

Electricity Spot Market Price Forecast

OVERVIEW

This brief provides background information on the Long-Term Market Electricity Spot Market Price Forecast used in the 2011 Integrated Resource Plan (IRP).

What is the Forecast?

BC Hydro has produced 20-year forecasts of electricity spot market prices for each of the major trading hubs in the Western Interconnected System (WECC regional market), which include the Western U.S. states, B.C. and Alberta. Specifically, the prices modelled are for a day-ahead preschedule product. The forecast is intended to represent what a buyer of spot market electricity could be expected to pay for day-ahead power. Note that this electricity has the following attributes:

- Spot electricity prices do not necessarily include any capital cost recovery allocation for existing or new generation units. These prices are predominately set by the variable costs (fuel and variable O&M) of operating generation units. Hence, the prices presented are significantly lower than the cost of new generation, as for most generation technologies, capital cost recovery tends to be a major component of the cost of producing electricity.
- It should also be noted that spot market electricity prices have historically been highly volatile, as they are subject to fluctuations in electricity supply, demand, and fuel prices. The electricity price forecasts presented by BC Hydro for this IRP are averages, which must be considered to include a wide uncertainty band.
- Finally, the prices are applicable to short-term (day-ahead) transactions only. For longer-term deals, it must be assumed that for the buyer to obtain some element of price certainty, that the seller must commit an actual generator to servicing the transaction, and that this commitment would come with some compensation for reserved capacity.

BC Hydro has deliberately not produced a single outlook or forecast of electricity prices. BC Hydro has adopted a forecast-based approach, and has produced several internally-consistent price forecasts based on varying key assumptions; in particular, natural gas prices and greenhouse gas prices. The basis and development of the forecasts and associated market scenarios are covered in the *Market Scenarios for the IRP Risk Framework* summary brief.

How are the Forecasts used in the IRP?

The spot market electricity price forecasts are used in generation and transmission portfolio modelling to determine the value of surplus (to domestic needs) of electricity that is sold strictly into the spot electricity market. Due to the variability in both B.C. domestic load and generation, there are times in which BC Hydro will be surplus electricity, and will need to access the spot markets. The forecast of the value that BC Hydro can derive in selling this surplus energy is derived from the forecast prices. The prices are produced on an hourly-resolution basis, so that the average seasonal and intra-day value of electricity is available. Since the forecast results are averages of potential future market prices, any analysis of the total future value of generation will have to consider the significant additional economic and operational benefits of generation dispatchability and curtailability.

PURPOSE

This brief provides background information on the Electricity Spot Market Price Forecast used in the 2011 Integrated Resource Plan (IRP).

How is it developed?

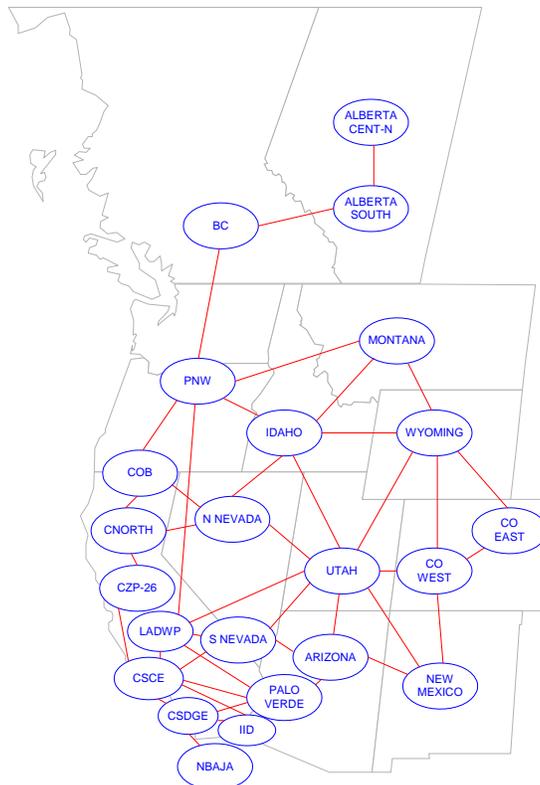
Spot market electricity prices are modelled for each of the subregions of the WECC using a computer simulation of the hourly supply-demand balance. The dispatch cost of the marginal resource at the point where supply and demand are in equilibrium determines the market price for that hour. Monthly and yearly average prices are obtained by aggregating the computed hourly prices. The electricity prices are modelled for the next 30 years for those forecasts using the Mid Gas inputs.

For those forecasts that use the High and Low Gas inputs, BC Hydro models these for 20 years out to the year 2031. The electricity price results are then extrapolated using the MS Excel 'GROWTH' function from the years 2032 to 3036 based on the 2027 to 2031 model results. For the last 5 years (2037 to 2042) BC Hydro uses a 1% real growth rate for the High Electricity Forecast and flat real growth for the Low Electricity Forecast.

Inputs and Assumptions

Key assumptions for the electricity price forecast include:

- The architecture of the WECC. This includes the characteristics of major generation units, and the major transmission interconnections between the modelled regions. When modelling the performance of individual generation units, key parameters as fuel efficiency, maximum and minimum capacity and minimum start-up and shutdown times are included. Transmission lines are modelled with maximum transfer capabilities. The modelling introduces periodic random but plausible generation and transmission outages to simulate realistic market prices.



- Regional electricity demands. Hourly-resolution demand forecasts are constructed for each region of the WECC for the entire forecast period.
- Natural gas prices. The WECC's electricity and natural gas markets have become closely inter-related since natural gas has become the predominant fuel for new electricity generation. The inter-related nature of the electricity and natural gas markets means that market prices for electricity are closely tied to the market prices for natural gas. This is due to natural gas-fired generation's operational flexibility and relatively high variable operating costs, which typically places it last in the order of generation resources to be dispatched. As such, natural gas-fired generation is the marginal market resource and gas prices are likely to drive high electricity market prices in the foreseeable future.
- Other fuel prices. Coal, uranium (for nuclear) and oil price forecasts are applied to generation units that use these fuels.
- Greenhouse gas (GHG) price forecasts. A key input into the electricity price forecasts is GHG prices for each of the modelled regions. BC Hydro has used a GHG price forecast, the costs of which apply to the fuel component for modelled thermal generation. BC Hydro has made the assumption that all of the fuel used by electricity generation in the WECC is subject to GHG prices, which is a more aggressive assumption than that used in the 2008 BC Hydro LTAP. In the 2008 LTAP, BC Hydro assumed that only the electricity generation that emitted more GHGs (per unit of output) than an efficient combined-cycle gas plant was subject to GHG offset costs.

Two of these key inputs, the GHG price forecasts and the natural gas price forecasts, are covered in the *Greenhouse Gas (GHG) Price Forecast* and *Natural Gas Price Forecast* summary briefs along with presentation materials. The key inputs into electricity price forecasts are summarized as follows:

Spot Market Electricity Price Forecast	Gas Prices	GHG Prices
A High	High	Mid
B Mid	Mid	Mid
C Low	Low	Low
D Mid	Mid	High
E Low	Low	None