reserve margins



Source: Cervigni and Niedrig 2011 based on UCTE

Generation from renewable resources

Generation from renewable resources as share of the total gross electricity generation



Source: Cervigni and Niedrig 2011 based on EU energy trends to 2030 – Baseline scenario

What capacity markets are

What is traded?

- Contracts for installed capacity
- Obligation to make installed capacity **available** to generate at the delivery date
- Energy price at which energy is provided/sold from the installed capacity is not specified in the capacity contract

Who are the suppliers?

- Generators with capacity already installed or who may install capacity by the delivery date
- Demand response, merchant transmission

What determines the demand?

- Requirement imposed on the retail suppliers to demonstrate sufficient capacity to meet their peak load at the delivery date

Capacity markets were NOT intended to…

Reduce investment risk for generators. This is solved by:

- Hedging instruments
- Consistent energy policies reducing regulatory risk (nuclear/renewable)

Cope with market power in energy markets. This is solved by:

- Concentration control
- Competition investigations

Provide backup for intermittent renewable energy. This could be solved by:

- Improving the real-time price signals and lower trade barriers between balancing and ID and DA markets.
- Higher demand for operating reserve capacity from TSOs
- Balancing requirements imposed on renewables

Yet capacity markets are often considered as remedies for all these problems

Capacity Mechanisms.

Current state – experience to date

- US
  - Simple capacity markets prior in early 2000s (PJM, ISO-NE, NYISO)
  - Capacity market revisions late 2000s (PJM, ISO-NE)
  - "Energy only " markets in MISO (until recently) and in Texas
- UK
  - Short-term payments scheme before NETA (gaming issues) and no capacity mechanism now. Could change in future
- Italy
  - Currently administratively set capacity payments, long term option contracts proposed by the Regulator
- Spain
  - Administratively set capacity payments.
- France
  - Proposed new market design (NOME) includes capacity obligations
- Germany
  - Options discussed for a capacity mechanism

Capacity Markets experience in the US

Early capacity markets designs (early 00s)

- Monthly time horizon
- Inelastic demand
- Area-wide capacity requirement

Problems with early capacity markets

- High price volatility
- Market power
- Locational capacity issues

Revised capacity markets (mid-00s)

- Forward time horizon
- Administrative demand curves
- Locational requirements
- Complex construct similar to a “planning “ process
- High degree of market power and market mitigation

Demand curves to reduce price volatility

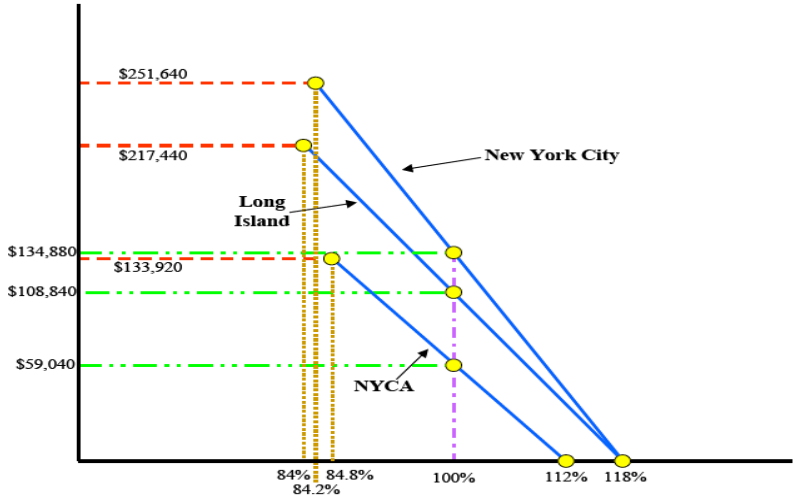
Early capacity markets

- Monthly time horizon
- Inelastic demand
- High price volatility
- Market power

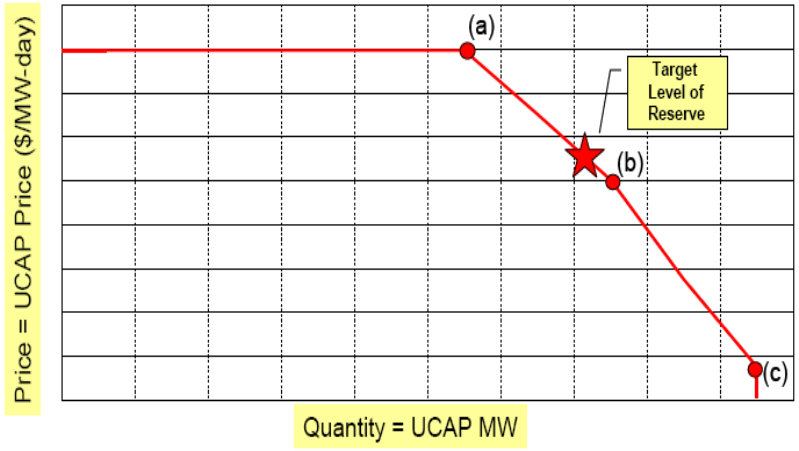
Revised capacity markets

- Forward time horizon
- Locational requirements
- Administrative demand curves
- Comlex construct similar to a "planning " process
- Still high degree of market power and market mitigation

New York capacity demand curve



PJM capacity demand curve



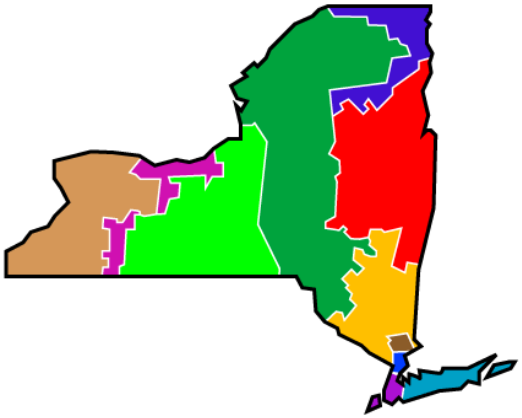
Locational aspect

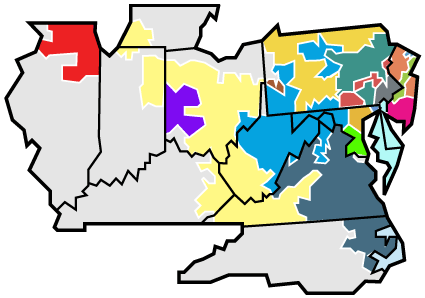
New York

- Capacity Market (ICAP) has 3 locational requiremen
  - 68% of requirement in NYC sourced in NYC
  - 84% of requirement in LI sourced in LI

PJM

- Capacity Market (RPM) has 23 zones (Locational Deliverability Areas)





Capacity markets designs

Simple design

- Has too many flaws

Advanced designs

- Quickly become very complex constructs similar to a “planning “ process
- Significant public intervention
- Multiple possible schemes exist
- None is recognized as superior

Conclusion

Improving balancing regimes

- Deliver higher spot prices reflecting real-time market conditions and scarcity providing an investment signal for conventional plants
- Boost the market solutions for valuation of plants' flexibility
- Economist's choice

Capacity markets

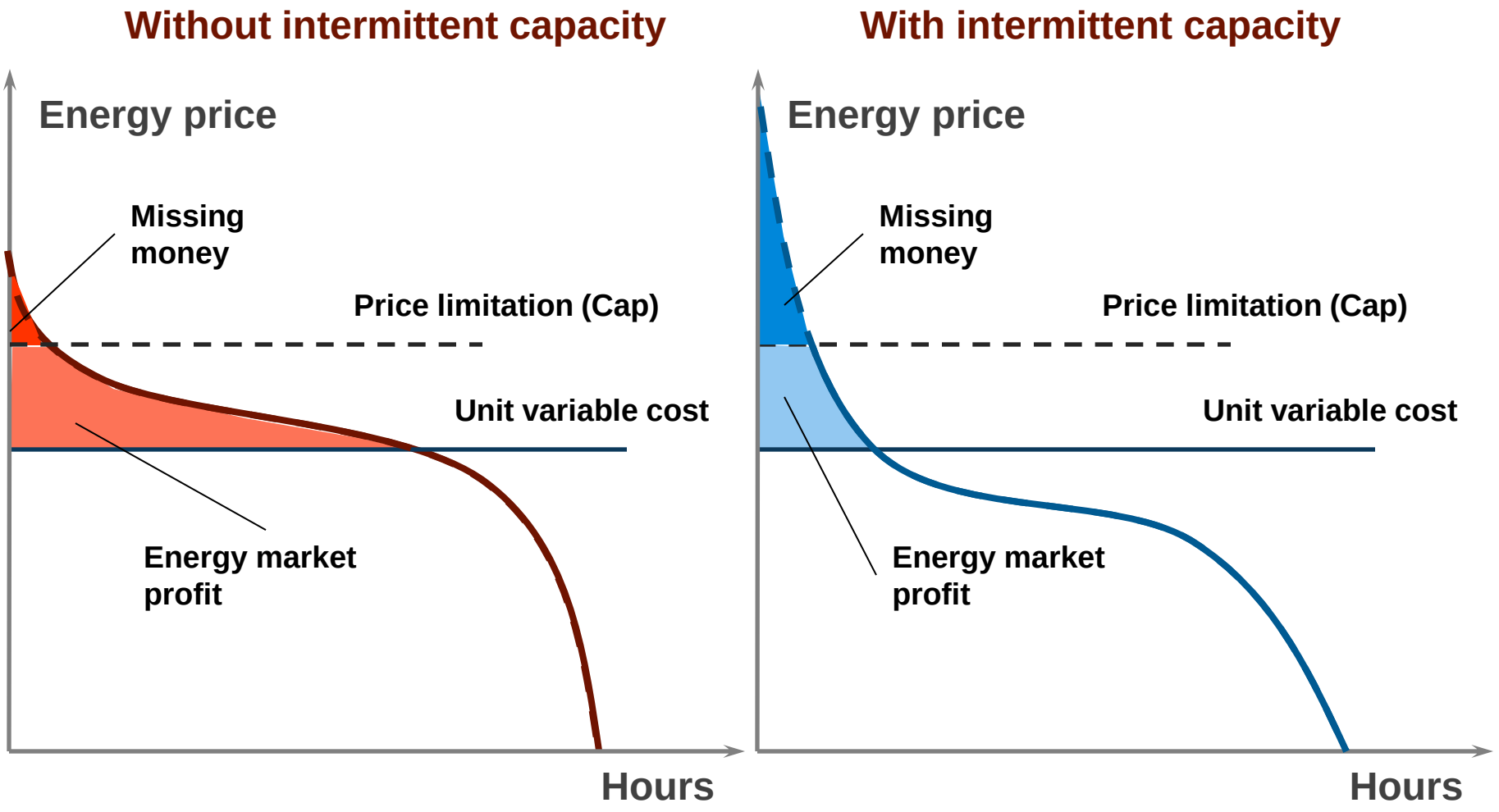
- Are not a targeted response to the problem of flexibility valuation of conventional plants
- Tend to replace market-based investment mechanisms by planning
- Regulators' choice

One does not exclude the other

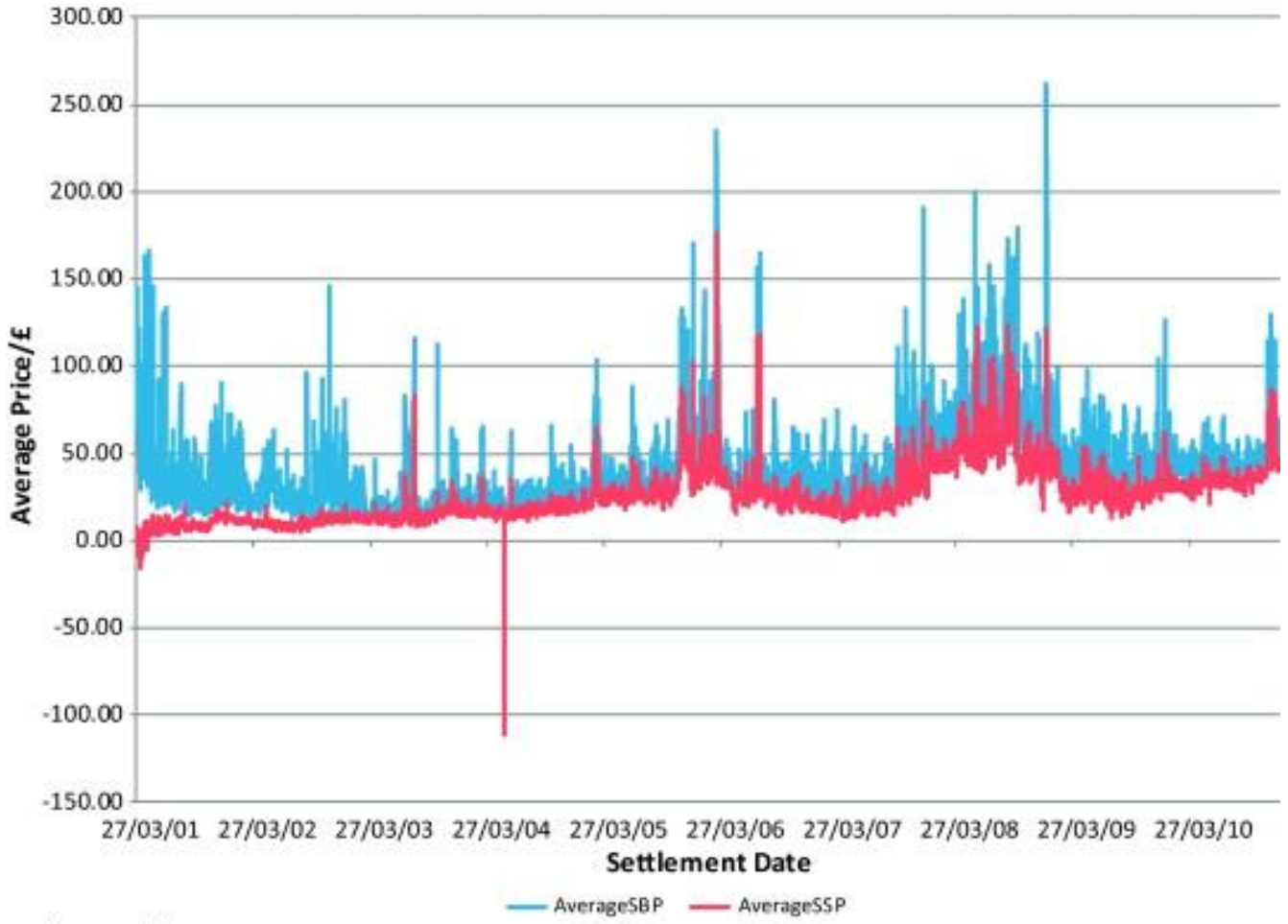
- Better scarcity and flexibility price signals would make the capacity market less important
- Would reduce possible unintended consequences of the capacity markets

BACKUP

Intermittent capacity may aggravate the missing money problem



Historic SBP and SSP



Source: Elexon

Historic over-commitment in the UK