

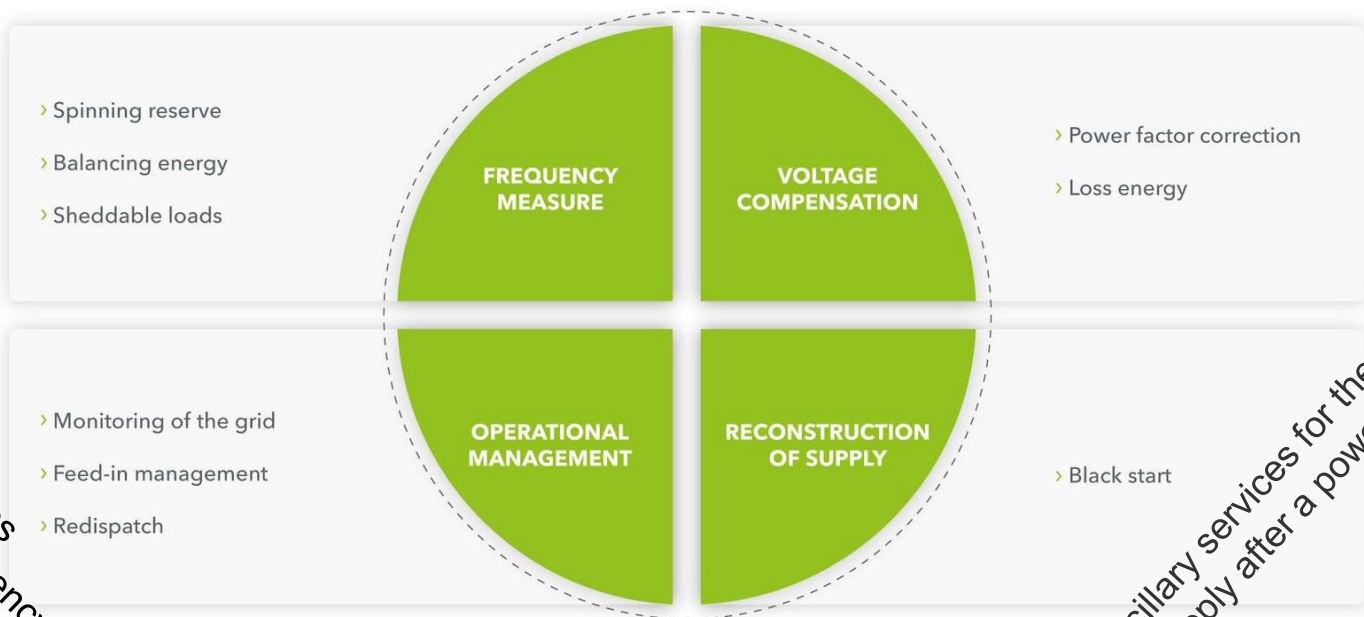
Market Code Consultation WS 9

International experience on Ancillary services and
Capacity Remuneration Mechanisms



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Ancillary Services – definitions



Ancillary services
«Balancing»/frequency control

Ancillary services for the reconstruction
of supply after a power failure

Source: Next Kraftwerke

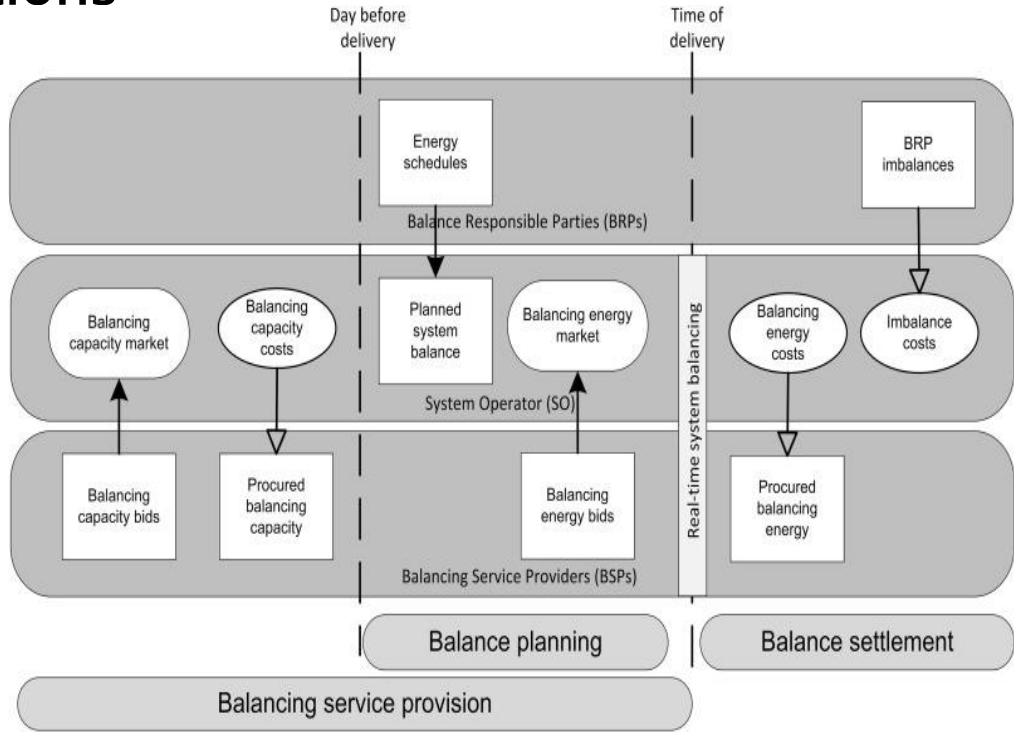


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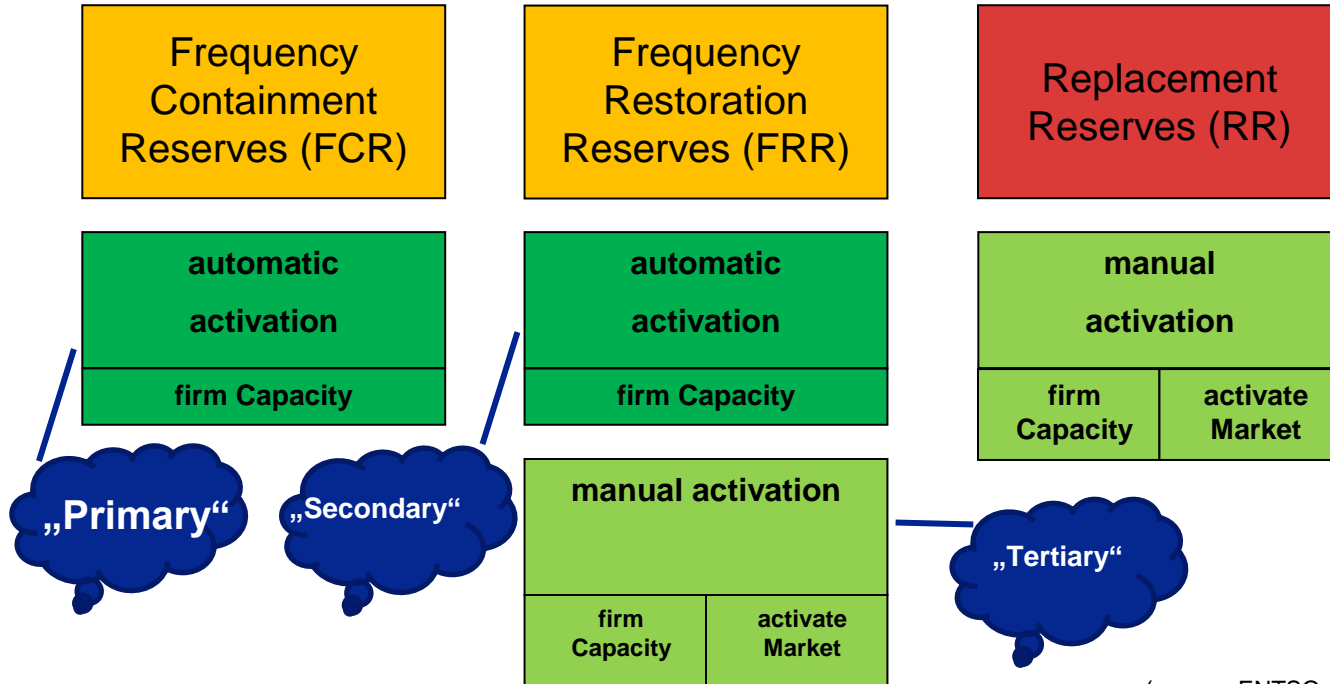
Some important clarifications

Distinction between procurement of balancing energy and reserves:

- Balancing energy is procured in the Balancing Market and imbalances are settled at the imbalance settlement price.
- Reserves are capacity (availability) products procured through auctions at different time scales (including daily) and they are paid (usually) as-bid.



Different kinds of Reserves & Sourcing



(source: ENTSO-e)



Capacity mechanisms – aiming to make participants “whole”

- Capacity mechanisms are closely interlinked with the whole market concept:
 - Are the market design for electricity (physical incl FW, DA, ID and BM) delivering sufficient income for (especially generators)
- To answer this, there are many influences:
 - Price limits
 - Legacy costs
 - Customers willingness (or ability) to pay
- Closely linked to the topic of SPVs as discussed earlier
- Therefore, there is no generic answer to the question: “Do we need Capacity payments?” – it all comes down to the overall status in the power sector
- However, a big discussion is: How to do this in a manner that is not “state aid” or giving preferential treatment of parts of the sector?



Capacity payments – factors that will affect the answer

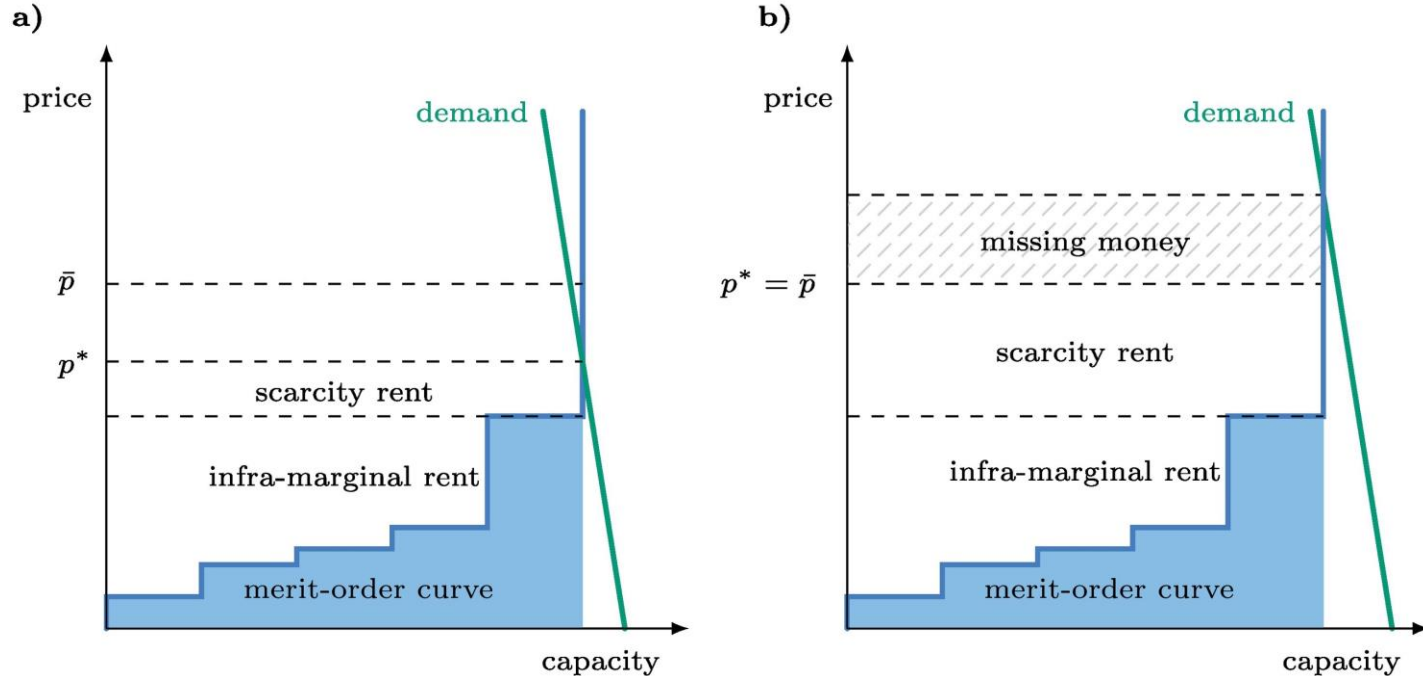
- Scarcity pricing – should enable an “Energy only market” – what is the target of some regions (like EU)
- If you allow for scarcity prices and a high «upper price limit» in the markets, in theory, your fixed costs are covered:
 - by the infra-marginal rent for low and mid merit order units;
 - by scarcity rent (when the market price is higher than the marginal cost) for peak units.
- Economic effects:
 - The generator is remunerated solely through selling energy in the market
 - Increased occurrence of price spikes in the spot market gives the signal to investors that new investment in peak units (whose marginal cost is the highest) would be profitable.
 - These market forces ensure that the system achieves the desired level of reliability.
 - If the market functioned perfectly, income from the sale of MWh would be sufficient to ensure the profitability of the generation system.

So here the answer is **“No”**...



Capacity payments – factors that will affect the choice (and answer)

The “missing money” problem – if prices are not allowed to reflect scarcity rent



Source: "A survey on electricity market design: Insights from theory and real-world implementations of capacity remuneration mechanisms" by Bublitz, KelesF, Zimmermann, Fraunholz, Fichtner, ref <https://www.sciencedirect.com/science/article/pii/S0140988319300453#f0005>







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Capacity payments – factors that will affect the choice (and answer)

Allowing for scarcity pricing – the use of Price limits

One interesting observation looking at US Capacity market shows a clear indication:

- If you have a **high** upper price limit in the energy only market – you don't need a Capacity mechanism
- If the price limit is lower – you would need a capacity mechanism to ensure that the peaking plants are there when needed.

	U.S. Market:	CAISO	ERCOT	ISO-NE	MISO	NYISO	PJM	SPP
Capacity Market Structure								
Formal Market	No ¹	No	Yes	Limited ²	Yes	Yes	Yes	No
Name			Forward Capacity Auction (FCA)	Planning Resource Auction (PRA)	Installed Capacity Market (ICAP)	Base Residual Auction (BRA)		
Resource Requirement	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Reserve Margin (%)	15%	"Target" of 13.75%	15 ³	14.7	17.0	15.9 ³	12.0	
Bilateral Market	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market Participation			Mandatory	Voluntary	Mand. & Vol.	Mandatory		
Scarcity Pricing (Energy Market)		Yes						
Energy Market Price Cap ⁴	\$1,000/MWh	\$9,000/MWh	\$850/MWh	\$3,500/MWh	\$500/MWh	\$550/MWh	\$1,100/MWh	
Capacity Performance			Yes	no	no	Yes		
Market Timing								
Product Term								
New Resources			7 years	1 year	6 mo/1 mo	1 year		
Existing Resources			1 year	1 year	6 mo/1 mo	1 year		
Auction Timing								
Initial			3 years prior	30 days prior	3 mo prior	3 years prior		
Incremental 1			1 year prior		1 mo prior	1 year prior		
Incremental 2			3 mo prior		days prior	3 mo prior		
Incremental 3								
Price Caps								
Maximum			1.6 x CONE	1.4 x CONE	2.0 x CONE	1.5 x CONE		
Demand Curve Structure								

Description

Notes: 1. Imposes a capacity requirement on load-serving entities (LSEs), and has a standardized capacity procurement mechanism but, at present, has no formal capacity market.
 2. Limited capacity mechanism in the form of capacity auctions.
 3. Estimated. Resource Adequacy set by LOLE analysis.
 4. All RTOs approach Scarcity or "Shortage" pricing differently, and have prices for varying amounts of the actual shortage, and type of shortage (e.g., Spinning Res. vs. Non-Spinning Res).

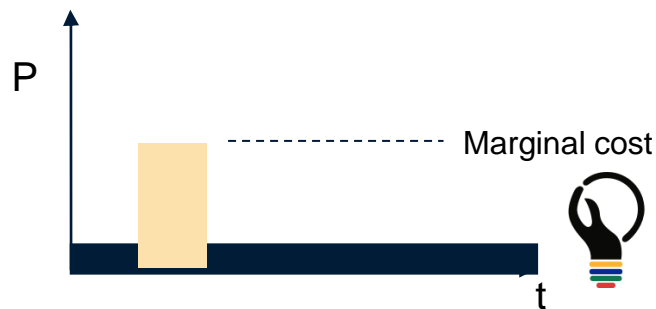
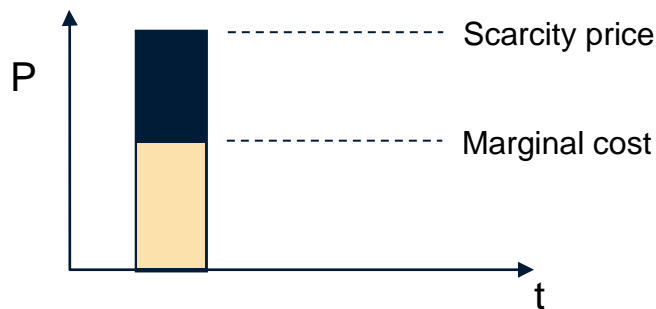


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A simplified example of the difference

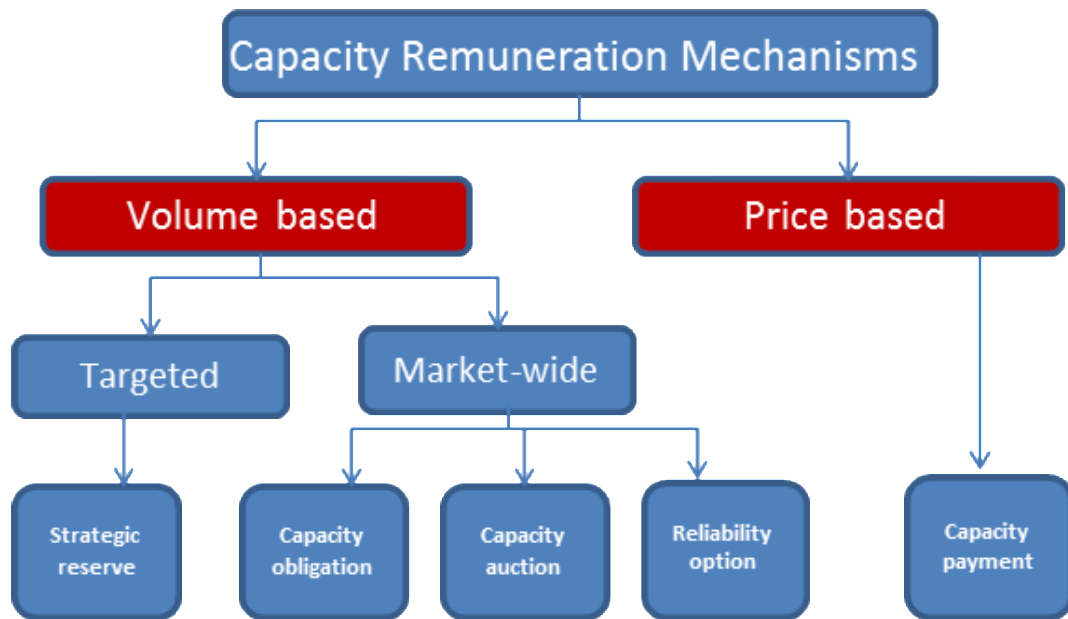
In theory, the cost (and income) should be the same

- In Germany, 10 years ago a normal gas-fired generating unit would run between 600 and 1000 hours a year.
- With increased penetration of VRE in Germany, the gas-fired power plant is now acting as a flexible peaking plant that will only be used 60-100 hours a year;
- The income that the gas-fired unit in Germany would need to cover its annual total costs would therefore be 10 times higher than before.
- In this circumstance, the market design can solve this in two main ways:
 - In an energy-only market with scarcity pricing, you would allow the gas-fired unit to bid a price 10 times higher than before and when it is needed, it will get a sufficient price to cover its costs. The effect of this is that prices will go high in the events when it is needed (and it needs to be allowed to) and this will affect all market participants. However, at the same time, this will give a good price signal for others to try to offer this capacity at a lower price and thereby competition will drive efficiency;
 - Another way is to implement a Capacity Remuneration Mechanism where the gas-fired unit will get a separate payment to be available and offer lower prices in the market. This would again make the business case for the gas-unit still fine. However, there are several other drawbacks with this:
 - First is – how shall the price of the capacity mechanism be established?
 - Who shall be eligible for it?
 - How do you control that they really are available when needed?
 - This will distort the market as these units eligible for this, will have a competitive advantage in the market and thereby be chosen before cheaper resources.
 - Last, but not least: It will dampen the prices in the market and make the prices established not reflecting the real cost of the system.



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Capacity mechanisms – overview of generic models



Price-based CRM

- A capacity payment ‘adder’ to an energy- price is a way of ‘fixing’ scarcity pricing in an energy-only market:
- Capacity payments do not directly result in a target level of capacity

Volume-based CRM

- Targeted: provide a ‘back-stop’ to the energy-only market rather than an entry-support mechanism for all new generation capacity
- Market-wide: Various means to use more market-based solutions for CRMs



Short description of the CRMs

Price-based CRMs

- *Capacity Payments*
 - Capacity Payments represent a fixed price paid to generators/consumers for available capacity.
 - The amount is determined by an independent body. The quantity supplied is then independently determined by the actions of market participants.
- CRMs within any of these categories may be designed in many different variants, including with respect to:
 - a) differentiation between different kinds of capacity, and demand side participation;
 - b) how the eligibility to provide capacity is determined, especially in the case of load;
 - c) how far in the future obligations are contracted;
 - d) how the level of (adequate) capacity is determined;
 - e) how availability is documented or certified;
 - f) how, in the context of a Capacity Payments scheme, the payment is determined: whether prices are set administratively, according to auctions or in the market. Or, under a Capacity Obligation or a RO scheme, how the threshold/strike price is determined;
 - g) how the costs are allocated; and
 - h) the rules for the operation and activation of the capacity, including participation in energy markets.



Short description of the CRMs

Volume-based CRMs

Strategic Reserve

Some generation capacity is set aside to ensure security of supply in exceptional circumstances, which can be signalled by prices in the organised market(s) increasing above a certain threshold level.

An independent body (TSO), determines the amount of capacity to achieve the desired degree of adequacy and dispatches it whenever due.

The capacity to be set-aside is procured and the payments to this capacity determined through a (typically year-ahead) tender and the costs are borne by the network users.

A solution close to Ancillary service provisions

Capacity Obligations

A decentralized scheme where obligations are imposed on large consumers and on load serving entities to contract a certain level of capacity linked to their self-assessed future (years ahead) consumption or supply obligations, respectively.

It will be based on a reserve margin determined by an independent body.

The obligated parties can fulfil their obligation through ownership of plants, contracting with generators/consumers and/or buying tradable capacity certificates (issued to capacity providers).

Contracted generators/consumers are required to make the contracted capacity available to the market in periods of shortages

These capacity contracts could be traded in a secondary market

Capacity Auctions

A centralized scheme in which the total required capacity is set (several years) in advance of supply and procured through an auction by an independent body.

The price is set by the forward auction and paid to all participants who are successful in the auction.

The costs are charged to the suppliers who charge end consumers.

Contracted capacity should be available according to the terms of the contract.

Reliability Options

Reliability Options (ROs) are instruments similar to call options, whereby contracted capacity providers (typically generators) are required to pay the difference between the wholesale market price (e.g. the spot price) and a pre-set reference price (i.e. the "strike price"), whenever this difference is positive, i.e. the option is exercised.

In exchange they receive a fixed fee, thus benefitting from a more stable and predictable income stream.

Under a RO scheme, the incentive for the contracted generator to be available (at times of scarcity) arises from the high market price and from the fact that, if not available and therefore not dispatched, it will have to meet the payments under the RO without receiving any revenue from the market.

Often closely linked to a Capacity obligation scheme

