MANITOBA HYDRO

2012/13 & 2013/14 ELECTRIC GENERAL RATE APPLICATION

UNDERTAKING PROVIDED BY: T. MILES

Manitoba Hydro Undertaking #62

Manitoba Hydro will provide a qualitative description of how generation marginal value is determined.

Response:

Manitoba Hydro interprets marginal value to mean the cost or value to the system of deferring an increment of load growth. Since the supply power to residential load requires generation supply, bulk transmission capability and distribution capability, a marginal value has been determined for each of these three components. The marginal cost for generation consists of an energy and a capacity component while the transmission and distribution marginal costs has only a capacity component. The methodology used for the determination of current estimates of transmission and distribution marginal costs is provided in the report "Marginal Transmission and Distribution Cost Estimates, SPD 04/05", which was provided in the response to GAC/MH II-23 a).

Generation marginal value for the Manitoba Hydro system is determined by assuming that the load can be reduced by a small increment over the period of the planning horizon. Since the preferred development plan consists of hydroelectric resources installed in conjunction with new export contracts, a reduced load has the impact of increasing the quantity of firm energy and capacity that can be marketed as an incremental long-term export sale. This incremental long-term export sale creates incremental revenue to Manitoba Hydro. However, this incremental sale has some associated costs since it utilizes interconnection capability and thus affects other potential opportunity sales. This sale also affects the operation of the system and the quantity of import and thermal resources that may be required over the range of possible water flow conditions. These system operating impacts are called production costs and are determined by undertaking a simulation of system operation for 35 years into the future using a computer model called SPLASH.

Manitoba Hydro's SPLASH model utilizes an optimization technique to minimize the net production cost to the system by simulating the operation of reservoirs and hydroelectric generation plants utilizing a monthly time step. The objective is to ensure meeting all firm load requirements while optimizing the use of thermal generation and import energy. The expected price signals from the export market are provided to the model for on-peak and off-peak time periods for each month of the year. The capability of the interconnections to each market region is provided in order to limit the rate at which export energy can be transmitted. The SPLASH model determines the net production cost on a monthly basis for a series of years into the future. The net production cost is derived from the variable cost characteristics of the various generation sources and revenue is derived from export sales. A simulation of system operation is undertaken for each of the 99 flow conditions between the years 1912 and 2010 which are assumed to be representative of the range of flow conditions that may occur in the future.

In order to determine the marginal value of an increment of power, the production costs of two simulation runs of the SPLASH model must be compared. The first simulation run is a base case that corresponds to a specific development plan with new resources added over time as energy and capacity requirements increase as determined in the load forecast. In this model run firm (dependable) export sales are treated the same as domestic requirements in that they are both firm obligations that must be met. The output of a simulation consists of energy volumes, revenues and costs that vary with flow conditions such as thermal fuel costs, water rental costs and import energy costs. In order to determine marginal value, a second simulation is undertaken in which the load is reduced from the base case by a constant increment in each month for a total of 500 GWh over the year as an example.

It is assumed that the energy and capacity savings from this load reduction can be sold as a long-term firm sale on the export market. The characteristics of this sale are input into the second simulation run and the in-service date of all resources remains identical that those of the base run. The output consists of production costs for each month over all the same flow conditions for the same components as the base run. The net difference in production costs between the two simulations for each year of the study period is divided by the energy associated with the incremental load change to derive the marginal generation value in dollars per megawatt hour. Transmission and distribution losses are also calculated and added to the generation component to account for the full quantity of generation that is required to serve the end use load.