Engine power plants capture 1.6× more real-time market revenue in Texas, USA

USA

The Electric Reliability Council of Texas (ERCOT) operates the primary electricity grid of Texas, serving over 25 million customers. As an independent system operator, ERCOT ensures real-time balance between generation and demand, maintaining a reliable supply of electricity across the state.

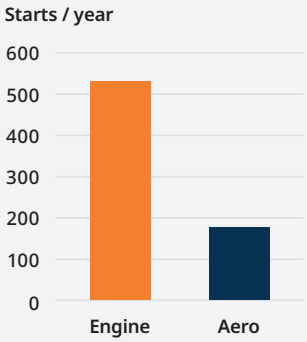
ERCOT manages this through day-ahead and real-time markets, which forecast and schedule generation based on expected load. Historically, natural gas has been the dominant resource, contributing 40–50% of the generation mix. Additionally, approximately 30% of ERCOT's thermal generation is more than 40 years old, making it less reliable for serving peak load and not flexible enough to respond to growing variability on the grid. New natural gas engine power plants offer flexibility and reliable output that does not derate during peak demand periods.

Texas also leads the nation in wind generation, with wind resources supplying 20–25% of annual energy and occasionally exceeding 50% of real-time system load. This variability highlights the need for fast, dispatchable resources to stabilise the grid.

To help manage variability from high renewable penetration, ERCOT relies on gas reciprocating engines alongside other dispatchable resources. Engines can start, stop, and adjust output extremely quickly – reaching full load within minutes – making them ideal for compensating rapid fluctuations in wind and solar generation. This flexibility not only stabilises supply and demand but also makes the grid more adaptable to sudden changes while allowing operators to capture revenue opportunities by responding quickly to price spikes and avoiding losses during low-price periods.

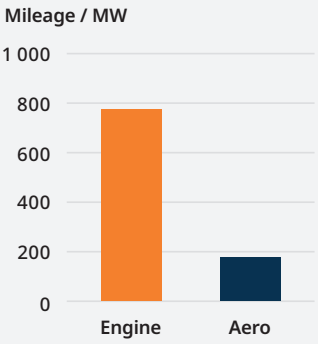
In our case example in Texas, we analysed dispatch data for two engine and two aero power plants in the ERCOT South Zone during 2022. The plants are comparably sized (ranging from 202 MW to 242 MW) and share similar power market pricing dynamics, including high price volatility.

The results presented below are averages of the two sets of plants.



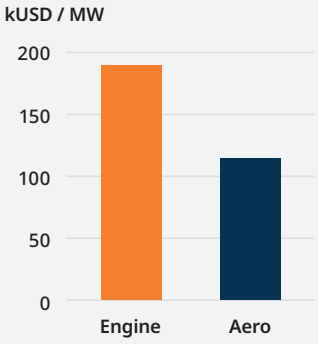
3x times more starts for engine power plants

With zero start-up cost and no minimum up or down time, plus superior thermal efficiency, the engine plants recorded almost three times as many starts as the aero plants.



4x more utilisation for ramping

Just like an odometer measures the distance travelled by a car, a generator's mileage quantifies its total movement over an operating period. When net demand spikes, flexible engine generation can start up in five minutes, quickly ramp to the exact output needed and then turn off almost instantly when load is served. Quick start-up times and the ability to rapidly ramp output and operate efficiently at any level meant that the engine plants' utilisation for ramping was over four times higher compared to the aero plants.



1.6x higher real-time market revenue

Higher thermal efficiency, lower start-up costs and the flexibility to catch short-duration real-time price spikes meant the engine plants could have earned as much as 1.6 times higher real-time market revenue compared to the aero plants. For a 200 MW engine power plant, this translates into an additional benefit of approximately $4 to $24 million in value per year.

In ERCOT's highly volatile real-time market, flexibility translates directly into financial performance. Gas engine power plants, with their ability to start and ramp output within minutes, can capture short-duration real-time price spikes that inflexible generators cannot respond to. In a rapidly evolving and highly renewable grid, investing in the most flexible assets can not only enhance reliability but also unlock significant value through superior flexibility and lower operating costs.