

# 2023 ESOO Input Data Package and Model Instructions

August 2023

A Guide to the Input Data and  
Published Model of the 2023  
*Electricity Statement of Opportunities*





# Important notice

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# 1 Configuring the 2023 NEM ESOO Model

This chapter contains the steps needed to set up the 2023 ESOO PLEXOS market model, including configuration of the input data package used in the simulation model. The step by step guide is documented below.



1. Download the zip files (summarised in Table 1) from AEMO's 2023 ESOO web page.

**Table 1 Zip files from AEMO's 2023 ESOO webpage**

No	File	Description	Where to save the files
1	2023 ESOO Model.zip	Contains model files, folder structure, and associated parameter files.	Place the extracted files in the root folder
2	2023 Solar A-L.zip 2023 Solar M-Z.zip	Contains half-hourly generation traces for solar.	Place the extracted files in the '\Traces\Solar Traces' folder
3	2023 Wind A-L.zip 2023 Wind M-Z.zip	Contains half-hourly generation traces for wind.	Place the extracted files in the '\Traces\Wind Traces' folder
4	2023 Rating POE10.zip 2023 Rating POE50.zip	Contains half-hourly line ratings for transmission lines.	Place the extracted files in the '\Traces\Rating Traces' folder
5	2023 PV_TOT.zip	Contains half-hourly regional generation traces for embedded PV, including rooftop PV and PVNSG.	Place the extracted files in the '\Traces\Demand Traces' folder
6	2023 OPSO_PVLITE.zip	Contains half-hourly regional demand traces for operational demand (demand before the impact of rooftop PV and PVNSG).	Place in the extracted files the '\Traces\Demand Traces' folder
7	2023 OPSO_MODELLING.zip	Contains half-hourly regional demand traces for operational demand without inter-regional transmission losses (demand after the impact of rooftop PV and PVNSG).	Place in the extracted files the '\Traces\Demand Traces' folder
8	2023 OPGEN_MODELLING.zip	Contains half-hourly regional operational demand traces delayed by 1-hour, for use by the Network Constraints.	Place the extracted files in the '\Traces\Demand Rating Traces' folder
9	2023 Timeslices.zip	Contains the traces that determine the Generators Ratings' seasons and each region's seasonal hot days.	Place the extracted files in the '\Traces\Timeslices' folder

2. Unzip the file *2023 ESOO Model.zip*. This will generate the 2023 ESOO Model folder structure. The contents of the 2023 ESOO Model folders are illustrated in Figure 1. The 2023 ESOO Model NEM Constraints are already incorporated into the PLEXOS XML Document. No folders or files regarding the NEM constraints are required besides the Rating traces. This feature requires the ESOO model to be run in PLEXOS version 8.3 R06 or higher.

**Figure 1** Contents of the 2023 ESOO Model file

Name	Date modified	Type	Size
 Traces	28/08/2023 5:22 PM	File folder	
 SimulationShell	28/08/2023 5:17 PM	XML Document	360,247 KB

3. Open the *Traces* folder.
4. Extract the other 11 zip files into their respective sub-folders as outlined in Table 1.
5. Use Plexos 8.300 R06 x64 (or higher) to open and run the model file '*SimulationShell.xml*' in the root folder.

The 2023 ESOO discusses multiple scenarios and sensitivities. Only the Central ESOO scenario is available in the *2023 ESOO Model.xml*. More information about the ESOO scenarios is available in the 2023 ESOO and 2023 Inputs, Assumptions and Scenarios Report (IASR)<sup>1</sup>.

The 2023 ESOO includes four different forced outage rates applied at the station level. To protect confidentiality, the published model includes only averaged technology aggregate rates. A detailed explanation of how these rates are calculated can be found in the *ESOO and Reliability Forecast Methodology Document*<sup>1</sup>. The rates are applied for the following technology aggregates:

- Black coal New South Wales (until 30 June 2028).
- Black Coal Queensland (until 30 June 2028).
- Brown coal Victoria (until 30 June 2028).
- All coal (from 01 July 2028).
- Closed-cycle gas turbines (CCGTs) and gas-fired steam turbines.
- Open-cycle gas turbines (OCGTs).
- All hydros.
- Small peaking plants.

Figure 2 shows that in PLEXOS there are 26 different models, each with a different reference year and maximum demand probability of exceedance (POE). Every model is configured with one stochastic iteration, resulting in the potential for 26 iterations per forecast year. In the published 2023 ESOO 2,600 iterations were run (for example, 100 iterations per model, which can be selected).

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<sup>1</sup> At <https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-reliability/nem-electricity-statement-of-opportunities-esoo>.

**Figure 2 Full model list with respective scenarios and settings in PLEXOS**

The screenshot displays the PLEXOS software interface, divided into two main panes. The left pane, titled 'Execute', shows a hierarchical tree of models under the 'Models' folder. The right pane, titled 'Simulation', shows the configuration for the selected model, including various scenarios and settings.

**Left Pane (Models):**

- \_tESOO\_sSC\_y2333\_p10\_r2011\_dBase
- \_tESOO\_sSC\_y2333\_p10\_r2012\_dBase
- \_tESOO\_sSC\_y2333\_p10\_r2013\_dBase
- \_tESOO\_sSC\_y2333\_p10\_r2014\_dBase
- \_tESOO\_sSC\_y2333\_p10\_r2015\_dBase
- \_tESOO\_sSC\_y2333\_p10\_r2016\_dBase** (highlighted)
- \_tESOO\_sSC\_y2333\_p10\_r2017\_dBase
- \_tESOO\_sSC\_y2333\_p10\_r2018\_dBase
- \_tESOO\_sSC\_y2333\_p10\_r2019\_dBase
- \_tESOO\_sSC\_y2333\_p10\_r2020\_dBase
- \_tESOO\_sSC\_y2333\_p10\_r2021\_dBase
- \_tESOO\_sSC\_y2333\_p10\_r2022\_dBase
- \_tESOO\_sSC\_y2333\_p10\_r2023\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2011\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2012\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2013\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2014\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2015\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2016\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2017\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2018\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2019\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2020\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2021\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2022\_dBase
- \_tESOO\_sSC\_y2333\_p50\_r2023\_dBase

**Right Pane (Simulation):**

- \_tESOO\_sSC\_y2333\_p10\_r2016\_dBase
  - Scenarios
    - Demand Traces
      - Demand STEP\_CHANGE 2016 POE10
    - Solar Traces
      - Solar 2016
    - Timeslice Traces
      - Timeslice 2016
    - Wind Traces
      - Wind 2016
  - Horizon
    - 2023-2033
  - Report
    - ESOO (no constraints)
    - LT Plan
  - PASA
    - Base
  - MT Schedule
    - 2023 ESOO MT Day 3bl
  - ST Schedule
    - 2023 ESOO ST
  - Stochastic
    - 1 samples (no maintenance) - normal
  - Transmission
    - Losses ST
  - Production
    - Linear
  - Competition
    - SRMC

## 2 2023 NEM ESOO model naming convention

A set of naming conventions was used in the 2023 ESOO to shorten the model names to comply with the maximum number of characters allowed in naming models in PLEXOS. Table 2 describes the model naming convention used in the 2023 NEM ESOO. The job sets populated in this model reflect this naming convention.

For example, the job set “\_tESOO\_sSC\_y2333\_p10\_r2018\_dBase” represents the following assumptions:

- Central (called *Step Change* in the model) demand scenario.
- A model horizon between 01 July 2023 and 30 June 2033.
- The POE10 peak demand forecast.
- The 2017-18 reference year.
- Base refers to this being the Central ESOO scenario that assumes only existing, committed, and anticipated projects.

**Table 2 ESOO 2023 naming convention**

Descriptor	Prefix	Options	Description
<b>Project</b>	_t	ESOO	2023 NEM ESOO
<b>Scenario</b>	_s	SC	SC = Step Change (ESOO Central Scenario)
<b>Financial year</b>	_y	2333	Financial year range modelled, for example, 2023-24 to 2032-33
<b>Probability of exceedance</b>	_p	10, 50	POE demand trace used
<b>Reference year</b>	_r	2011 to 2023	Historical reference year traces used in the model, for example, 2010-11 or 2022-23
<b>Sensitivity</b>	_d	Base	Base = Core ESOO assumptions



## 3 Further details

The model is populated with the settings that were used in the 2023 ESOO modelling which was run using custom results extraction tools on a cloud simulation platform. Desktop applications may require changes to settings to reduce the size of simulations and allow for results to be produced in other forms.

Model file provided:

- SimulationShell.xml – this contains the core Central scenario (labelled ‘Step Change’ in the model).

PLEXOS 9.100 R02 x64 was used to create and run the 2023 ESOO scenarios and sensitivities.

PLEXOS software is available from Energy Exemplar.

Each model was run using a Split Execution with the number of splits equal to the number of samples.

The published results in the 2023 ESOO report used a model with individual unit confidential that has been aggregated by technology in the published model. Results achieved with the published model may slightly vary from the published results.

The 2023 ESOO model includes NEM Constraints integrated within the PLEXOS XML.

The NEM constraints represent the constraints that are relevant for assessing reliability. These constraint sets do not account for all transmission limitations in the NEM. The constraint sets applied are focused on constraints that impact reliability outcomes. The transmission augmentation commissioning dates and other dates applied in the constraint sets are sometimes grouped into Timeslices for modelling efficiency that sufficiently match the published commissioning dates for transmission augmentation projects and provide an accurate reliability outcome<sup>2</sup>.

The constraint set also includes outage constraint sets which are triggered based on outage variables specified in the model. These constraints should be ignored if simulating for another purpose, or when transmission outages are not considered.

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<sup>2</sup> Any questions related to the NEM constraint set should be directed to [planning@aemo.com.au](mailto:planning@aemo.com.au).