

## PRiSM Model Guide

PRiSM is an Excel based model used to select new resources to meet customer demands for capacity, energy and clean energy. The model uses mixed integer programming to determine the least cost resources to meet load obligations considering the constraints of resource options and load requirements. More information regarding PRiSM is available in Chapter 11 of the 2021 IRP document. The purpose of this document is to provide an overview and guide of the Excel spreadsheets and worksheets within the PRiSM folder included in the appendix of the IRP document and on Avista's IRP website.

In order to re-solve this PRiSM model, the user will need the industrial version of *What's Best* software by Lindo Systems. Avista also uses *Gurobi* software to promote faster solving of the model - this software is optional to run the model but will require changes to the setup for the model to solve<sup>1</sup>.

*What's Best* uses specific formatting to cells and special characters to identify cells that effect the operation of the mixed integer program. Specifically, any cell with a blue font is considered an adjustable cell which means the solver selects the value of the cell using the optimization engine. Cells with constraints are identified by “=>”, “=<”, or “=” symbols. These constraints enforce user-determined requirements of formulas effected by adjustable cells.

**WB! Status:** This worksheet is generated by the *What's Best* software and provides information related to the optimization solution. This information is useful to determine whether the model optimally solved or stopped with the best solution over period of time unless an error is detected. This worksheet is also useful in debugging the model if it does not solve due to error.

**README:** This worksheet shows a description of the study being performed and provides context of the study.

**Selection Summary:** This worksheet includes a summary by year of the resources retired or selected by jurisdiction, and summarizes the cost, risk values, and other key summary information from the study.

**Financial Summary:** This worksheet provides detailed line item accounting of each financial item by jurisdiction in millions of dollars. This sheet includes both the financial values used for solving the model plus the revenue requirements of the solution. The objective cell is included in cell reference C126. This is the value the *What's Best* model minimizes (optimizes) by changing resources. Included in this sheet are the costs<sup>2</sup> and revenues of each plant as well as the load and summary greenhouse gas emissions.

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<sup>1</sup> Contact Avista for assistance if you plan on running the model.

<sup>2</sup> Ongoing O&M and capital costs are included; operating costs from model results is also linked into this sheet.

Rows 110 through 150 include the summary financial information for each jurisdiction for all costs included in the model.

**Clean Goals:** This worksheet is used to account for the amount of clean energy resources selected in average megawatts each year by jurisdiction. Data is also included for existing resources, new resources selected by the model, and is the worksheet where transfers of REC/clean energy between jurisdictions occur. Lastly, this worksheet includes the constraints for the minimum amount of clean energy the optimization must add.

**LR:** This worksheet includes the load and resource balance for the system for each jurisdiction. It includes the balance for summer and winter peaks, plus annual average energy. This worksheet includes line items for each existing resource, load, purchases/sales. This sheet also includes the constraints for the minimum amount of resource peak capacity/energy to be acquired.

**Selection:** This worksheet is designed to include each of the supply and demand response resource options as an adjustable cell by jurisdiction. Each resource can be chosen in any given year. Further, this worksheet includes adjustments if the resource is selected for nameplate capacity, winter capacity contribution, summer capacity contribution or annual energy delivery that link to the “LR” worksheet. This sheet also includes construction and operations<sup>3</sup> related greenhouse gas information.

**DR:** This is the demand response (DR) information worksheet. This includes the maximum capability of each of the DR programs, its peak credits (by season), annual events and duration. This worksheet creates the ramp in of DR programs if selected in the “Selection” worksheet. Also included in this sheet is the estimated energy cost savings values for operating the selected programs.

**Resource Data:** This worksheet includes information related to each supply resource option. Including capability, peak credits, availability, reserves, capacity factors, wheeling costs, ancillary services, services cost/benefits, integration costs and cost per unit of energy/capacity. Lastly, this worksheet includes the limits (constraints) of the availability of the resource option.

**EE Selection:** This worksheet includes ~7300 energy efficiency measures available to reduce demand, sorted by jurisdiction. Each measure can be selected using the value in column “M”. Included in the worksheet is a summary of the amount of GWh each program can save, the winter/summer peak savings and the Total Resource Cost (WA)/Utility Cost (ID) estimates for each program option.

**Aurora Res Results:** This worksheet includes resource output data from the Aurora model. Specifically, the Aurora model results of the costs/revenues for each existing thermal and new resource options; including greenhouse gas emissions. Information included is the average annual values of the 500 simulations.

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<sup>3</sup> Life-cycle emissions not related to burning of fuel.

**Tran-Cap Rec:** This worksheet accounts for each supply side resource's capital cost to interconnect the resource to the system. If a particular resource is selected, the annual revenue requirement table will be populated with annual cost to be collected each year due to the transmission investment cost. This worksheet also includes constraints to limit the amount of transmission used in a location prior to adding incremental costs.

**New Resource Annual Cost:** This worksheet summarizes the annual cost of each of the new supply side resource options. This includes energy payments (i.e. PPA costs), capacity payments (i.e. PPA or ownership), wheeling costs, and intra-hour benefits/costs (i.e. reserves/integration).

**Res MWh:** This data is the supply resource output data from the Aurora model. It includes the megawatt-hour dispatch for each supply side resource option for each iteration of the Aurora study. Existing resources are in megawatt-hours and new resources are in megawatt-hours based on a capacity of one megawatt. Resources are also allocated by jurisdiction.

**Portfolio:** This worksheet includes summary level information regarding the market value or costs of Avista hydro system, purchase power contracts (including PURPA), and the market cost for the customer load. All data results from the Aurora model by year and iteration.

**Risk:** With 500 iterations/simulations of Aurora's market price and dispatch forecast, this worksheet summarizes all costs and revenues of the selected portfolio by iteration to estimate the standard deviation and tail value at risk cost estimates. Costs are divided by jurisdiction, year, and iteration.

**G A:** This worksheet of general assumptions includes inflation hours per year, jurisdiction PT ratio, REC prices, social cost of carbon, planning margins and many other values that are linked to other worksheets in the model.

**T&D:** This worksheet is not used in this version of the model; it is designed in the event there are distribution or transmission wire options that could be replaced with resources such as a DER. At this time, no options were considered for the 2021 IRP. Two options were evaluated in the 2020 IRP.

**Mrkt GHG:** This worksheet includes the greenhouse gas emissions from the regional market generated from the Aurora model. The data is in metric tons of CO2 by year and iteration. This data is used for emissions accounting related to wholesale market purchases or sales. Also included is the calculation for the amount of emissions based on the net purchases/sales of each year and iteration by jurisdiction.

**Other GHG:** This worksheet includes additional assumptions related to greenhouse gas accounting.

**EE Mrkt Value:** This worksheet includes calculations related to the effects of energy efficiency. The market values from the Aurora model for efficiency loads shapes are

include. These tables estimate the energy value of energy efficiency programs for the financial evaluation.

**NewCapex**: This worksheet is used to account for future capital investment requirements of existing thermal resources split by jurisdiction. Specifically, the table is used to evaluate the option to retire plants and the avoidance of future capital costs.