

Appendix 8

AURORA[®] ELECTRIC MARKET MODEL

This section describes the AURORA[®] (AURORA[®]) software City Light used to analyze the candidate resource portfolios. AURORA[®] was developed in 1997 and is used by many utilities, resource planners, and regulatory agencies for long-term planning.

The AURORA[®] model contains a database that includes the characteristics of load centers and generating resources throughout the West. The model simulates the operation of the market for electric power on the western grid. It provides aggregated data for the zones and hubs shown in Figure 1.

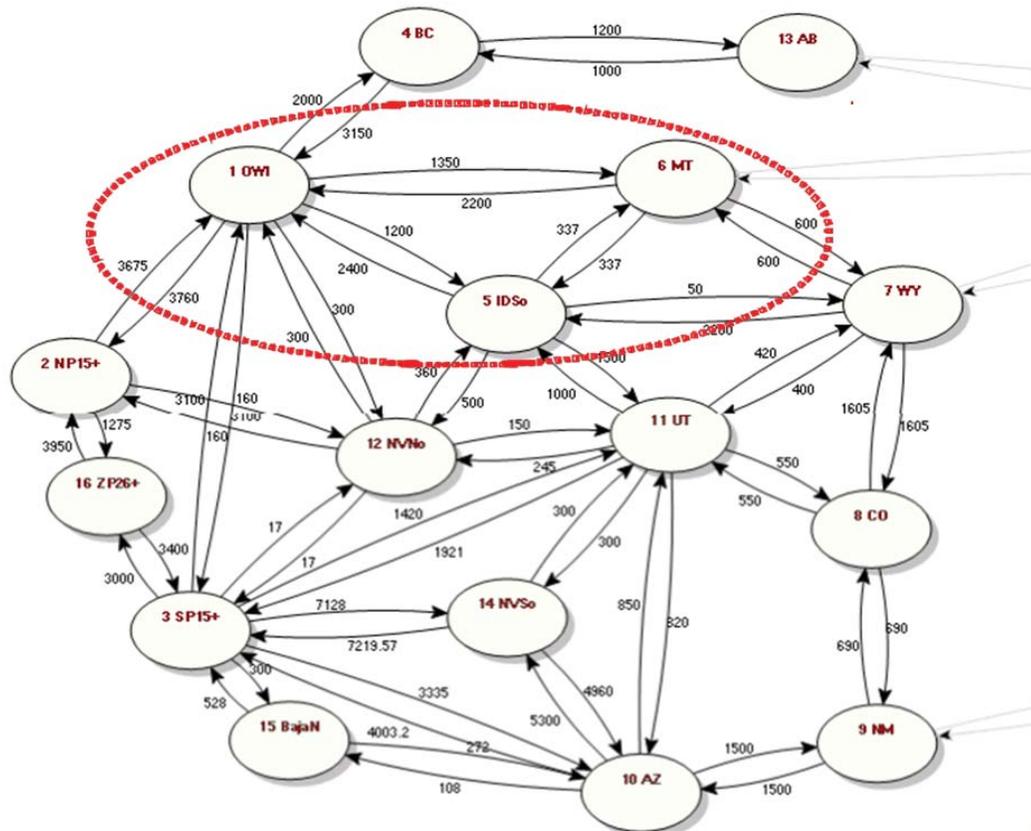
For its analysis, City Light disaggregated the data for the hubs circled in red into nine areas in order to more accurately depict transmission. The model forecasts electricity prices for each zone within the Western Electricity Coordinating Council (WECC) region, taking into account transmission costs and constraints that are a source of difference in wholesale electricity prices.

AURORA[®]'s extensive database of the North American power market is updated regularly. The type of information in the database includes generating resources with their retirement dates and constraints on generation capability; transmission capacities; pollutant emission rates; and reserve requirements.

The database also contains forecasts of certain parameters, such as natural gas prices and other fuel types, but the user can also supply alternative data. AURORA[®] forecasts new generating capacity additions using a specific optimization algorithm that identifies when and where capacity is needed; it then selects new resources having the lowest costs, including environmental costs.

The model draws on its database to simulate the electric power market using economic dispatch logic that stipulates that the resources with the lowest marginal cost will be dispatched first. Using its database, AURORA[®] forecasts future hourly demand at each load center. Then AURORA[®] applies its algorithms in order to economically dispatch resources to meet demand in every hour at every load center, subject to transmission availability. The result is an hourly local market clearing price equal to the marginal cost of the last resource dispatched.

Figure 1: AURORA[®] Model



City Light aggregates its existing resource portfolio within the model and inputs prospective new resources and load forecast information into AURORA[®], as well as selected cost and operational characteristics of selected potential new resources. Different combinations of resources (portfolios) are tested to see how they perform financially and operationally, given the simulated electric power market.

One of the key features of AURORA[®] is its ability to model uncertainty in loads, generation, and other variables for both the individual WECC zones and for City Light. Thus, the performance of potential resource portfolios can be tested over a large range of uncertainty. This capability allows City Light to test how a potential portfolio would perform given the volatility in its own hydro generation. The model has the ability to test portfolio performance by changing one parameter at a time, or it can be used to conduct a comprehensive risk analysis and test a portfolio's performance given multiple modeled uncertainties in the WECC electric power market.