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## FirstRate Generator Cost Model: User Guide

Thank you for your purchase of the FirstRate Generator Cost Model, a collaborative project of Energy Visuals and PowerWorld Corporation. This guide shows how to use the model with PowerWorld Simulator.

### Data Format

The FirstRate cost model is provided as a Microsoft Excel spreadsheet that can be copied and pasted directly into generator case information displays in PowerWorld Simulator, and as a PowerWorld Simulator Auxiliary file.

### Data Included

FirstRate provides the fuel type, prime mover type, and estimates of the heat rate, fuel cost, and variable operations and maintenance cost for each plant in the database. The field headings use PowerWorld Simulator's internal variable names as follows:

**BUSNUM (Number):** Bus Number in the power flow case; used in the primary key

**GENID (ID):** Generator ID in the power flow case; used in the primary and secondary keys

**BUSNAME\_NOMVOLT (Name\_Nominal kV):** Bus Number and Nominal kV in the power flow case; used in the secondary key

**CUSTOMSTRING:1 (Cust String 2):** Plant Name

**CUSTOMSTRING:2 (Cust String 3):** Operator Name

**GENCOSTMODEL (Cost Model):** PowerWorld Simulator supports both piecewise linear and cubic cost models. The FirstRate models are delivered in the cubic format. The cost model is set to "None" for units with fuel type of Hydro, Solar, Wind, Waste Heat, or Unknown.

**GENFIXEDCOST (Fixed Cost (\$/hr)):** Fuel independent constant coefficient in cubic input/output model, set to zero

**GENIOA (Fixed Cost (Mbtu/hr)):** Fuel dependent constant coefficient in cubic input/output model, set to zero

**GENIOB (IOB):** Linear coefficient in cubic input/output model, set to unit's average heat rate (Mbtu/MWh)

**GENIOC (IOC):** Quadratic coefficient in cubic input/output model, set to zero

**GENIOD (IOC):** Cubic coefficient in cubic input/output model, set to zero

**GENFUELCOST (Fuel Cost):** Average fuel cost (\$/Mbtu)

**GENVARIABLEOM (Variable O&M):** Average variable operations and maintenance cost (\$/MWh)

GENFUELTYPE (Fuel Type): Primary fuel type

GENUNITTYPE (Unit Type): Prime mover type

## File Name Format

The FirstRate file names adhere to the following convention (with no spaces in actual file names):

**FirstRate** *Region FilingYear Fuel xx m* *yyyymm . ext*

where:

*Region* corresponds to the NERC region (either ERCOT, MMWG, or WECC);

*FilingYear*<sup>1</sup> corresponds to the year of the corresponding FERC Form 715 filing;

*xx* is the total number of months incorporated in the rolling average fuel price;

*yyyymm* is the year and month of the last month of the rolling average fuel price (month ending).

## Basic Use

The FirstRate cost model is available in both Microsoft Excel and PowerWorld Simulator Auxiliary file formats. The Microsoft Excel format offers flexibility in selecting fields to import into the power flow case, while the auxiliary format does not require any software other than PowerWorld Simulator.

### Microsoft Excel Format

1. Select the entire spreadsheet, making sure to include cell A1 in the upper left corner of the selection. Select *Copy* from the *Edit* Menu in Excel.
2. In the PowerWorld Simulator case, open a generator case information display. (Select *Generators...* from the *Case Information* Menu.) Right-click in the Case Info Display and select *Paste*.

### Auxiliary File Format

1. In the PowerWorld Simulator case, open a generator case information display. (Select *Generators...* from the *Case Information* Menu.)
2. Right-click in the Case Info Display and select *Load*, then *Auxiliary File (any data)*...
3. Locate the Auxiliary File and click *Open*.

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<sup>1</sup> Prior to September 2008, the “Series Year” was used in the FirstRate file names. The Series Year corresponded to the year of case development, which was generally the year prior to the FERC Form 715 filing for the same set of cases. For example, the “MMWG 2006 Series Base Case Library” corresponds to the April 1, 2007 FERC Form 715 filing.

To set the generator Case Info Display to show fields related to FirstRate, load the auxiliary file entitled *FirstRateDisplaySettings.aux*, using the same procedure described above in Auxiliary File Format. This may be used regardless of whether the FirstRate data were loaded via Microsoft Excel or auxiliary file.

## Secondary Key Mapping

FirstRate models are designed for use with NERC MMWG, WECC, and ERCOT FERC 715 Filing Cases. The bus numbering was mapped to correspond to a specific case. Some bus numbers and generator IDs may not match power flow cases from a different year's filing, operations cases, or cases managed and maintained by different entities, such as ISOs.

To use the secondary key, follow the procedure in "Basic Use" for the Microsoft Excel format, except place cell B1 in the upper left corner of the selection. (Omit column A from the selection.)

The secondary key mapping depends on Bus Name and Nominal kV remaining consistent between cases, though in some instances this may not hold. To get the best matches possible without having to manually edit the bus numbers, first paste using the primary key mapping, then repeat with the secondary key mapping.

## Tips and Recommendations

You may wish to turn off the automatic generation control (AGC) for non-thermal units or units for which no cost information is available, if you do not want the optimal power flow to alter the dispatch of these units. Fuel cost and heat rate are not provided in FirstRate for Hydro and Wind units. The default values for new units in Simulator are applied. Use Simulator's Advanced Filters in the Generator Case Information Display to select Fuel Types of interest, such as Hydro and Wind. Refer to Simulator's on-line help for details.

If you are already using any of the custom generator fields used by FirstRate, you might not want to copy those fields from the FirstRate database into your case. If so, then you might perform one of the following prior to copying the data:

1. Delete the entire column from the FirstRate Excel spreadsheet; OR
2. Move the entire column in the FirstRate Excel spreadsheet outside of the range that you will copy; OR
3. Rename the column heading to correspond to a generator field that you are not using for another purpose.