

Plains End I & II

CASE STUDY



The wind enabler rises to the challenge

In early 2013, after acquiring the state-of-the-art Plains End I & II facility from Cogentrix, Tyr Energy became the owner of the largest natural gas-fueled internal combustion engine power plant in the USA.

“During breakfast and dinner hours demand increases and the plant follows this perfectly. This is the way. This is the future.”

Kent L. Fickett
former Senior Vice President of PG&E
National Energy Group (NEGT's predecessor)

When making the decision on which technology to utilise for Plains End I & II, the critical factor to take into account was the plant's ability to operate at peak efficiency at high altitudes and temperatures. The Plains End power plant is located at an altitude of 6150 feet (1845 m) above sea level with an average air temperature of 97°F (36°C). On top of dealing with these ambient requirements, a second key factor in the purchase decision was that the new plant could cope with the sudden load swings which frequently occur due to the high proportion of intermittent wind-driven generating capacity in the Colorado area. The growing list of demanding requirements brought the owners to Wärtsilä.

Being able to operate efficiently at minimum plant output, Tyr Energy has the opportunity to sell so-called 'spinning reserve' in the ancillary services market. The plant is also able to provide rapid up and down output regulation, which Investor Owned Utility, Xcel Energy, the local utility, has acknowledged as a great benefit provided by Plains End. The utility's capacity routinely exceed changes of 20 MW/minute – which Plains End is able to compensate for by ramping from minimum load to full load and back again in record time.

The Plains End facility is also set up as the 'grid black start facility' for Xcel Energy. This is due to the flexibility, reliability, and the exceptionally low cost compared to systems employing gas turbines. This capability is achieved by providing a very small amount of diesel-driven generating capacity (250 kW) that can supply the power required to start one Wärtsilä genset in the case of a transmission system blackout.

Plains End consequently feeds its output into the grid to supply start-up power for other generators of more traditional design. This has allowed Xcel Energy to optimize its portfolio of generation assets.

For most of the time, Plains End operates in non-spinning reserve mode. Should the need arise, the plant can reach full output in less than ten minutes. Its alternative mode of operation is spinning reserve, in which automatic signals from the grid dispatch centre commands the plant. In this mode the plant output is increased when the grid requires additional electricity, whereas a falling system demand triggers the plant to ramp down.

Annual operation time at Plains End totals 500–1500 hours. Both operating time and dispatch frequency are heavily dependent on the balancing requirements made by the Xcel Energy grid, and consequently also by the available wind power. The normal fluctuations that result from wind power generation are balanced by the Plains End regulation reserve service. Xcel Energy's generation mix also includes large coal plants, for which Plains End provides spinning and nonspinning reserve to cover any disturbances in supply.

The track record of Plains End is impressive. For example, in 2003, the monthly availability of Plains End I was between 99.4% and 99.9%, demonstrating the plant's astonishingly high level of reliability. With these figures in mind, Xcel Energy is relieved to know that the stability of their grid is in good hands. On top of their unrivalled reliability, should any issue arise in the natural gas supply, both Plains End plants can stay online significantly longer than other plants supplying the grid with power. This is due to the fact that even very low gas pressure (75 PSIG / 5 barg) is more than sufficient for Wärtsilä technology.

Looking back at more than a decade of active service, as the biggest, most flexible gas-fired wind chasing power plant in the USA, the Plains End I & II plant truly is a milestone in the history of power generation – for the owner, the utility and the manufacturer.

CUSTOMER

Tyr Energy (IPP)

TYPE

Wärtsilä 34SG gas power plant

OPERATING MODE

Peak load/stand-by & emergency

GENSETS

20 x Wärtsilä 18V34SG
+ 14 x Wärtsilä 20V34SG

TOTAL OUTPUT

231 MW

FUEL

Natural gas

SCOPE

Equipment delivery (ED)

DELIVERY

2001 & 2006



CHALLENGE	WÄRTSILÄ'S SOLUTION	BENEFIT
Fluctuating output from wind generation	Internal combustion engines with excellent ramp rates	Superb operational flexibility & increased revenue from selling balancing capacity
Increasing the reliability of the whole grid	Adding low-pressure gas plant with extremely high availability (>99.4%) to the generation mix	Grid black start capability at a very low cost & ability to keep plant online even when the quality of the gas supply suffers
Optimising return on investment	Adding rapidly dispatchable plant to the generation mix	Revenue from both the energy market and the ancillary service market – simultaneously
Harsh ambient conditions: high altitude and hot climate	Engines insensitive to ambient conditions	Full efficiency is reached throughout the year