



2020 ESOO Input Data Package and Model Instructions

August 2020

A Guide to the Input Data and Model of the 2020
Electricity Statement of Opportunities

Important notice

PURPOSE

AEMO has prepared this document to assist stakeholders in interpreting and using the input data produced for the purpose of modelling the National Electricity Market (NEM) using the assumptions and approach applied in the 2020 Electricity Statement of Opportunities (ESOO).

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VERSION CONTROL

Version	Release date	Changes
#1	27/08/2020	Release for 2020 ES00

1. Configuring the 2020 NEM ESOO Model

1.1 Running the Central Scenario

This chapter contains the steps needed to set up the 2020 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 from AEMO's 2020 Electricity Statement of Opportunities webpage. The list of zip files is summarised in Table 1.

Table 1 Zip files from AEMO's 2020 ESOO webpage

No	File	Description	Where to put the files
1	2020 ESOO Model.zip	Contains model files, constraint equation workbooks and associated parameter files.	Place in the root folder
2	2020 Solar.zip	Contains half-hourly generation traces for solar.	Place into the '\Traces\Solar' folder
3	2020 Wind.zip	Contains half-hourly generation traces for wind.	Place into the '\Traces\Wind' folder
4	2020 Rating.zip	Contains half-hourly line ratings for Victorian transmission lines.	Place into the '\Traces\Rating' folder
5	2020 PV_TOT.zip	Contains half-hourly regional generation traces for embedded PV, including rooftop PV and PVNSG.	Place into the '\Traces\Demand' folder
6	2020 OPSO_PVLITE.zip	Contains half-hourly regional demand traces for operational demand (demand before the impact of rooftop PV and PVNSG).	Place into the '\Traces\Demand' folder
7	2020 OPSO.zip	Contains half-hourly regional demand traces for operational demand (demand after the impact of rooftop PV and PVNSG).	Place into the '\Traces\Demand' folder

2. Unzip the file *2020 ESOO Model.zip*. This will generate the 2020 ESOO Model folder structure. The contents of the 2020 ESOO Model folders are illustrated in Figure 1.

Figure 1 Contents of the 2020 ESOO Model file

 AEMO Constraints	24/08/2020 2:13 PM	File folder	
 NEMConstraints	24/08/2020 2:12 PM	File folder	
 Traces	24/08/2020 1:48 PM	File folder	
 2020 ESOO Model	24/08/2020 11:23 ...	XML Document	24,502 KB
 NTNDP - Base	21/08/2020 2:44 PM	XML Document	3 KB
 NTNDP - ISP	21/08/2020 3:57 PM	XML Document	3 KB

3. Open the *Traces* folder.
4. Extract the other six zip files into their respective sub-folders as outlined in Table 1.
5. The 2020 ESOO modelling has been performed under three core scenarios and a sensitivity which includes the impact of Actionable ISP transmission augmentations. These scenarios and sensitivities contain varying outlooks for future supply and demand. The three core base scenarios are Central, Step change and Slow change. The ISP augmentations are implemented through a different set of constraints. Only the Central scenarios are set up in the *2020 ESOO Model.xml*, but these instructions explain how to configure the alternative scenarios.
6. To run the core scenario, copy and rename *NTNDP – Base.xml* to *NTNDP.xml*.
7. The model will run with the ‘Outages Average All’ scenario, where the rates are averaged for each respective technology type. Details of this scenario and alternate outage rate scenarios are in section 1.2.

1.2 Running alternative outage rate scenarios

For the 2020 ESOO, generator forced outage rates have been modelled with four different sets similar to the 2019 ESOO but with the addition of the forward looking rates for coal-fired plants and CCGTs. A detailed explanation can be found in section 2.2.1 of the ESOO and Reliability Forecast Methodology Document 2020. Outages rates have been calculated and applied at the station level for the 2020 ESOO results, however, to ensure this information is kept confidential, in the published ESOO model the rates have been aggregated based on the following technology types:

- Brown Coal
- Black Coal New South Whales
- Black Coal Queensland
- CCGT
- OCGT (units over 150 MW)
- Steam turbine
- Hydro
- Small peaking plant (OCGT less than 150 MW).

A description of each outage set is in Table 2.

Table 2 Outage Rate Scenario Descriptions

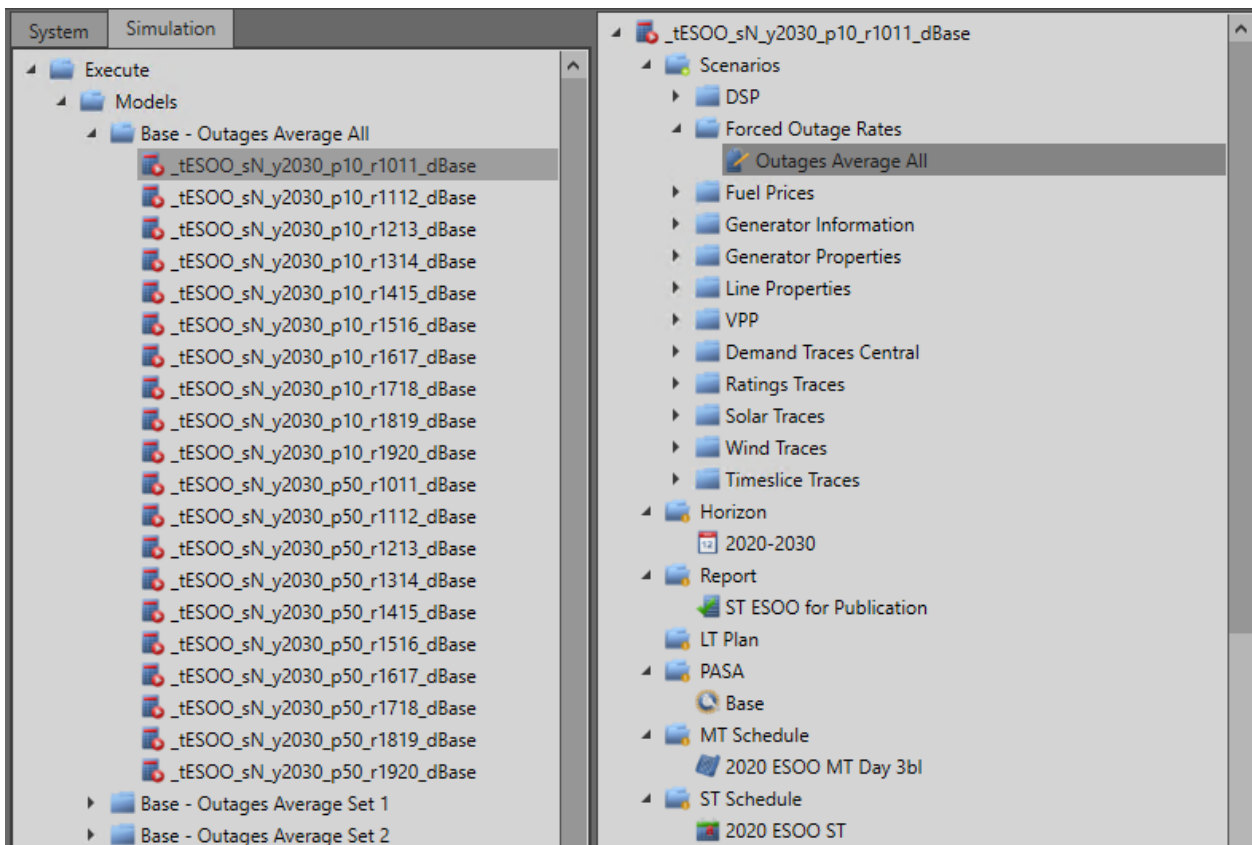
Scenario Name	Description
Outages Average All	This represents the average outage rate for each respective technology type (as described above), aggregated across the four sets below.

Scenario Name	Description
Outages Average Set 1	This represents the average outage rate for each respective technology type based on the historical year 2016-17.
Outages Average Set 2	This represents the average outage rate for each respective technology type based on the historical year 2017-18.
Outages Average Set 3	This represents the average outage rate for each respective technology type based on the historical year 2018-19.
Outages Average Set 4	This represents the average outage rate for each respective technology type based on the historical year 2019-20.

For the 2020 ESOO results presented in the report, the simulation used the four different sets at the confidential station level with 25 stochastic iterations for each set, two POEs (10 and 50) and ten reference years (2010-11 to 2019-20). This resulted in 2,000 simulation outcomes.

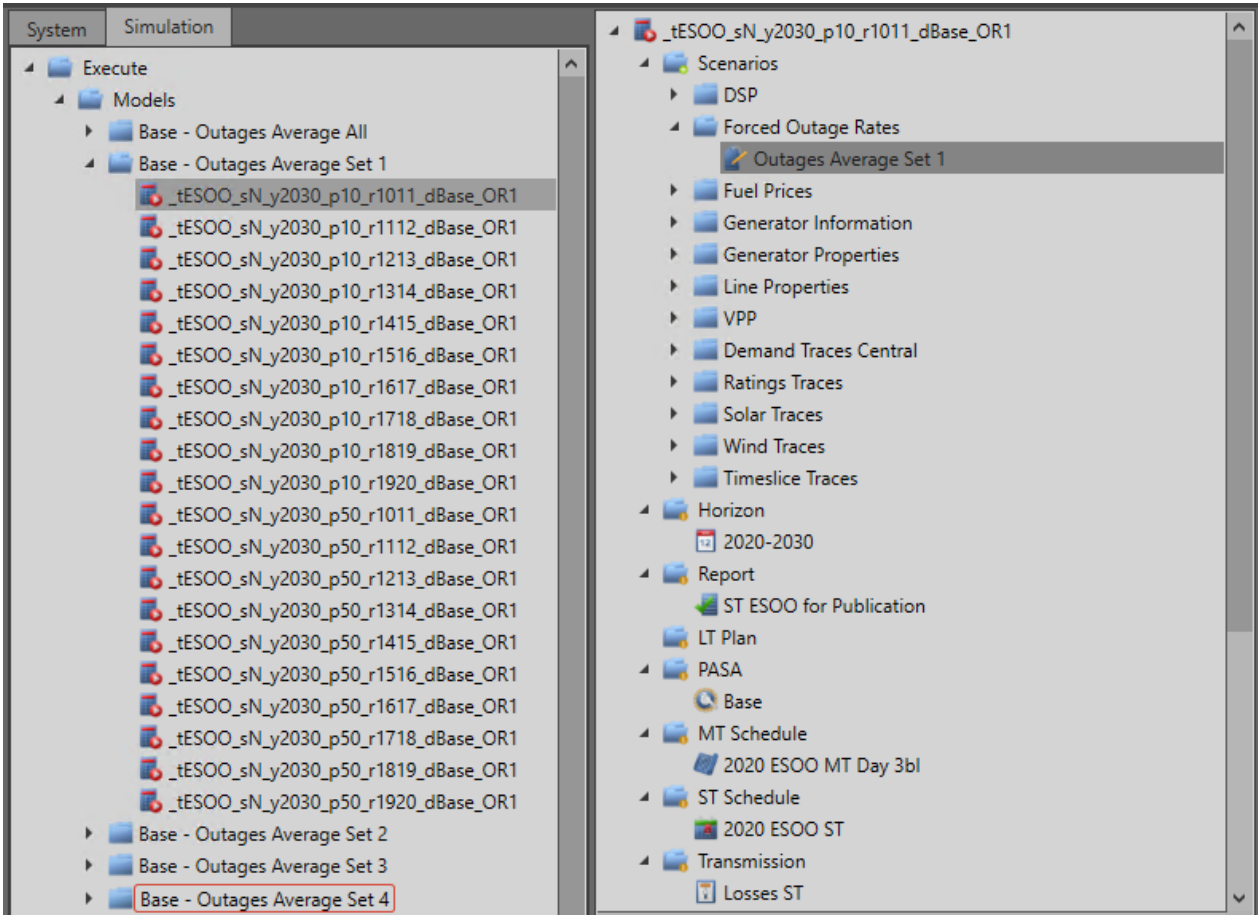
The published PLEXOS model is set up to run the Central scenario with the “Outages Average All” configured with 100 stochastic iterations or with the four non-confidential sets with 25 stochastic iterations each. If you select any of the models, you will see which Forced Outage Rates scenario is attached. The first group of models are the ones configured with the average rate (i.e.: *Outages Average All*), as shown in Figure 2.

Figure 2 Outages Average All scenario attachment



Should you prefer to run the model with the outage rate for each historical year, the models with the per outage set basis are already configured below the Average All models. Figure 3 below shows the Set 1 models. These models have the Stochastic sample count set to 25.

Figure 3 Attaching outage set 1



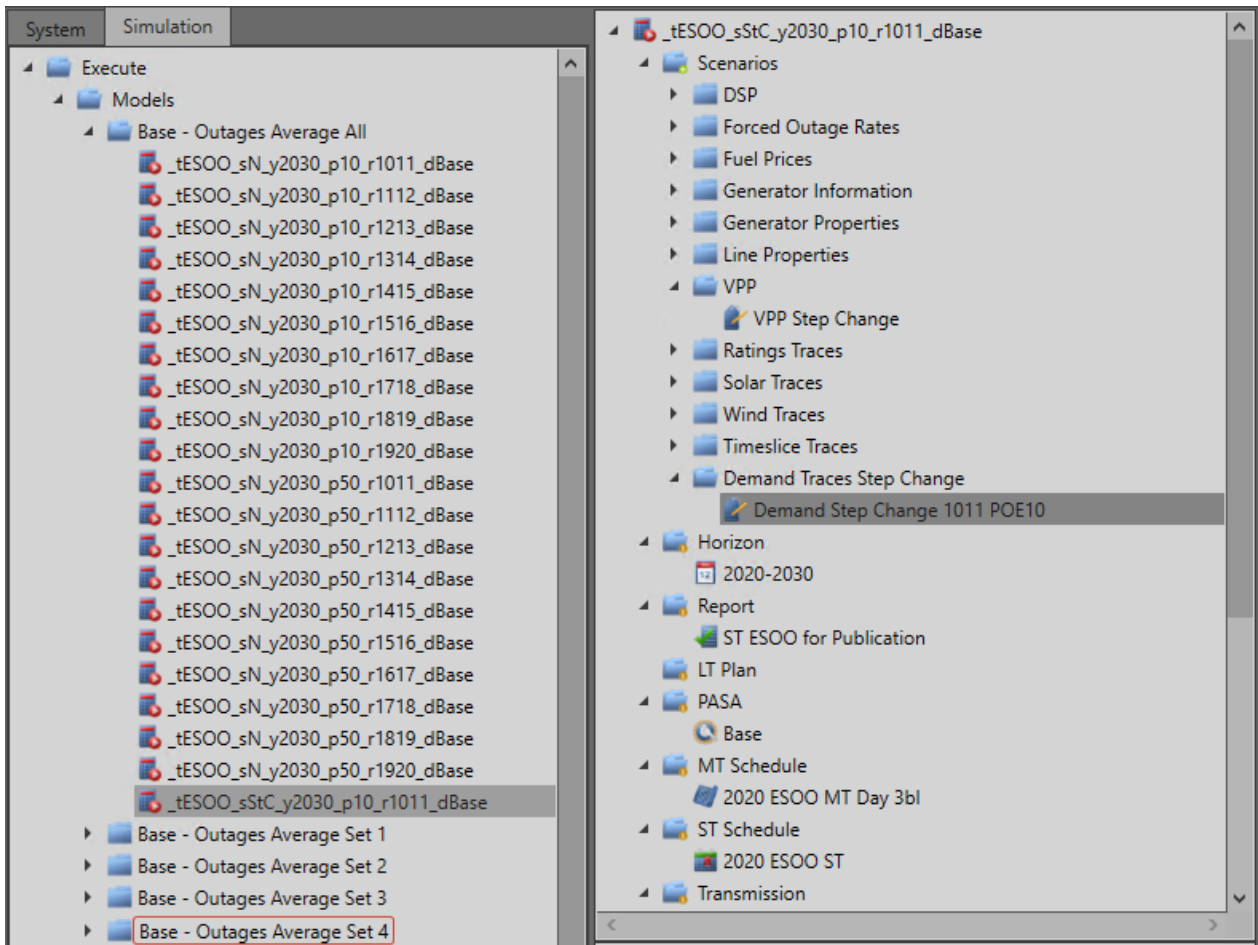
1.3 Running alternative scenarios

1.3.1 Running step change and slow change scenarios

To run the Step and Slow change scenarios follow these steps (using the Step change scenario as an example).

1. Rename the model changing the N in “_tESOO_sN_y2030_p10_r1011_dBase” to StC. I.e: “_tESOO_sStC_y2030_p10_r1011_dBase”
2. Remove the current ‘Demand’ scenario in the ‘Demand Traces Central’ folder.
3. Add the relevant ‘Demand Traces Step Change’ scenario to their respective reference year model.
4. Remove the current ‘VPP Central’ scenario in the ‘VPP’ folder.
5. Add the VPP scenario ‘VPP Step Change’ to each of your models.
6. Figure 4 has an example of this setup for Step change for one reference year and POE scenario.

Figure 4 Step change set up



1.3.2 Running the ISP scenario

To run the ISP scenario:

1. Change the Base in “_tESOO_sN_y2030_p10_r1011_dBase” to ISP. I.e.: “_tESOO_sN_y2030_p10_r1011_dISP”
2. Delete current *NTNDP.xml* file and copy and rename the *NTNDP- ISP.xml* to *NTNDP.xml*.
3. Run your models as you did in section 1.1.

2. 2020 NEM ESOO Model Naming Convention

A set of naming conventions is developed in the 2020 NEM ESOO to shorten the model names in order to comply with the maximum number of characters allowed in naming models in PLEXOS. Table 3 describes the model naming convention used in the 2020 NEM ESOO. The job sets populated in this model reflect this naming convention.

For example, the job set “_tESOO_sN_y2030_p10_r1718_dBase” represents the following assumptions:

- Central demand scenario.
- A model horizon between 01 July 2020 and 30 June 30.
- The POE10 peak demand forecast
- The 2017-18 reference year.
- The ESOO BAU scenario that assumed only existing and committed projects.

Table 3 ESOO 2020 naming convention

Descriptor	Prefix	Options	Description
Project	_t	ESOO	2020 NEM ESOO
Scenario	_s	N StC SIC	N = Central, neutral economic conditions and pace of change. Stc= Step change, strong economic conditions and pace of change. SIC= Slow change, slow economic conditions and pace of change.
Financial Year	_y	2030	Financial year range modelled e.g. 2020-21 to 2029-30
Probability of exceedance	_p	10, 50	POE demand trace used
Reference Year	_r	1011 to 1920	Reference year traces used
Sensitivity	_d	Base ISP	Base = Core ESOO assumptions ISP= ISP Constraints implemented

3. Further details

The model is populated with the settings that were used in the 2020 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:

- 2020 ESOO Model.xml – this contains the core scenarios, Central, Step change and Slow change. As well as the ISP augmentation sensitivity.

PLEXOS 8.000 R03 x64 was used to create and run the 2020 ESOO scenarios and sensitivity.

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

The ESOO was run with the OpenPLEXOS NEMConstraints assembly applied. This allows the application of transmission constraint equations contained in the constraint workbooks provided.

Both the PLEXOS software and the OpenPLEXOS assemblies are available from Energy Exemplar. The models can be run without the OpenPLEXOS assembly but would not incorporate the impact of transmission constraint equations. The constraints workbooks 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 constraints workbooks also include 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.

The constraints workbooks also change depending on the model run (e.g. Base vs ISP). These are controlled through the NTNDP.xml file.