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| **To:** | Files |
| **From:** | Analysis Group |
| **Date:** | September 28, 2020 |
| **Re:** | Net EAS Model Read Me |

This memo outlines the folder structure and model setup of the Net EAS Model provided to the New York ISO by Analysis Group, Inc. (AGI). Additional information and screen shots can be found in the PowerPoint file posted with the Net EAS Model. This copy of the model reflects updated gas price timing.

**Folder Structure**

The Net EAS Model is stored in five folders to cleanly separate model elements.

* **Program**: Contains the Net EAS Model code:
  + 1.0 Net EAS CT Revenues Model (2020.09.28) - Updated.sas contains the primary CT model.
  + 1.1 Net EAS CT Revenues Model No SCR (2020.09.28) - Updated.sas contains a modified version of the CT model that runs for a Frame unit without SCR.
  + 2.0 Net EAS CC Revenues Model (2020.09.28) - Updated.sas contains primary CC model, created for informational purposes only.
* **Input**: Contains four input files:
  + “Net EAS Model Inputs.xlsx” contains Net EAS Model inputs that will be updated on a yearly basis as part of annual updating.
  + “Lummus Performance and OM Data.xlsx” contains technology-specific parameters that can be updated by NYISO’s consultant during each ICAP Demand Curve reset (DCR) process.
  + “Lummus Performance and OM Data – No SCR.xlsx” contains technology-specific parameters specifically for the No SCR Frame run.
  + “Level of Excess Adjustment Factors.xlsx” contains level of excess (LOE) adjustment factor values. These adjustment factors are utilized to account for the tariff-prescribed LOE conditions for establishing ICAP Demand Curves in the projection of net Energy and Ancillary Services (EAS) revenues. LOE adjustment factor values are calculated based on GE MAPS runs.
* **Output**: Raw output from the Net EAS Model will be saved by the SAS model into this folder. One file is outputted from the model. This file can be flexibly named based on an input to the SAS model so that multiple runs do not override each other (see “Running or Updating the Net EAS Model”):
  + Output files can be linked to the “EAS Model Results - Linked Copy.xlsx” file in the Results Tables folder to view a formatted version of net EAS results.
* **Datasets**: While running, the Net EAS Model saves several intermediate datasets to prevent a need to re-run the entire model in order to inspect hourly results with all model variables. These datasets are:
  + Full\_input\_data.sas7bdat contains the final input data to the model, merged together into one dataset at the hourly level.
  + Modelout\_lms.sas7bdat contains the LMS hourly output.
  + Modelout\_f.sas7bdat contains the Frame hourly output.
  + Modelout\_w.sas7bdat contains the Wartsila hourly output.
  + Modelout\_h.sas7bdat contains the H Machine hourly output.

These datasets have two suffixes that can be either, “no” and “yes.” The first indicates if the model is being run in “gas only” mode. The second indicates if the LOE Adjustment factor code is activated. For example, “modelout\_lms\_no\_yes.sas7bdat” indicates that this save file is for a dual fuel, LOE adjusted run.

Model output for the CC or No SCR runs contain additional suffixes.

* **Results Tables**: This folder contains four Excel files with hardcoded results tables for the reference unit in each capability year (“EAS Model Results (20XX-20XX).xlsx”). It also contains an Excel file, “EAS Model Results - Linked Copy.xlsx,” that can be linked to the Net EAS Model output in order to present final results. The default links in this workbook can be changed to link to outputs produced by new user runs, as described below in “Running or Updating the Net EAS Model.”   
  **Note:** The “EAS Model Output […].xlsx” files that users link to the “EAS Model Results - Linked Copy.xlsx” file must be open while viewing the results tables to avoid error messages.

**Net EAS Model Structure**

The Net EAS Model is a SAS model that can be run with SAS 9.4. AGI notes that Excel data input statements function differently in SAS 9.3 and versions prior to 9.4. The model will not properly input files from Excel with versions of SAS older than 9.4.

The Net EAS CT Revenues Model is split into 11 segments of code.

1. Load Annually Updated Parameters
2. Load DCR Set Parameters
3. Merge Together Data for Each Hour
4. Calculate Base DAM and RTD Energy Profits in Each Hour
5. DAM Energy Blocks – Set Day-Ahead Behavior and Determine if Real-Time Buyout Profitable
6. DAM Non-Energy Hours – Determine if Units Commit Non-Spin Reserves or No Commitment
7. RTD Energy Blocks – Determine if Profitable to Change Day-Ahead Non-Energy to Real-Time Energy Dispatch
8. RTD Non-Energy Hours – Determine if Units Buyout or Dispatch Real-Time Reserves
9. EFORd Adjustment
10. Run-Time Limit for New Source Performance Standards
11. Summarize and Output Model Results

**Running or Updating the Net EAS Model**

The Net EAS Model can be updated in 4 steps.

1. Update the data in “Net EAS Model Inputs.xlsx” to reflect a range of days including the three years under study for the update.
   1. This file includes an “Instructions” tab, a “Data Sources” tab and a “Dates tab” that automatically updates based on an input on the “Instructions” sheet.
   2. The remaining tabs include model inputs.
   3. The set of the tabs labeled “DA LBMP – All Zones”, “RT LBMP – All Zones”, “DA Ancillary – All Zones”, and “RT Ancillary – DCR Zones” include LBMP and ancillary price data available on the NYISO website.   
      Note: RT ancillary prices on the NYISO website are five minute prices and must be converted to hourly integrated prices prior to modeling.
   4. The remaining tabs are named with their data type and data source. For example, “SNL Gas” indicates that the Gas data comes from SNL.
   5. Updated data should be put into each sheet using the same column headers and unit of observation (e.g., hourly, monthly, and quarterly) as in the current “Inputs” file.
   6. The Net EAS Model will ‘fill forwards’ emission allowance prices on days where they are missing. To ensure that all days are covered with data, we suggest starting the input data for allowance prices at least one reading prior to the start of the modeling period.
      1. For example, RGGI auctions are conducted quarterly. If the modeling period starts between RGGI auctions, the RGGI auction price before the first day of the modeling period should also be provided on the input sheet.
   7. The Net EAS Model will ‘fill backwards fuel prices on days where they are missing. To ensure that all days are covered with data, we suggest providing the input data for fuel prices through at least one reading after the end of the modeling period.
2. Update cell F10 in sheet “Instructions” of the “Net EAS Model Inputs.xlsx” file to be the first date of the Net EAS Modeling period. Doing so automatically updates sheet “Dates” which determines what days are modeled by the Net EAS Model.
3. Run the SAS Code, “1.0 Net EAS Revenues Model (2020.09.28).sas”
   1. To run, update “filepath” on line 10 of the code to reflect the location where the model directories have been saved on your system, and the “output\_name” on line 11 to specify what you would like to name your output file. Push F3 to run the code in full.
4. To view output diagnostics, update the Linking in “EAS Model Results - Linked Copy.xlsx” to point to the new output data.
   1. In Excel, click on Data -> Edit Links -> Change Source