Optimizing the Value of Self-Sufficiency Surplus

PURPOSE

To describe how BC Hydro optimizes the value of self-sufficiency surplus using export markets.

OVERVIEW

This summary brief explains the importance of securing additional transmission to link B.C. with the U.S. energy markets, as well as the potential benefits of incremental generation capacity or pumped storage capability in the BC Hydro system in optimizing the value of the domestic portfolio in export markets.

Self-Sufficiency Surplus

The self-sufficiency requirements of the Clean Energy Act (CEA) obligate BC Hydro to have rights to electricity from resources in B.C. sufficient to meet expected load requirements under critical water conditions by 2016 and to exceed that volume by 3,000 GWh/yr by 2020. As BC Hydro meets these requirements, there will be a surplus of energy in most years. Surplus energy and system capability is traditionally exported by Powerex, a subsidiary of BC Hydro that is responsible for trading power with Alberta and the U.S., and the revenue generated from the exports is used to reduce domestic customers' rates. As such, BC Hydro / Powerex strive to optimize the value of this surplus.

In meeting the self-sufficiency requirements, BC Hydro is expected to have an energy surplus of about 8,000 GWh/yr under average water conditions. The estimation is based upon 4000 GWh/yr of non firm energy from Heritage Hydro resources, 3,000 GWh/yr from the insurance requirement, 3,000 GWh/yr of non-firm from existing IPPs and future resources, and with generation from all dispatchable natural gas-fired generation being reduced to a minimum. Further, in considering the variability in water inflows to the Heritage Hydro system alone, the average 4,000 GWh/yr of Heritage Hydro non-firm energy can vary between 0 GWh/yr and 10,000 GWh/yr in any given year. Hence, the annual energy surplus can vary from as low as 4,000 GWh/yr to as high as 14,000 GWh/yr. Among other factors, additional variations in IPP generation and generation from future resources will also contribute to these extremities.

Market Value of Energy

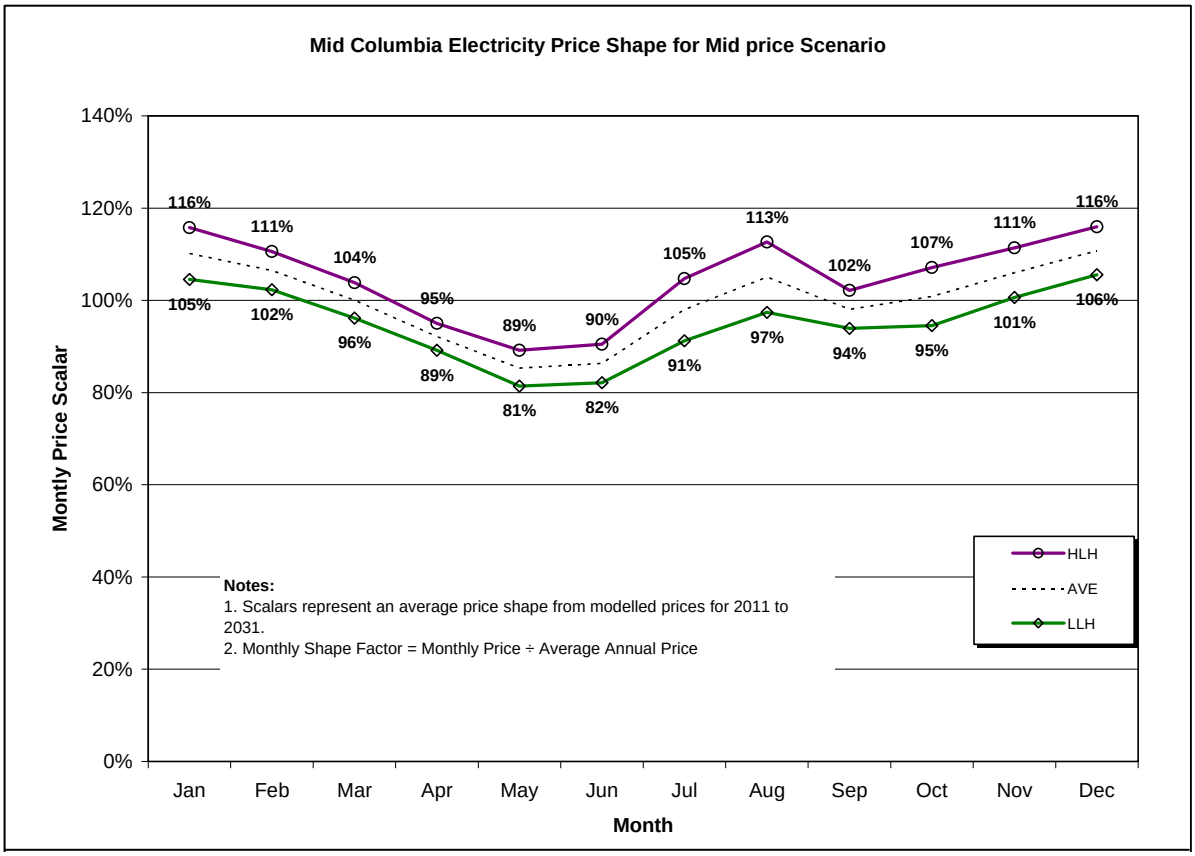
Optimizing the value of Self-sufficiency surplus involves targeting market sales during high value periods and maximizing imports (or keeping exports to a minimum) during times of depressed market prices. Sufficient transmission access to market and generation capacity and pumping capability to move energy from lower to higher value periods are required to transact energy in such a manner. These factors will be considered within the IRP portfolio analysis and are described further below.

Market prices differ over the year. The Pacific Northwest markets are typically depressed in April through June as a result of spring freshet conditions because the surplus energy volumes from spring runoff are sold in market at a time when loads are low. In more recent times, additions of significant volumes of non-dispatchable wind generation in the region have had a further impact of reducing freshet prices. Historically, BC Hydro has been one of the few purchasers in the April to June market. As BC Hydro's surplus of power continues to increase, its ability to import will be restricted and it is expected that April to June prices will approach $0/MWh and may go negative in some hours. The ability to absorb energy (i.e. import energy while saving water in reservoir by not having to generate energy from B.C. reservoir) in the freshet and sell more energy outside of the April to June period would yield the best value. Prices are

typically the highest during the winter heating months and during the summer when cooling loads in California are at their peak.

Market prices also differ within the day. The following figure shows the price factors in heavy load hours (HLH) and light load hours (LLH) of each month, demonstrating that targeting the HLH of the winter and summer months for sales yields the best value.

Figure 1: Monthly HLH and LLH Price Factors



Transmission Access to Market

If the average water year surplus of 8000 GWh was exported in every hour of the year, the transmission access to market required is about 900 average MW. At 14,000 GWh/yr of surplus this number would be about 1,600 average MW. However, to optimize value by selling to periods other than April to June and to target HLH, more transmission access capacity than the average MW quoted above is needed.

Sending surplus clean and renewable energy from B.C. to U.S. markets that offer the best value, such as California that can yield energy value as well as Renewable Energy Credits (RECs), requires transmitting electricity through Bonneville Power Administration's (BPA's) transmission network to the Pacific Northwest and on to California markets. The transmission path rating through BPA from north to south is nominally rated at 3,150 MW.

While in the past 5-10 years, as much as 2400 MW of the 3150 MW path rating was available on a relatively consistent basis, more recently the new norm of available transmission has reduced to often around or below 1500 MW (based on daily minimum during heavy load hours that dictates how much can be traded on next day market). This reduction is a result of a change in operating criteria and system constraints in BPA's system. For example, Powerex has often had its firm transmission rights curtailed as a result of outages in the Puget Sound Area.

Given that the current transmission path from B.C. to U.S. markets is often highly congested, transmitting the Self-sufficiency surplus to capture optimal value would require additional transmission capacity. The two basic options to acquire additional transmission are to either make a request from BPA or to work to have an additional transmission line built by 3rd parties on which BC Hydro could hold rights. Powerex has requested additional transmission capacity from BPA. However, whether, when and at what cost BPA is willing to make that capacity available will be the subject of further study by BPA.

Last but not least, sending surplus clean and renewable energy from B.C. to U.S. requires sufficient transmission capacity within B.C. to bring the energy to the B.C.-U.S. border. B.C.'s strategy for transmission procurement south of the border must be aligned with plans for transmission development within B.C.

Generation Capacity and Pumping Capability

The BC Hydro system is a winter peaking system with demand being highest during the winter. However, inflows into BC Hydro's reservoirs are at their highest during the spring freshet when customer demand is relatively light. Thus, the ability to store and shape energy is critical even from the perspective of meeting domestic load. Such capabilities become even more important if BC Hydro were to optimize the value of the Self-sufficiency surplus. Incremental generation capacity assists in this regard by allowing sales to be maximized during periods of high market prices such as in the summer or the winter. Pumping capability in the form of pump storage hydro units will allow the system to absorb and store energy during low value periods for use during high value periods. These assets can also assist in integrating intermittent renewable resources such as wind by firming their output.

In this IRP, BC Hydro will consider infrastructure needs to achieve the best value for Self-sufficiency surplus. The combination of transmission resources (to external markets as well as internal transmission), generation capacity and pumping capability will be considered.