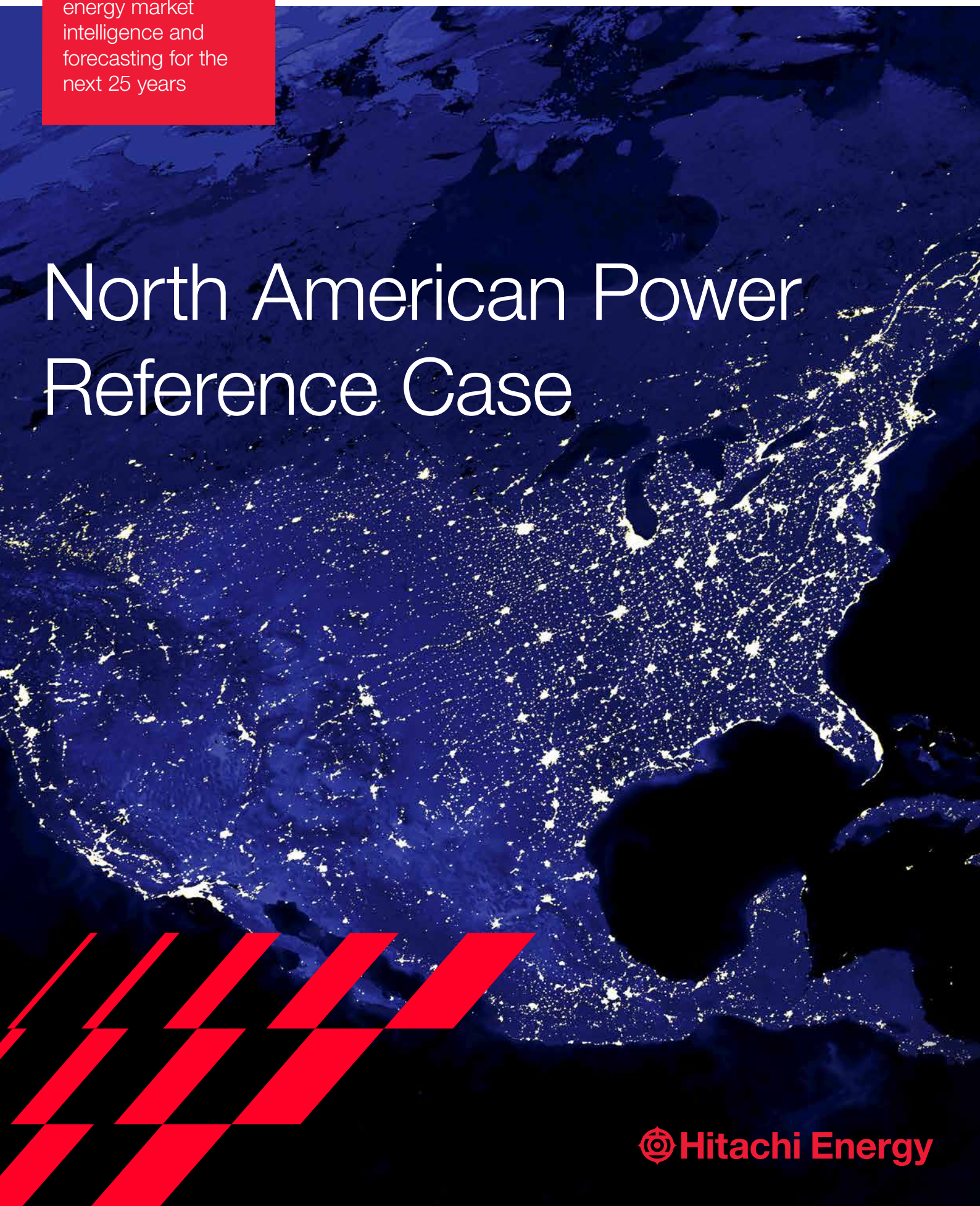
HITACHI
Inspire the Next

Comprehensive energy market intelligence and forecasting for the next 25 years

North American Power Reference Case



Hitachi Energy

Independent and unbiased analysis
for your strategic investment & operational decisions

Whether building a new generation asset, providing financing for new generation, considering entry into a new market or any other major capital decision, the need for comprehensive market intelligence and accurate forecasts is critical. But energy is a complex industry, with volatile fuel and energy prices, ever-changing regulations, environmental pressures and varying demand forecasts.

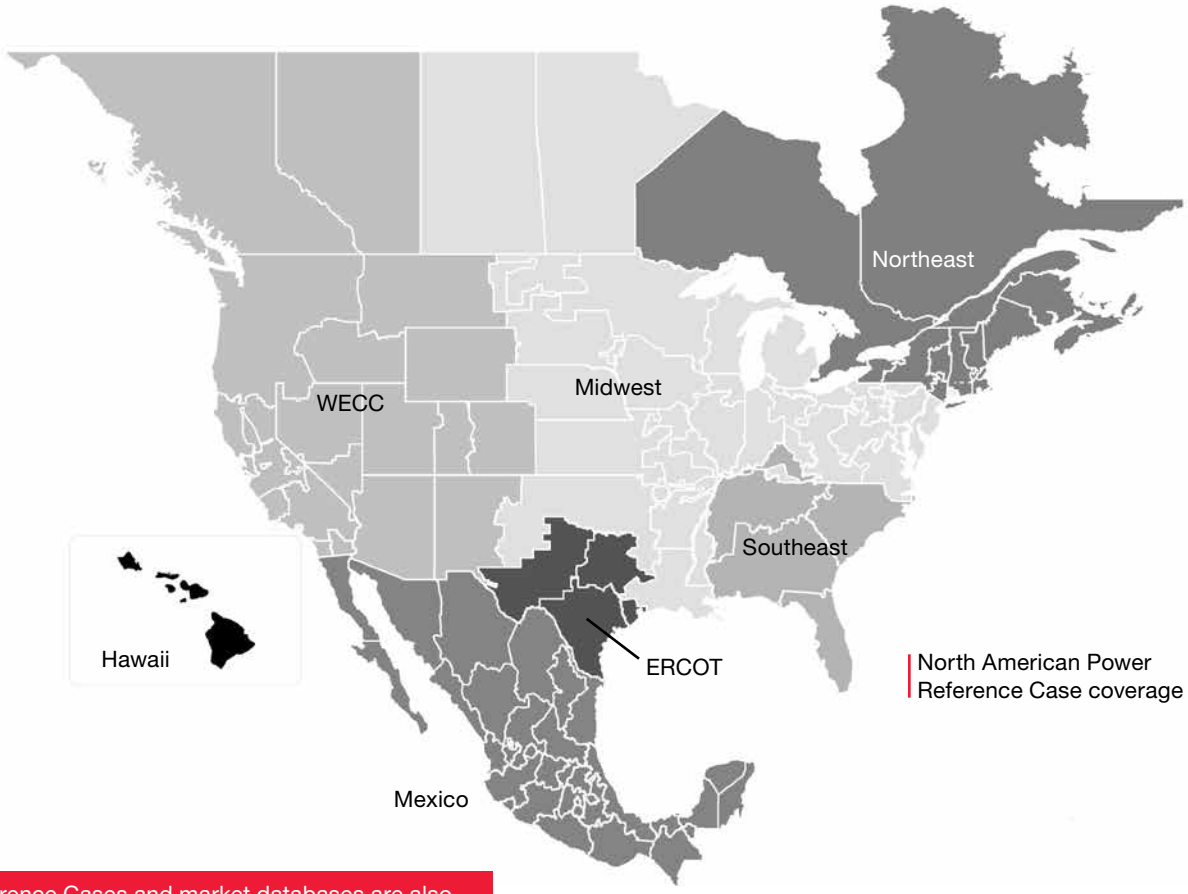
The data gathering, forecasting and analysis required to make strategic investment and operational decisions requires significant resources and expertise. Often, this analysis needs to be independent and unbiased. Market participants, financial institutions and regulators require an integrated forecast model to help them value assets, evaluate market opportunities and increase confidence in investments.

Hitachi Energy produces a fundamental analysis of the North American electric market twice a year using the PROMOD® electric market simulation tool, Velocity Suite data and our proprietary Integrated Model. This provides a market-based, fundamental view of North American power, renewables, gas, coal and environmental markets, which accounts for the interdependency of these markets and provides forecasts based on consistent economic assumptions.

This analysis, called the North American Power Reference Case, considers current and projected new resources; transmission limits and losses; operations and seam issues in neighboring markets; renewable portfolio standards; environmental constraints, and hourly loads. It includes a fundamental base forecast of market clearing prices, which are comprised of hourly, monthly and annual prices for the 25-year study period.

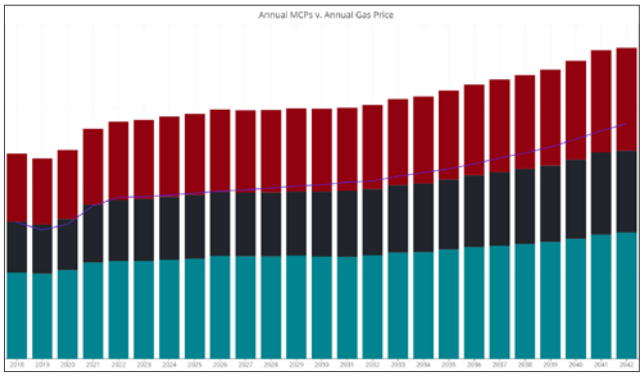
North American Power Reference Case includes:

- Fall and spring long-term forecast summary reports and detailed databases for the seven regions shown below, now including Mexico and Hawaii
- Monthly short-term power and gas price updates
- Fall and spring webcasts summarizing methodology, inputs and results
- Three sensitivities (US, Canada): CO_2 tax, high natural gas price and low natural gas price
- Two sensitivities (Mexico, Hawaii): low natural gas price (or low fuel price) and high natural gas price (or high fuel price)
- Capacity prices, capture prices, state REC prices and solar REC (or SREC) prices in US and Canada



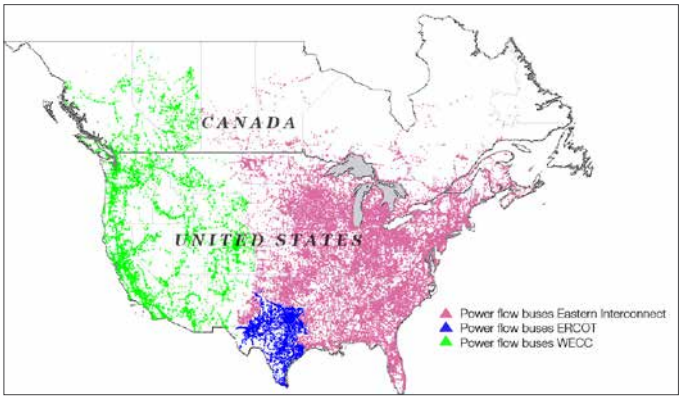
Reference Cases and market databases are also available for Europe, Chile and Japan. Power price projections for an additional 15 years are available for NAM, Europe and Japan.

Reference Case Visualization
Reference Case Visualization allows active subscribers to fully customize charts and data downloads from any Reference Case release that they have purchased. Users can quickly identify important business drivers like forecast changes from prior releases, forecast spreads between regions, and market fundamentals impacting the forecast prices. This allows you to understand the forecasts and how the market continues to evolve.



Power Reference Case Visualization: bar with line – annual MCPs vs gas price

Nodal Reference Case
Nodal Reference Case is an hourly, off-the-shelf, pre-simulated, fundamental locational marginal price or LMP forecast for 25 years and for all physical nodes across the three transmission interconnects in the United States and Canada (Eastern Interconnect, WECC and ERCOT). This offers the same fundamental assumptions of the North American Power Reference Case, but with specific geography to account for transmission impacts to asset valuation and basis-risk analysis in renewable project life cycles. You can access LMP projections under multiple scenarios, extend the forecast horizon (for an additional 15 years), and calculate generation-weighted prices to better understand curtailment risk, plan for different potential revenue impacts and negotiate PPAs with confidence. Click here for more information.



Transmission grid nodes (Source: Hitachi Energy Velocity Suite)

The North American Power Reference Case provides an in-depth, comprehensive, integrated fundamental analysis of:

Penetration of renewable energy and battery storage
Considers state level targets in NAM, existing renewable and battery storage generation, regional potentials, deployment history and characteristics of new renewable and battery storage capacity

Gas prices
Considers power and non-power sector demand, production cost by basins, transportation network to liquid market centers, and tariffs to the market areas.

Coal prices
Considers demand, production cost curves by mine, transportation network to the plants on heat input and SO_2 content

Emissions prices
Considers current regulations on CO_2, SO_2 and NO_x, existing unit emission rates and environmental controls, and options for retrofits or retirement

Capture prices
Considers renewable (i.e., solar, onshore wind, offshore wind) penetration to help estimate the price any given intermittent electric power source is likely to capture

Capacity prices
Considers cost curves for new generation, reserve margin requirements, technical-life / economic retirement options, and capacity market areas

Electric energy prices
Considers detailed unit characteristics incorporating all forecasts presented above, hourly dispatch of units versus demand, scarcity adders at tighter reserve margins, and electricity transmission network

REC prices
Considers renewable supply-demand fundamentals for 16 states in the Eastern Interconnect (EI) and seven states in the WECC interconnect to develop state REC prices. Solar REC prices are available for six states in the EI.

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