Synchronous condenser for CHP

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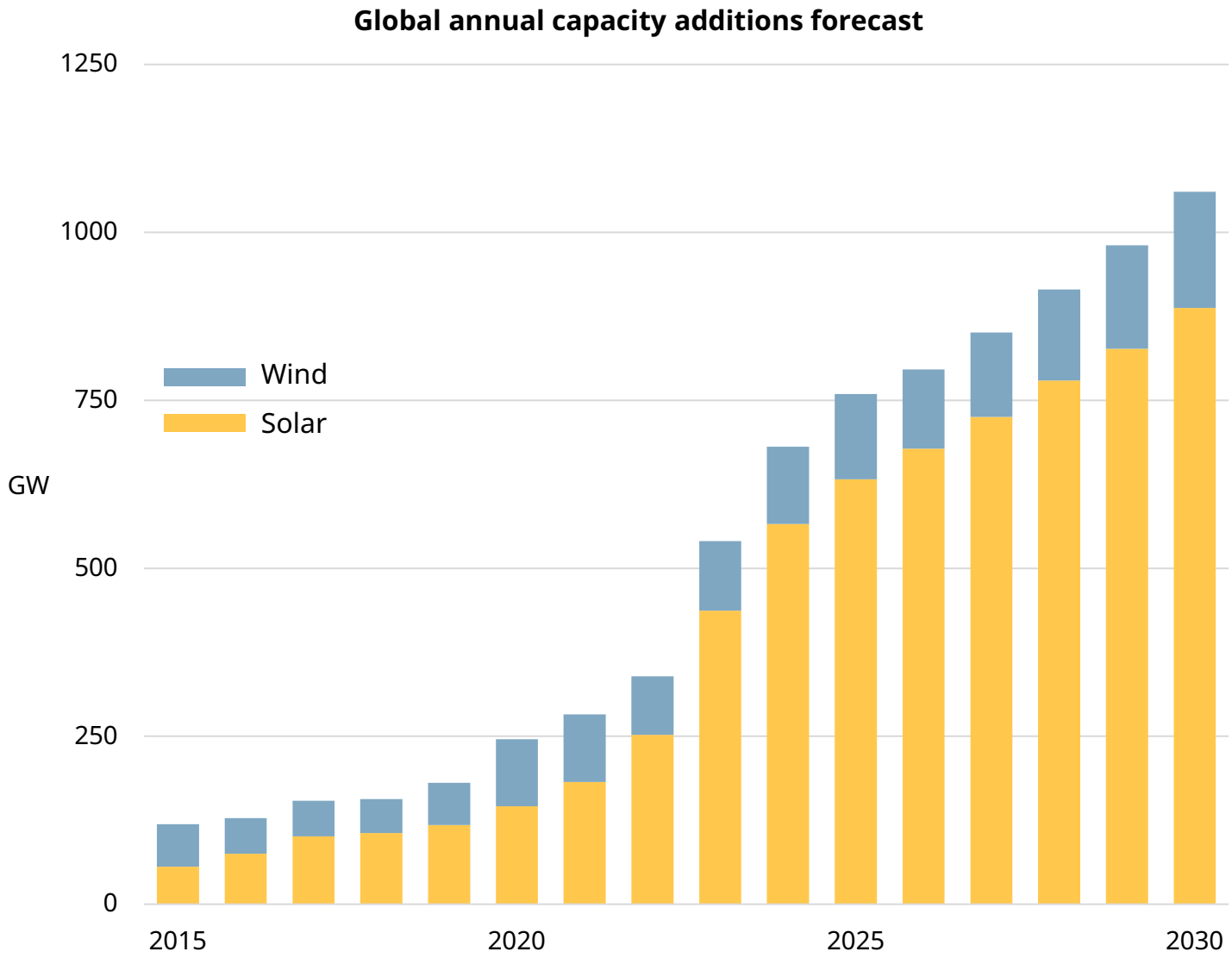
Descargar presentación en español:

Preparing for a stable grid in a renewable future

Rapid growth in wind and solar is transforming the grid, increasing the system volatility.

Grid operators are seeking solutions to maintain stability and are willing to invest in assets that provide strength and reliability.

Red Eléctrica de España is planning on investing 750 million € to strengthen the power system.



Source: BNEF: 1Q 2024 Global PV Market Outlook and 2H 2023 Global Wind Market Outlook

High shares of renewables bring technical challenges to the grid

Frequency stability

Inverter-based resources lack inertia, making the grid more sensitive to rapid frequency changes.

Voltage stability

Weak grids with limited short-circuit capacity and reactive power control.

Protection

Insufficient short-circuit current for reliable relay operation.

Future for CHP plant operation

Declining running hours and future possibilities

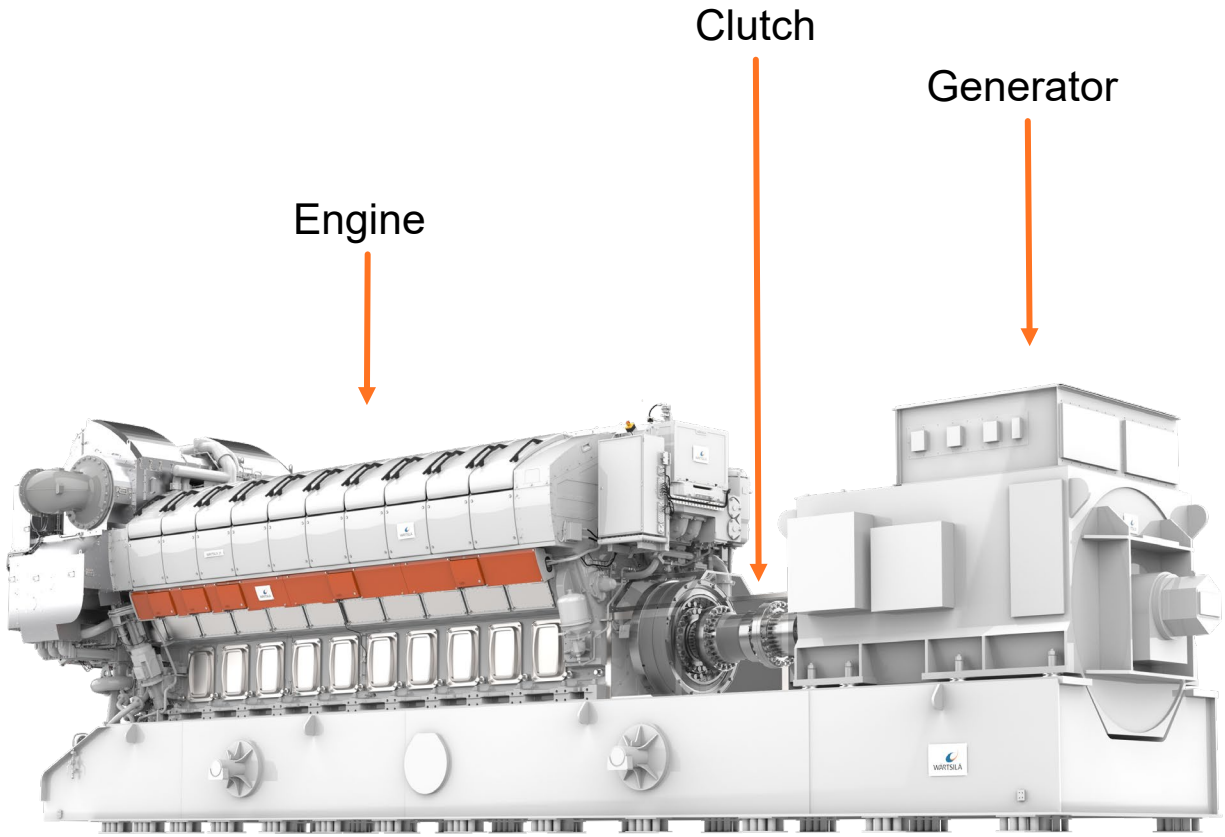
Low spot prices reducing CHP running hours, leading to lower energy revenue and asset utilisation.

Renewable dispatch priority.

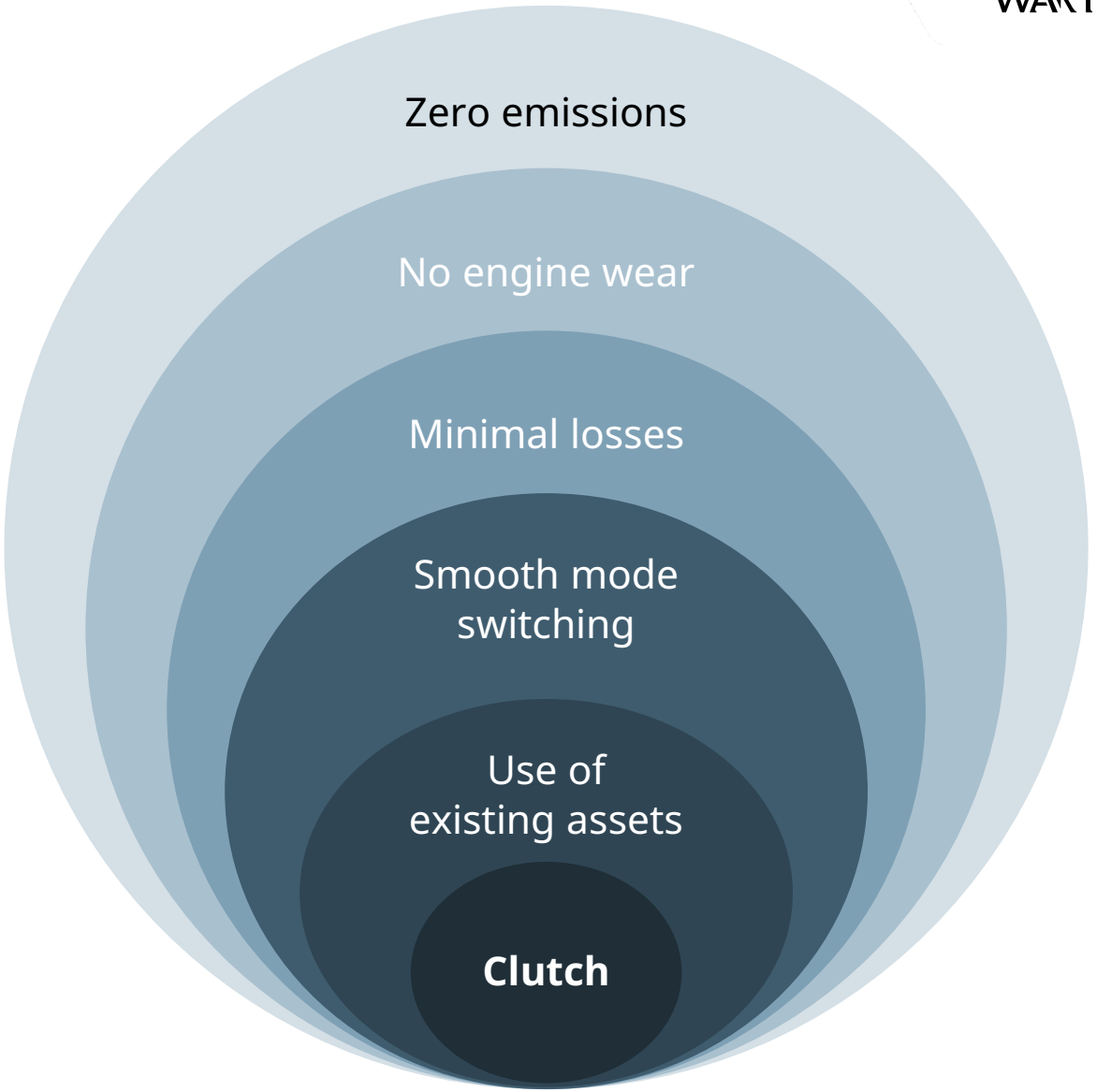
Regulatory changes are creating new opportunities with new markets and remuneration for grid support services.

Wärtsilä synchronous condenser feature

- Wärtsilä generating sets incorporate the synchronous condenser feature through the integration of a **clutch**.
- **Generator operating as synchronous condenser** when active power is not needed.
- CHP plants can earn revenue from voltage control, short-circuit capacity, and inertia—even when not generating active power & heat.



Why choose a clutch-based solution?



Spain: Voltage / reactive power market (CNMC OP 7.4) in 2026

Continuous participation opportunity in both operating modes

Basic service

- Mandatory +/- 0.98 pf requirement

Real-time service

- Set-point based (voltage or reactive power)
- Remuneration of 1€/MVArh

Zonal reactive power market

- Bid by €/MVAr
- Similar to frequency reserve markets

Dispatch priority

Increased value with the Wärtsilä synchronous condenser feature

Maximize asset utilisation and revenue

Switch between power generation and synchronous condenser operation to earn from both energy sales and paid grid services—without downtime.

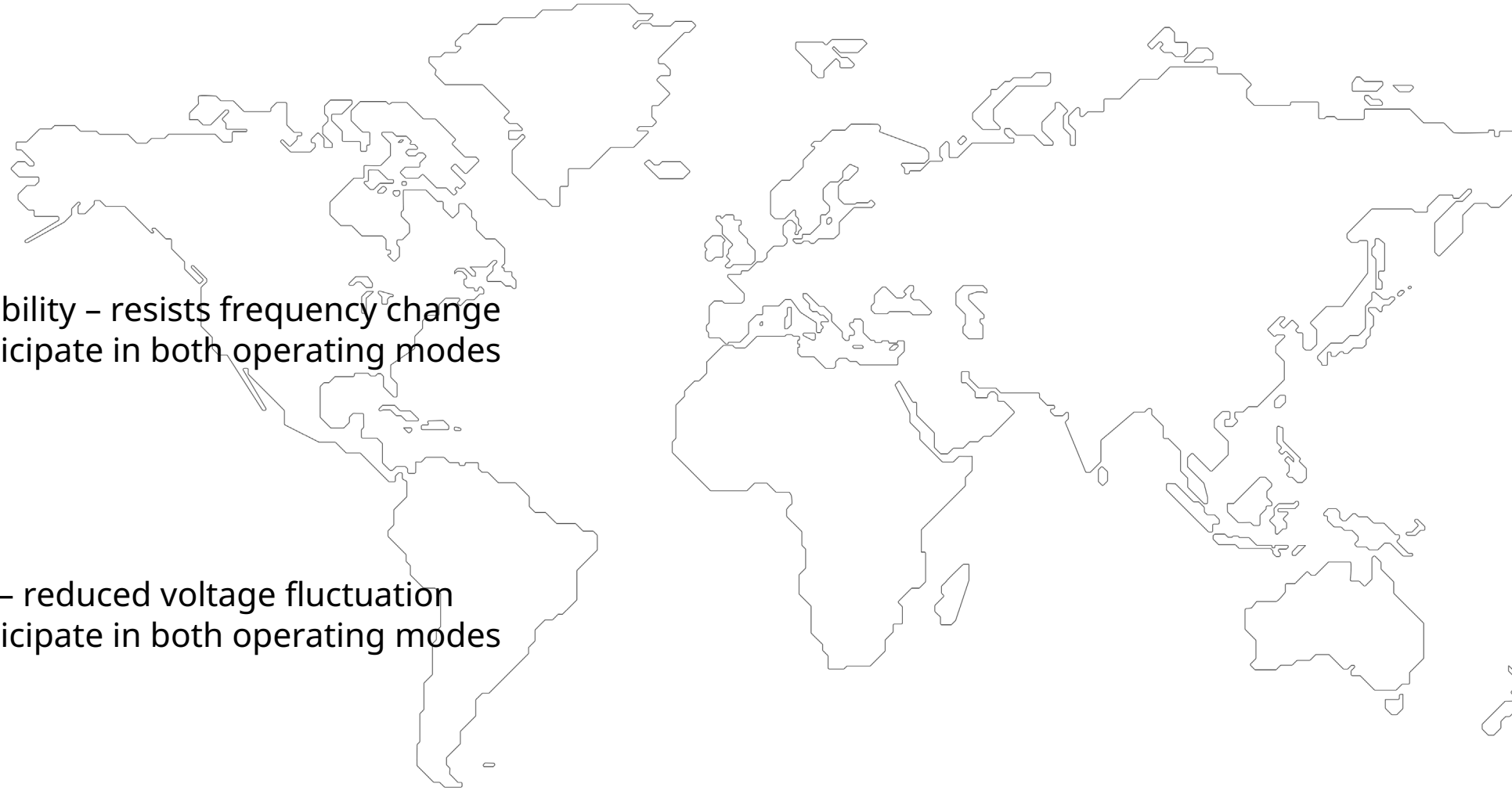
Expected payback

6 months to 2 years

With conservative market assumptions
Zonal Market Price: 2-4 €/MVAr
Energy price: 80–200 €/MWh
Running: 5,000–8,700 h/year

Other grid support services for synchronous condenser operations

Globally and in Europe. Could they be required in Spain in the future?



Inertia

- Capacity market
- Improves frequency stability – resists frequency change
- Generating set can participate in both operating modes

Short-circuit power

- Capacity market
- Strengthening the grid – reduced voltage fluctuation
- Generating set can participate in both operating modes

Key takeaways

Capex effective solution

Minimal cost impact on overall solution

New revenue streams

Integrating synchronous condenser features creates additional revenue opportunities for CHP plant owners

Continuous grid support services

Voltage- /reactive power support, inertia and short-circuit power always available

Competitive market position

CHP plants with these features remain competitive in evolving energy markets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