



# Digital Wind Business Optimization from GE Renewable Energy

Leveraging sophisticated analytics to drive increased revenue



# DIGITAL WIND SOLUTION

# BUSINESS OPTIMIZATION

## BUSINESS CHALLENGES

Operating silos between the generation and the trading organizations in renewable energy results in negative financial impacts. Additionally, for commercial operations teams in organizations that trade power and energy, there is rarely real-time visibility into the productivity potential of the wind farms.

With missed opportunities from inefficient capacity planning and ill-timed maintenance windows, the bottom line takes a hit and an energy generator can become a price taker as smarter, more competitive organizations leverage data and analytics to solve these issues and become the price setters.

What is needed is a more accurate way to predict output capacity and improve operating insights to intelligently make dispatch and trading decisions for the most financially positive outcomes possible. GE's Digital Wind Business Optimization solutions bring the ability to forecast both capability and market trends to lead to production with refined accuracy, resulting in incremental revenues and margin.

## SOLUTION DESCRIPTION

Digital Wind Business Optimization is a cloud-based suite designed to help renewable energy generators to take full advantage of predictive analytics to make improved decisions around energy trading, fuel purchases and portfolio management. The solution is comprised of the following modules:

### Market Intelligence & Forecasting – Forecast farm/plant capability and market behavior to increase revenue

- **Power Forecasting:** Forecasting the expected MW generation of the Wind/Solar farm or Hydro plant based on operating conditions and weather.
- **Coming Soon! Power Price Forecasting:** Forecasting the power market prices for energy for each node in the ISO markets of operation.

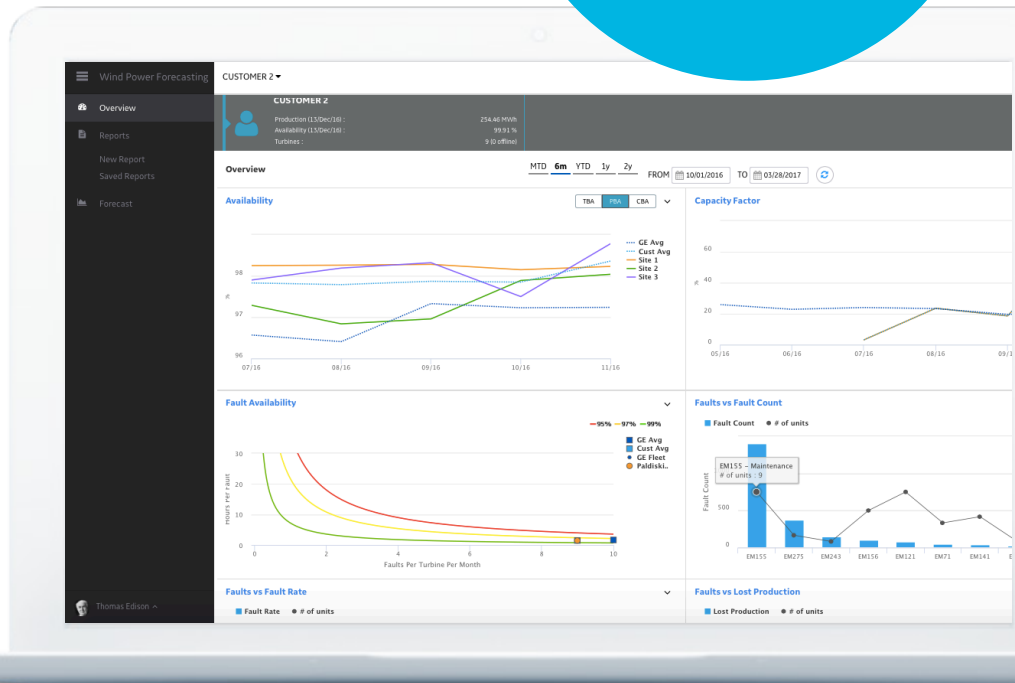
### Portfolio Optimization – Schedule the portfolio to increase profitability

- **Enhanced Bidding:** Recommendations on hourly optimal Day Ahead & Real Time bids/offers for energy based on strategies set by the customer's risk limits.
- **Coming Soon! Optimal Outage Planning:** Recommendations on optimal maintenance schedule and asset utilization based on market opportunities.

## CUSTOMER BENEFITS

- For merchant windfarms, BO power forecasting + optimized bidding enables customers to optimally schedule their expected generation in the day-ahead and real time markets to take advantage of the DA/RT spread and increase revenue for every MW-hour produced.
- Increasing production-based and revenue-based availability through better asset utilization driven by informing O&M decisions based on power forecasts and market commitments. Future roadmap: Market price forecast.
- Provide direct control by traders to dynamically adjust production and take advantage of market opportunities. During times of negative prices, empower customer to curtail production. Future roadmap: Dynamically boost output based on market conditions.
- Reduce curtailment payments or imbalance penalties by increasing accuracy of short-term forecasts given country- or market-specific

**Up to 6% better forecast = \$ 126K per farm/year lower imbalance penalties**





# Power Forecasting - Minimizing Imbalance Penalties

Business challenges are always complex, especially in the India renewable energy market. For Panama Group, it was 4-fold: meeting India RRF regulatory requirements, getting quality weather data for forecast accuracy, managing unreliable site connectivity, and capturing turbine data availability and closed-loop control.

In partnership with GE Renewable Energy, the co-innovating team designed a solution to develop new wind power forecast algorithm for 1-4 hours ahead. It addressed network connectivity challenges with on-prem + cloud hybrid architecture. The team took a test-and-learn approach by rolling out the solution first on 1 wind farm (44 WTG and 70 MW).

The results speak to the power of co-innovation and purpose-driven industrial digital applications. The forecasting had 94% accuracy - that's 6% better than the industry's best. The increased accuracy resulting in lower imbalance penalties by \$126,000 per farm per year.



This is a very relevant indication of what is possible with well calibrated forecasting algorithms even with only 8 revisions.

—Official from Central Electricity Regulatory Commission of India





## About GE

GE (NYSE: GE) is the world's Digital Industrial Company, transforming industry with software-defined machines and solutions that are connected, responsive, and predictive. GE is organized around a global exchange of knowledge, the "GE Store," through which each business shares and accesses the same technology, markets, structure, and intellect. Each invention further fuels innovation and application across our industrial sectors. With people, services, technology and scale, GE delivers better outcomes for customers by speaking the language of industry.

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