

The Role of Natural Gas in Maintaining Electric Grid Stability in SE Asia

ERIA/EPRINC/IEEJ Joint Webinar

"The role of LNG and natural gas toward and beyond the energy transition in Asia"

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Outline

- Potential Effects of Increasing VRE on Grid Reliability
- Importance of "Dispatchable" Generation
- A Role for Gas in Improving Grid Stability



Intermittent renewables create additional reliability challenges

Event	Variable Renewable Energy Complications
2016 South Australian Blackout	Effects of major storm were exacerbated by grid's reliance on wind farms which shut down during high winds. Lack of "inertia" in the system also led to cascading failures. Black start required.
2019 United Kingdom Blackout	Lightning strikes caused an offshore wind farm to trip. Low wind speeds prior to the event combined to create a blackout for 1 million customers.
2020 California Blackouts	Operators struggled to major the "duck curve" in the evenings after gas and nuclear plants were closed due to increased confidence in wind and solar capacity.
2021 Texas Winter Storm Blackout	Icing and low wind speeds froze wind turbines which combined with reduced gas fired generation and peak load to create blackout.
2022 California Heatwave Outages	California's push for 60% renewables by 2030 amplified challenges, as insufficient storage and dispatchable power couldn't compensate for VRES variability.
2024 Victorian Blackout	Wind farms temporarily offline due to high wind speeds. 40% renewable share complicated grid stabilization, as variable output required careful load shedding to prevent a system-wide failure.
2024 UK Low Wind Events	Low wind speeds. UK's 30% wind power share exposed reliability risks caused by insufficient storage and interconnection capacity.
2025 Heathrow Airport Substation Fire	Still under investigation, extreme day-night thermal cycling associated with solar can degrade transformers not designed for these conditions.
2025 Spain and Portugal Blackout	Still under investigation, but some indication that the capacity of inverters to introduce "harmonic currents" back into the system can accelerate wear on switchgear.



Maintaining electrical grid reliability

Power Generation Capacity (GW) and Capacity Factors (%)

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ILLUSTRATIVE

- Electrical grid reliability will become an increasingly important issue as the share of renewable energy increases.
- In general, one must maintain a 10-20% reserve margin in dispatchable capacity to ensure grid reliability.
- As the share of non-dispatchable energy sources increases, it will typically displace generation from dispatchable sources, causing the capacity factors for those dispatchable power plants to decline.
- Maintaining those dispatchable sources as the capacity factors decline will cause total system costs to increase.

Gas-fired generation well suited to add stability to the grid

"Dispatchable" generation that can follow weather related changes in VRE generation and total system demand.

Contributes to physical "inertia" in an electrical grid.

Relatively low capital costs and relatively high operating costs make it well suited for providing system stability and seasonal/annual "storage".

Can be installed in a "modular" manner.







Thank you.

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