

**System services are
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to provide the expected
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sustainable energy for everyone



System Services – Overview, Stakeholders, Trends

**DFBEE Conference – System Services
provided by PV plants, Paris**

03/11/2015

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- > **'Ancillary services'** refers to a range of functions which TSOs contract so that they can guarantee system security. These include
 - black start capability (the ability to restart a grid following a blackout);
 - frequency response (to maintain system frequency with automatic and very fast responses);
 - fast reserve (which can provide additional energy when needed);
 - the provision of reactive power and
 - various other services.

- > Access to a broad range of services from a wide range of providers, including generators but also demand response (which involves customers changing their operating patterns to aid system balancing) gives TSOs flexible options, which allow them to make efficient decisions.

Source: ENTSO-E, <https://www.entsoe.eu/about-entso-e/market/balancing-and-ancillary-services-markets/Pages/default.aspx>

System services – German Transmission System Operators

- > In the context of an electrical power system, **system services** refers to the services indispensable to the proper functioning of the system which system operators provide for connection owners/connection users in addition to the transmission and distribution of electrical energy, and which thus determine the quality of power supply:
 - > frequency control
 - > voltage control
 - > restoration of supply
 - > system management/ operation management
- > The investments made in the design of plants (e.g. generating unit) for the provision of **ancillary services** for frequency control ...

Source: VDN (BDEW), TransmissionCode 2007, Network and System Rules of the German Transmission System Operators, Berlin, 2007

An analogy – traffic



An analogy – traffic profits from ,system services‘



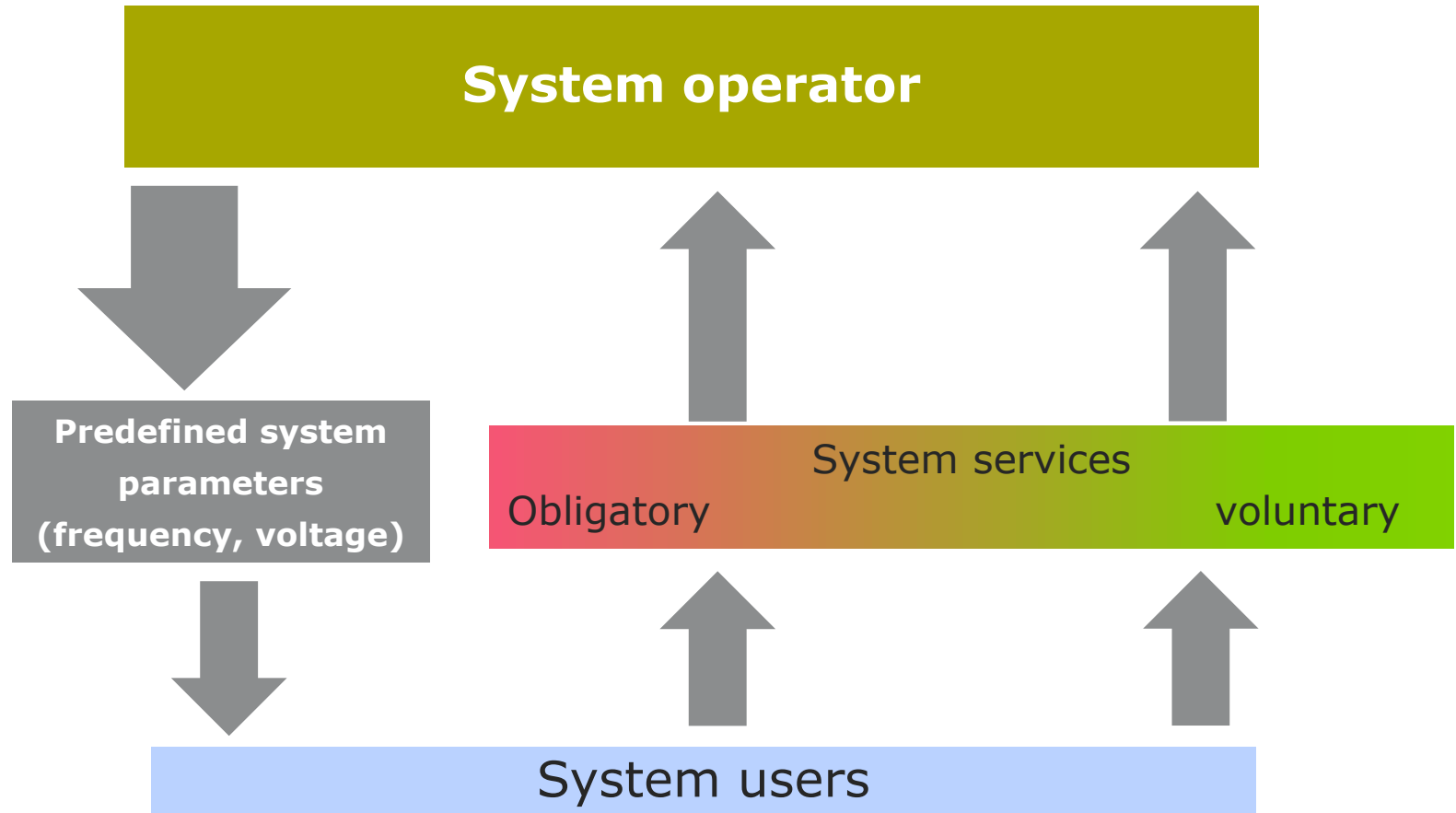
System Services may be provided by the system operator with no extra charge.



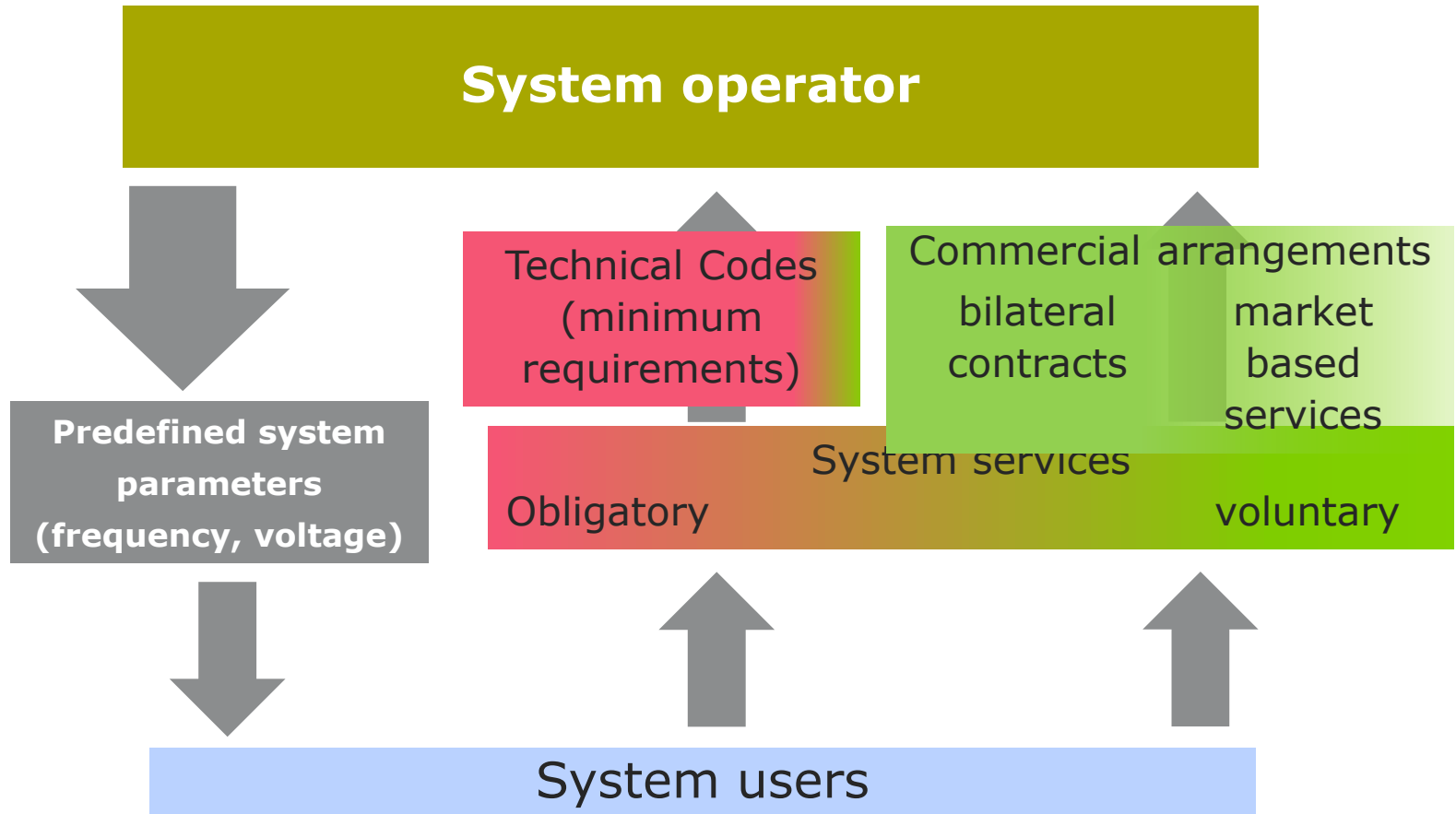
System Services may be provided by the system operator or as a commercial activity.



System services in power systems – the rules of the game.



System services in power systems – the rules of the game. Are they negotiable?



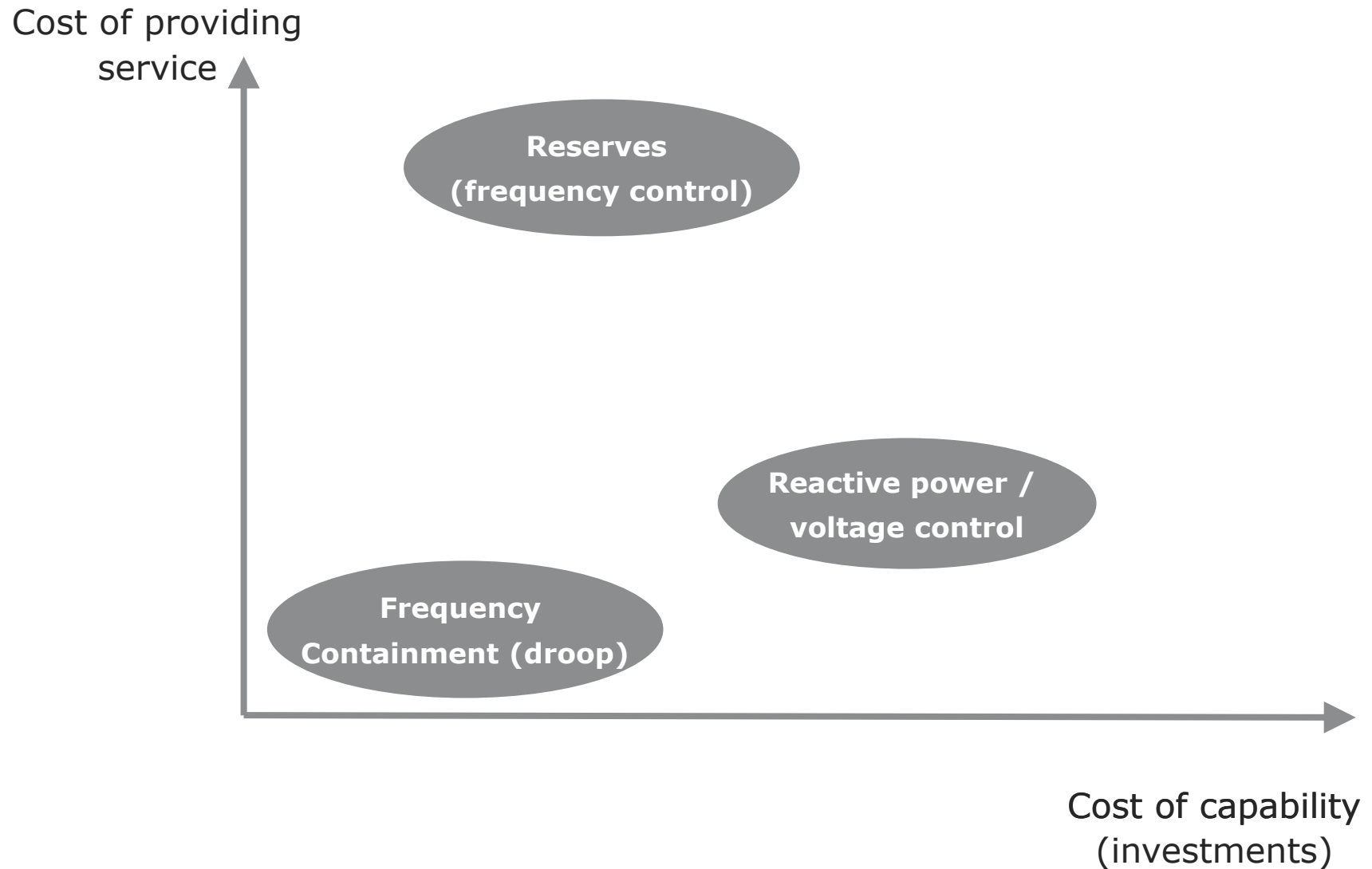
Some services and trends (1) - frequency

- > Frequency is a system wide parameter. Apparently, frequency is permanently the same in all geographically regions and across all network levels.
- > Maintaining frequency stability is vital for system stability.
- > Previously, frequency control was the domain of large power plants.
- > Nowadays, all generators, incl. distributed generation, have to support frequency stability. Distributed generation may offer services for actively contributing to frequency stability.

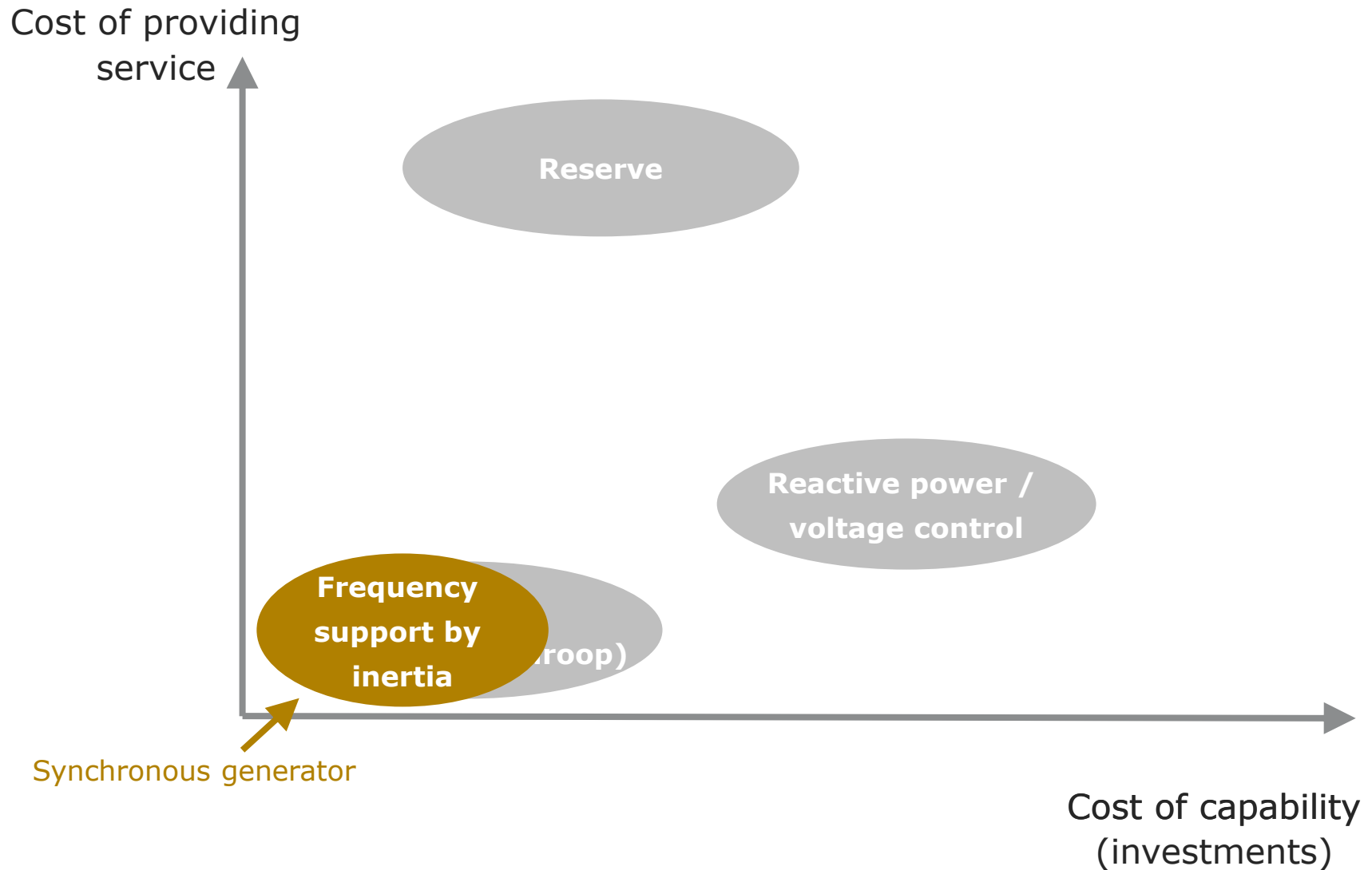
Some services and trends (2) – voltage / reactive power

- > Voltage is a local parameter. Voltage in a network section is affected by the local balance of load and generation and parameters of assets. Voltage can be influenced by reactive power.
- > Maintaining voltage within tolerances is crucial for effective operation of equipment and subsystems.
- > Generators may or may not be in a position to effectively contribute to voltage management.
- > Distribution network operators just start exploring the capabilities of distributed generation.

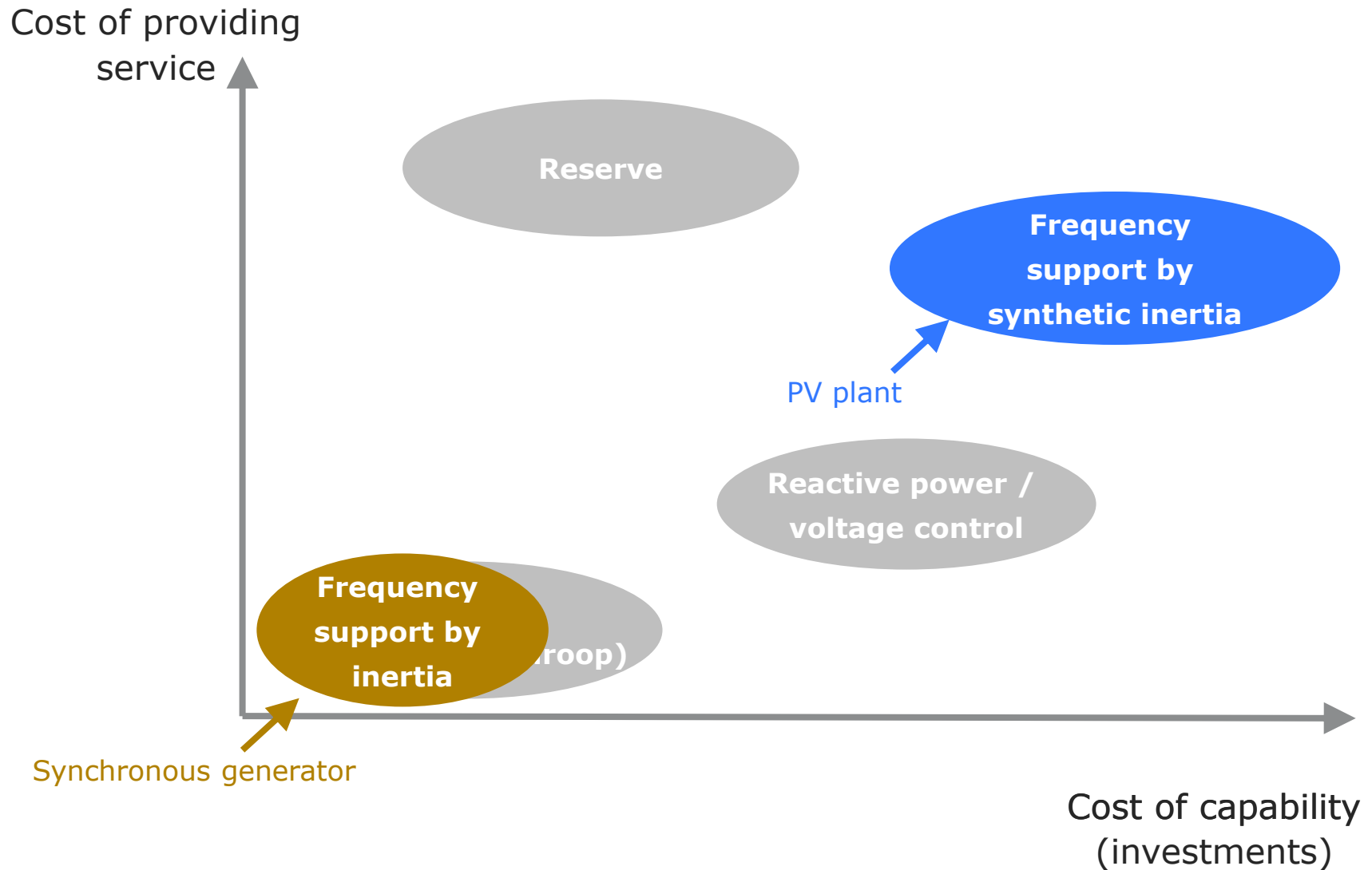
System services are associated with various costs.



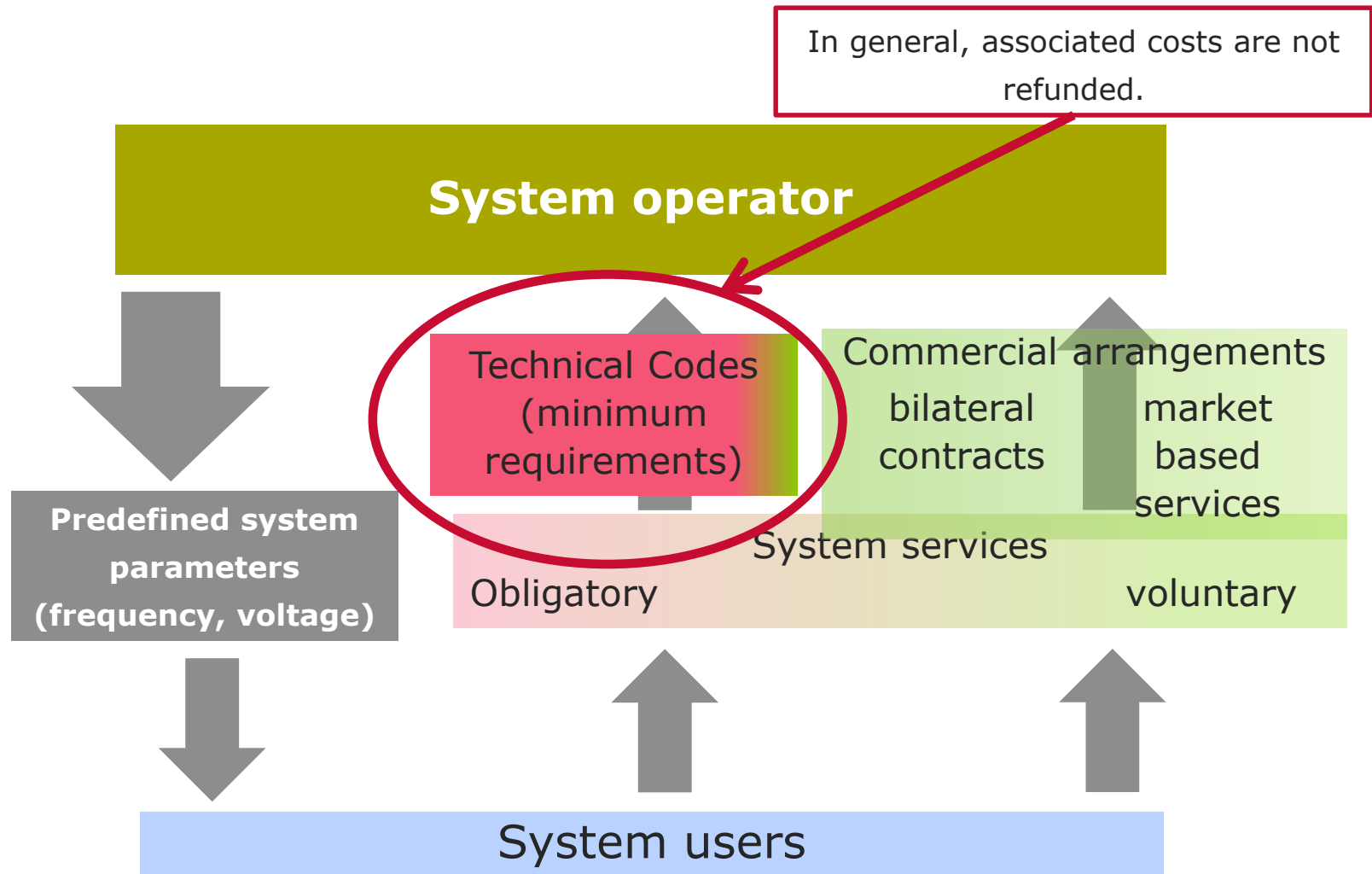
New obligatory system services may introduce new costs.



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System services in power systems – the rules of the game. Are they negotiable?



The rationale behind the services is not always obvious.





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