International Smart Grid Action Network (ISGAN)

Working Group 9: Flexibility Markets

Capacity Mechanisms

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In recent years, the electricity market has experienced strong fluctuations and frequent market interventions (e.g., windfall profit taxes in Austria, Germany, Italy, and Spain, or the introduction of electricity price caps), which can significantly affect the security of supply. In addition, high shares of renewable energy sources (RES), driven by support mechanisms, have led to increasingly volatile generation patterns and a growing demand for flexibility, as well as for additional generation technologies and storage capacities. Moreover, heightened price volatility, uncertain geopolitical conditions, and short-term market interventions undermine long-term planning certainty and, consequently, weaken investment incentives. The main concern is that, alongside the continued expansion of RES to meet ambitious decarbonization targets, the energy-only market may not provide sufficient incentives for new investments in the future. In general, capacity mechanisms can be categorized into the following types:

Targeted mechanisms only reward specific technologies. They identify the additional capacity needed beyond what the market would naturally provide and support only this extra "top-up" capacity. There are three main types:

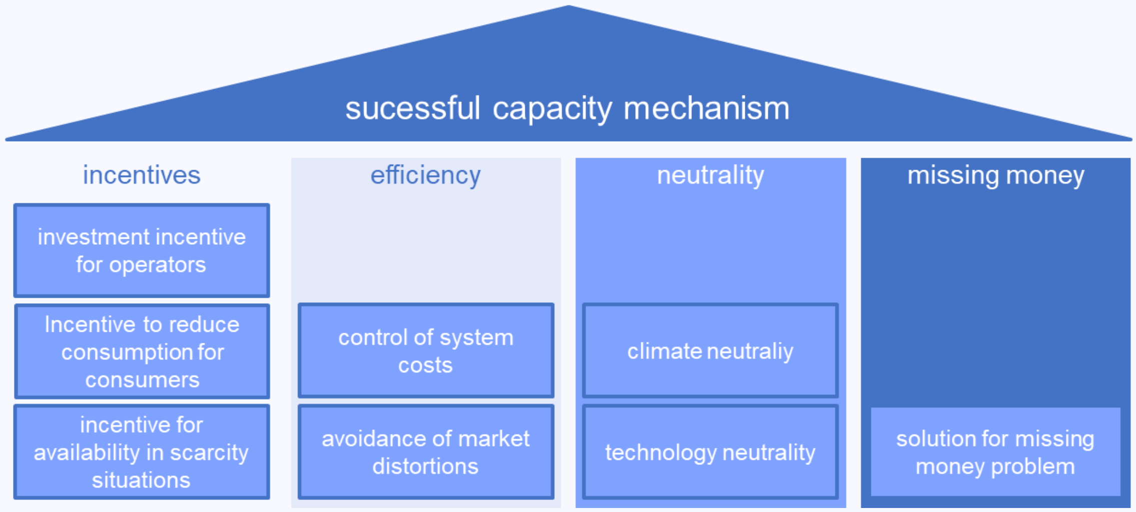
1. **Tender for new capacity:** This involves financing the construction of a power plant to provide the additional capacity, which is then operated on the market, possibly under a power purchase agreement (PPA).
2. **Strategic reserve:** In this model, additional capacity is secured through contracts and held as a reserve, only used under specific conditions such as capacity shortages or high electricity prices, typically to maintain existing capacities.
3. **Targeted capacity payment:** A central authority sets a price for capacity and pays it to a specific subset of market-operating capacities, based on technology or other criteria.

In a **market-wide mechanism**, all capacities necessary to ensure supply security receive payments, covering both existing and new capacity providers. This effectively creates a separate market for "capacity," distinct from the "electricity market." There are three basic types:

1. **Central buyer:** A centrally determined total capacity is procured through a central tendering process, with the market determining the price.
2. **Decentralized obligation:** Electricity suppliers/traders are required to enter into contracts with capacity providers to secure the total capacity needed to meet the demand of their consumers, with market forces determining the price without a central tendering process.
3. **Market-wide capacity payment:** A centrally determined capacity price, based on estimates required to ensure sufficient total capacity, is paid to all capacity providers in the market.

The main pillars to form a successful capacity mechanism can be grouped into four sub-categories:

- ***incentives***
- ***efficiency***
- ***neutrality***
- ***missing money***



Incentives:

Investment incentives for operators: An effective CM must ensure that energy producers receive sufficient incentives to invest in new capacities. Mechanisms should be designed to encourage long-term investments in modern and efficient power plants to maintain grid stability. Ensuring *revenue security* is crucial, as predictable income streams create the confidence needed for long-term investments. *Capacity payments* for maintaining the readiness to produce electricity provide an additional financial incentive for operators to invest in new generation capacities. Moreover, *price stability* through mechanisms like Reliability Options or Contracts for Differences (CfD) help mitigate market price volatility, offering a more stable revenue model and reducing investment risks. *Long-term contracts* offer further financial certainty, especially for projects involving new or emerging technologies. Additionally, *technology-specific contracts* with tailored provisions for key areas, such as storage, demand response, or renewables, can promote investment in these essential components of a flexible and sustainable energy system.

Incentives for consumers to reduce consumption: In addition to producers, consumers should be motivated to reduce their electricity usage during periods of high grid demand. This can be achieved through *dynamic pricing models* or special *demand-side management programs*. Such incentives can support grid stability and reduce the need for additional generation capacity.

Incentives for availability during scarcity situations: Ensuring that capacity is available when needed, particularly during scarcity situations, is a critical part of the incentive structure. Operators should be *obligated* to offer their capacity on the market during periods of system stress to ensure grid reliability. *Penalties for non-availability* serve as a deterrent against failing to provide capacity when it is most needed, reinforcing the importance of maintaining readiness. *Financial incentives* play a crucial role in motivating operators to meet these obligations, particularly through mechanisms like Reliability Options, which ensure capacity is available during critical periods while stabilizing prices for both producers and consumers.

Efficiency:

Control of system costs: A crucial aspect of an effective CM is controlling system costs. Costs must not spiral out of control, as this can lead to significant economic burdens. An example is the situation in Ukraine, where although a blackout was avoided, it resulted in extremely high prices. Therefore, a CM should be designed to ensure supply security without significantly increasing costs for end consumers. *Proper design* is essential, including a *competitive procurement process* that takes into account the "right" capacity requirements at the appropriate locations. Failure to secure sufficient capacity during periods of system stress can lead to additional cost factors, such as delayed energy transition, missed climate targets, reduced resource availability, power shortages, and increased price volatility. The *financing* of the CM is typically covered through tariffs, either via electricity providers or grid operators, ensuring a balanced and sustainable approach to cost distribution.

Avoidance of market distortions: Existing energy markets should not be distorted by the CM. Ideally, a CM should seamlessly integrate into the existing macroeconomic structures, ensuring that competitive conditions are maintained and the efficiency of the overall market is not compromised. Various design options can support this goal. One approach is the choice between *marginal pricing and pay-as-bid* systems, which determine how prices are set in the market. Additionally, *price-responsive demand curves* representing the relationship between the price of capacity and the amount of capacity that the market (or system operator) is willing to purchase, can help balance supply and demand more effectively. The distinction between "*price takers*" and "*price makers*", as seen in Poland, allows for a clearer separation of participants based on their market power, promoting fair competition. Moreover, the implementation of *auction price caps*, such as in Ireland, can prevent excessive price increases while maintaining the stability of the energy market.

Neutrality: A CM must be designed to be both climate- and technology-neutral. This means it should neither favor nor disadvantage specific technologies while encouraging the participation of low-emission or emission-free technologies within the mechanism. However, *technology-specific de-rating factors* can be applied to account for the reliability and availability of different technologies. In some cases, as seen in the UK, CM may include a *split into multiple auctions* to accommodate various technology types more effectively. Additionally, *minimum quotas* e.g. for demand response can be introduced to ensure sufficient participation of flexible, low-emission solutions, further promoting a balanced and sustainable energy system.

Missing Money: A CM must address the "Missing Money" problem by creating additional revenue streams or providing incentives to ensure that producers are adequately compensated, even in volatile market conditions. This helps ensure the financial viability of energy producers despite fluctuations in market prices.

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