



Energy System Modelling Using OSeMOSYS

Hands-on 14

Please use the following citation for:

- **This exercise**

Plazas-Niño, F. (2026, August). Hands-on 14: Energy System Modelling Using OSeMOSYS (Version 2.0.). Climate Compatible Growth. DOI: 10.5281/zenodo.14871610

- **OSeMOSYS UI software**

Climate Compatible Growth. (2026). MUIO (Version v5.6.0). GitHub.
<https://github.com/OSeMOSYS/MUIO/releases>

Learning outcomes

By the end of this exercise, you will be able to:

- 1) Create scenarios using MUIO
- 2) Develop assumptions to design various scenarios in an OSeMOSYS model

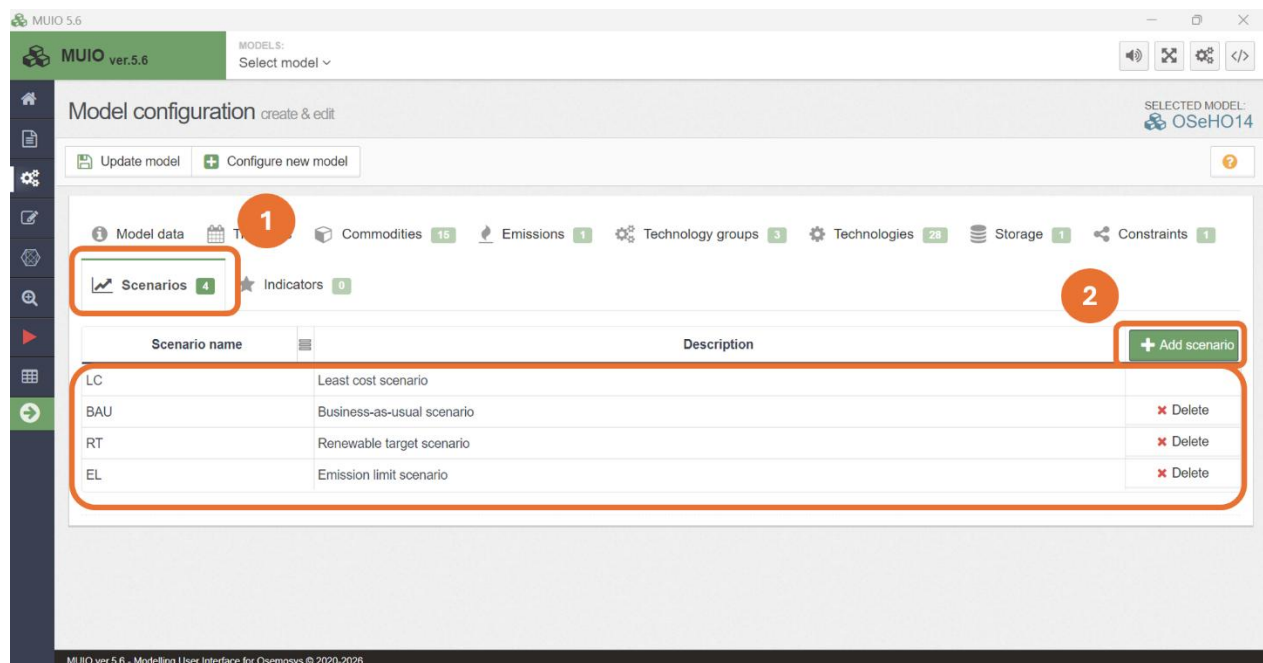
Creating scenarios in MUIO

In this hands-on exercise, we will not add new technologies or commodities.

IMPORTANT: Before proceeding, you must copy the model and rename it as you have done before (this time as OSeHO14).

As we discussed in Lecture 15, the scenario that we can run after calibrating our model represents the Least-cost scenario. Having said that, we already have that model done from our previous hands-on practice. We will complement the analysis by modelling three additional scenarios. We will explore the Business-as-usual scenario, Renewable target scenario, and Emission Limit scenario.

The first step is to create these scenarios in MUIO. Navigate to the Configuration tab and select the Scenarios section. Rename the default scenario from SC_0 to LC and update the description from 'Base scenario' to 'Least-cost scenario.' Next, click on +Add scenario on the right and create three additional scenarios. Rename the scenarios as shown in the image below. Finally, click on Update Model to save the changes.



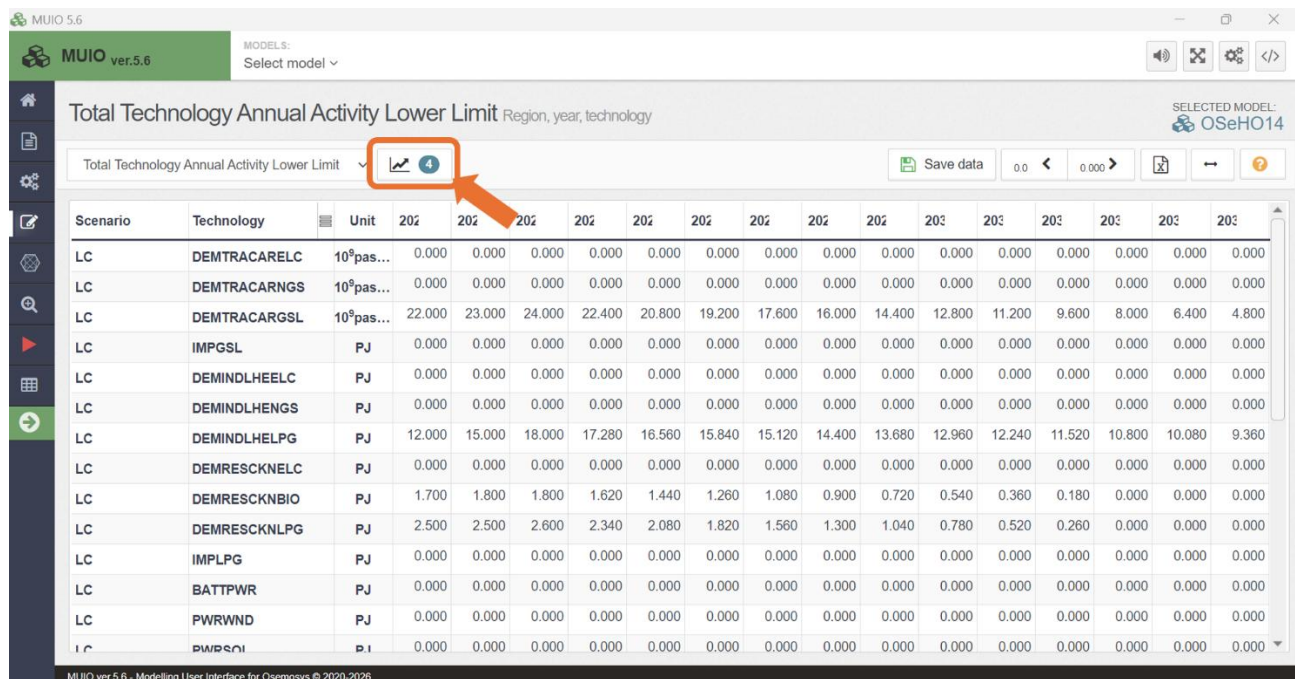
Next, we will define each scenario by adding the relevant parameters.

Business-as-usual scenario

In the BAU scenario, we assume that current trends, policies, and technologies are maintained in the long term. In OSeMOSYS, this scenario can be represented by constraining the energy supply to reflect the most representative technologies in each sector. Using the share of each technology in the last year of calibration (2023), we will maintain these shares from 2024 to 2030. From 2031 to 2035, we will allow a 10% share for new technologies to compete in meeting energy demands. These calculations will be added as parameters in the Total Technology Annual Activity Lower Limit. You can find these calculations in the [Data Preparation file OSeHO14](#).

Try It: Add the Total Technology Annual Activity Lower Limit parameters for the BAU scenario.

1. Click on the data entry button, and in the search bar, type '**Total Technology Annual Activity Lower Limit**.' Then, navigate to that parameter.
2. Click the line diagram button located next to the parameter name, as illustrated in the image below.



MUJO 5.6

MODELS: Select model

SELECTED MODEL: OSeHO14

Total Technology Annual Activity Lower Limit Region, year, technology

Total Technology Annual Activity Lower Limit

Save data 0.0 0.000

Scenario	Technology	Unit	202	202	202	202	202	202	202	202	202	202	202	202	202	202	202	202
LC	DEMTRACARELC	10 ⁶ pas...	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMTRACARNGS	10 ⁶ pas...	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMTRACARGSL	10 ⁶ pas...	22.000	23.000	24.000	22.400	20.800	19.200	17.600	16.000	14.400	12.800	11.200	9.600	8.000	6.400	4.800	4.800
LC	IMPGSL	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMINDLHEELC	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMINDLHENGSL	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMINDLHELPG	PJ	12.000	15.000	18.000	17.280	16.560	15.840	15.120	14.400	13.680	12.960	12.240	11.520	10.800	10.080	9.360	9.360
LC	DEMRESCKNELC	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMRESCKNBIO	PJ	1.700	1.800	1.800	1.620	1.440	1.260	1.080	0.900	0.720	0.540	0.360	0.180	0.000	0.000	0.000	0.000
LC	DEMRESCKNLPG	PJ	2.500	2.500	2.600	2.340	2.080	1.820	1.560	1.300	1.040	0.780	0.520	0.260	0.000	0.000	0.000	0.000
LC	IMPLPG	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	BATTPWR	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	PWRWIND	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	PWRWIND	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	PWRWIND	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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- Click on the folder icon to open the scenario data. By default, the BAU scenario will be selected in this case

The screenshot shows the MUJO 5.6 software interface. The main window displays a table titled 'Total Technology Annual Activity Lower Limit' with columns for Scenario, Technology, Unit, and various years (2010, 2012, 2014, 2016, 2018, 2020, 2022, 2024, 2026, 2028, 2030). A dropdown menu is open for the 'BAU' scenario, showing a folder icon, a refresh icon, and a close icon. The folder icon is highlighted by a red box and an orange arrow. The table lists various technologies and their activity levels across different years.

Scenario	Technology	Unit	2010	2012	2014	2016	2018	2020	2022	2024	2026	2028	2030
LC	DEMRACARELC	10 ⁶ pas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMRACARNGS	10 ⁶ pas	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMRACARGSL	10 ⁶ pas...	22.000	23.000	24.000	22.400	20.800	19.200	17.600	16.000	14.400	12.800	11.200
LC	IMPGSL	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMINDHEELC	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMINDHENGSG	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMINDHELPG	PJ	12.000	15.000	18.000	17.280	16.560	15.840	15.120	14.400	13.680	12.960	12.240
LC	DEMRESCKNELC	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMRESCKNBIO	PJ	1.700	1.800	1.800	1.620	1.440	1.260	1.080	0.900	0.720	0.540	0.360
LC	DEMRESCKNLPG	PJ	2.500	2.500	2.600	2.340	2.080	1.820	1.560	1.300	1.040	0.780	0.520
LC	IMPLPG	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	BATTPWR	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	PWRWIND	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LC	DEMRESCKNLPG	PJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

- Once the BAU scenario data is activated, the parameters for the second scenario will appear below those of the first scenario. To locate them, scroll down. By default, these parameters will be empty and marked as 'n/a.'

MUIO 5.6

MODELS: Select model

Total Technology Annual Activity Lower Limit Region, year, technology

SELECTED MODEL: OSeHO14

Total Technology Annual Activity Lower Limit BAU

Save data 0.0 0.000

Scenario	Technology	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BAU	DEMRACARELC	10 ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMRACARNGS	10 ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMRACARGSL	10 ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	IMPGSL	PJ ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMINDLHEELC	PJ ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMINDLHENG	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMINDLHELPG	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMRESCKNELC	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMRESCKNBIO	PJ ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMRESCKNLPG	PJ ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	IMPLPG	PJ ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	BATTPWR	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	PWRWIND	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	PWRWIND	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

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- Copy and paste the data for the years 2021–2035 for the corresponding technologies from the [Data Preparation file OSeHO14](#). The input should resemble the image shown below.

MUIO 5.6

MODELS: Select model

Total Technology Annual Activity Lower Limit Region, year, technology

SELECTED MODEL: OSeHO14

Total Technology Annual Activity Lower Limit BAU

Save data 0.0 0.000

Scenario	Technology	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
BAU	DEMRACARELC	10 ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMRACARNGS	10 ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMRACARGSL	10 ³ pas...	22.000	23.000	24.000	25.000	26.000	27.000	28.000	29.000	30.000	31.000	28.800	29.700	30.600	31.500	32.400
BAU	IMPGSL	PJ ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMINDLHEELC	PJ ³ pas...	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMINDLHENG	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMINDLHELPG	PJ	12.000	15.000	18.000	21.000	24.000	27.000	30.000	33.000	36.000	39.000	37.800	40.500	43.200	45.900	48.600
BAU	DEMRESCKNELC	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	DEMRESCKNBIO	PJ	1.700	1.800	1.800	1.840	1.880	1.920	1.960	2.000	2.050	2.090	1.870	1.900	1.940	1.980	2.010
BAU	DEMRESCKNLPG	PJ	2.500	2.500	2.600	2.660	2.720	2.780	2.840	2.900	2.950	3.010	2.810	2.870	2.920	2.980	3.030
BAU	IMPLPG	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	BATTPWR	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	PWRWIND	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	PWRWIND	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

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MUIO 5.6

MODELS: Select model

SELECTED MODEL: OSeHO14

Total Technology Annual Activity Lower Limit Region, year, technology

Total Technology Annual Activity Lower Limit BAU

Save data 0.0 0.000

Scenario	Technology	Unit	2017	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090
BAU	MINWND	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	MINSOL	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	PWRBIO	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	PWRHYD	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	MINBIO	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	MINHYD	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	PWRDIST	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	PWRTRN	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	PWRNGS	PJ	5.050	6.100	6.580	7.680	8.770	9.870	10.970	12.060	13.160	14.250	11.050	11.840	12.630	13.420	14.210	
BAU	PWRDSL	PJ	19.520	24.610	30.280	35.320	40.370	45.410	50.460	55.510	60.550	65.600	66.340	71.080	75.820	80.560	85.300	
BAU	IMPDSL	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	MINNGS	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	BACKSTOP	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAU	MINBACK	PJ	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

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6. Save the data and update the model.

Renewable target scenario

In the Renewable Target (RT) scenario, we will aim to achieve at least 50% of electricity production from renewable sources by 2030, progressively increasing to at least 80% by 2035. While this is an ambitious target, it provides an opportunity to explore how to set and implement such goals using OSeMOSYS. As discussed in Lecture 15, we can incorporate a renewable target by adding a User Defined Constraint (UDC). In this case, activity multipliers are used since we are dealing with electricity production (i.e., the activity of power plant technologies). The corresponding inequality is shown below.

$$\text{Input Activity Ratio of Transmission} * \text{Percentage Target} * \text{Transmission Activity} < \sum_{t=1}^n \text{Renewable Technology Activity}_t$$



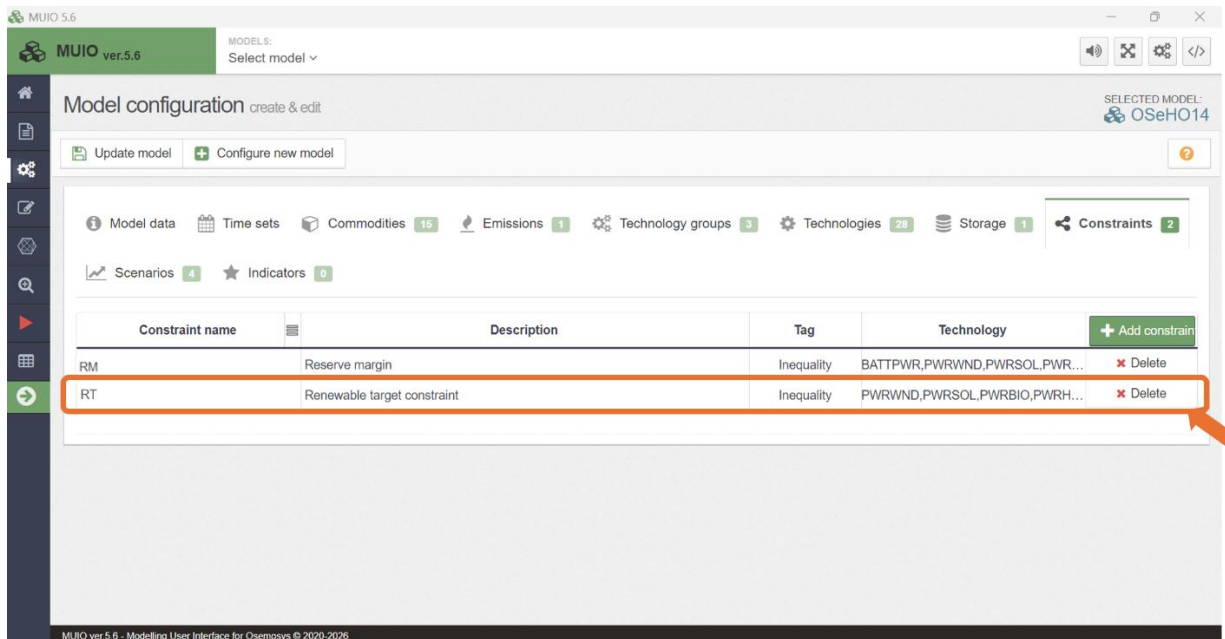
*Input Activity Ratio of Transmission * Percentage Target * Transmission Activity*

$$- \sum_{t=1}^n \text{Renewable Technology Activity}_t < 0$$

The multiplication of the transmission activity by its input activity ratio gives the total electricity production feeding the transmission technology. By multiplying this total electricity production by the percentage target, we calculate the amount of energy required to be produced by renewable technologies. This amount must then be greater than or equal to the sum of electricity generated by renewable technologies (e.g., solar, wind, hydro, and biomass). By rearranging the equation and moving the terms to one side, we obtain the standard form of a UDC. In this form, the UDC constant becomes zero, the UDC activity multipliers for all renewable energy technologies are set to -1, and the activity multiplier for the transmission technology is set to the input activity ratio multiplied by the percentage target.

Try It: Add the UDC activity multiplier parameters for the RT scenario.

1. First, let's add a new UDC. On the model configuration page, navigate to the 'Constraints' tab and click on '+ Add Constraint.' This constraint will be an inequality, as explained previously. Select the relevant technologies for this constraint, which include the renewable power plants and transmission: PWRHYD, PWRBIO, PWRSOL, PWRWND, and PWRTRN.



2. Update the model.
3. Click on the data entry button, and in the search bar, type '**UDC Multiplier Activity.**' Then, navigate to that parameter.
4. Click the line diagram button located next to the parameter name, as illustrated in the image below.

MUIO 5.6

MODELS: Select model v

UDC Multiplier Activity Region, year, technology, constraint

UDC Multiplier Activity

Save data 0.0 0.000

Scenario	Technology	Constraint	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
LC	PWRWND	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRSOL	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRBIO	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRHYD	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRTRN	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRNGS	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRDSL	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	BACKSTOP	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRWND	CO_s1a6x	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRSOL	CO_s1a6x	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRBIO	CO_s1a6x	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRHYD	CO_s1a6x	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRTRN	CO_s1a6x	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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- Select the RT scenario in the drop-down list and click on the folder icon to open the scenario data.

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MODELS: Select model v

UDC Multiplier Activity Region, year, technology, constraint

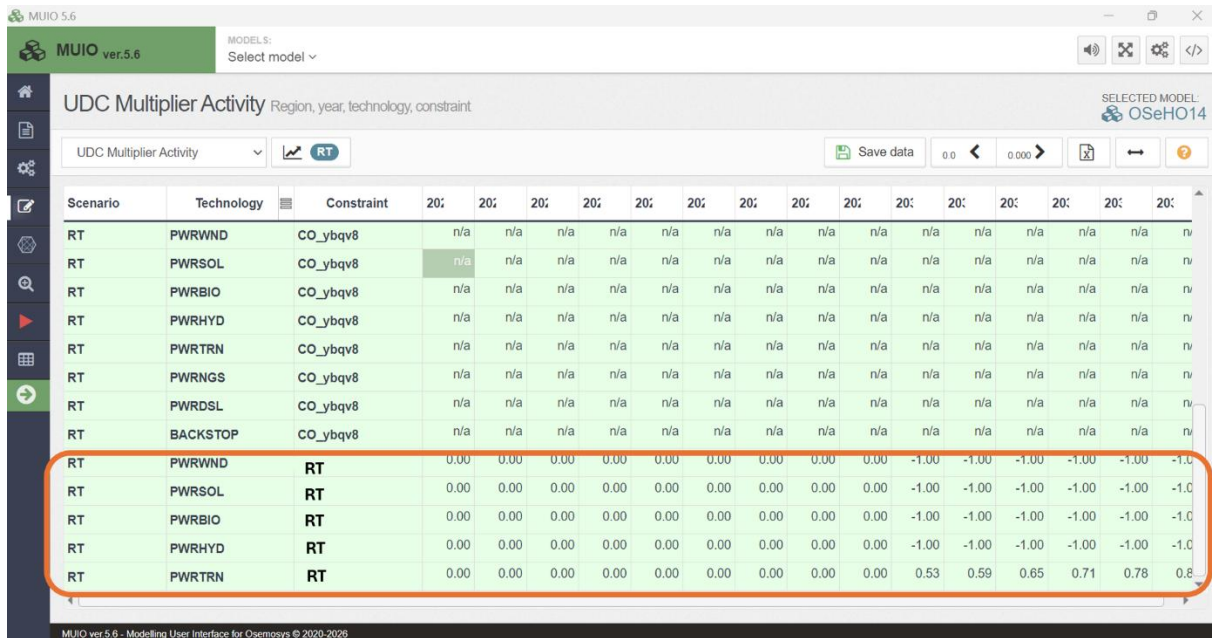
UDC Multiplier Activity

Save data 0.0 0.000

Scenario	Technology	Constraint	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
LC	PWRWND	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRSOL	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRBIO	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRHYD	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRTRN	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRNGS	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRDSL	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	BACKSTOP	CO_ybqv8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRWND	CO_s1a6x	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRSOL	CO_s1a6x	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRBIO	CO_s1a6x	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRHYD	CO_s1a6x	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LC	PWRTRN	CO_s1a6x	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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6. Once the RT scenario data is activated, the parameters for this second scenario will appear below those of the first scenario. To locate them, display additional rows and scroll down. By default, these parameters will be empty and marked as 'n/a.'
7. Copy and paste the data for the years 2021–2035 for the corresponding technologies from the [Data Preparation file OSeHO14](#). The input should resemble the image shown below. Be careful with selecting the right scenario (RT) and constraint (RT).



Scenario	Technology	Constraint	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
RT	PWRWND	CO_ybqv8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RT	PWRSOL	CO_ybqv8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RT	PWRBIO	CO_ybqv8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RT	PWRHYD	CO_ybqv8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RT	PWRTRN	CO_ybqv8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RT	PWRNGS	CO_ybqv8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RT	PWRDSL	CO_ybqv8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RT	BACKSTOP	CO_ybqv8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RT	PWRWND	RT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	-1.00	-1.00	-1.00	-1.00
RT	PWRSOL	RT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	-1.00	-1.00	-1.00	-1.00
RT	PWRBIO	RT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	-1.00	-1.00	-1.00	-1.00
RT	PWRHYD	RT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	-1.00	-1.00	-1.00	-1.00
RT	PWRTRN	RT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.59	0.65	0.71	0.78

8. **Save the data and update the model.**

Emission limit scenario

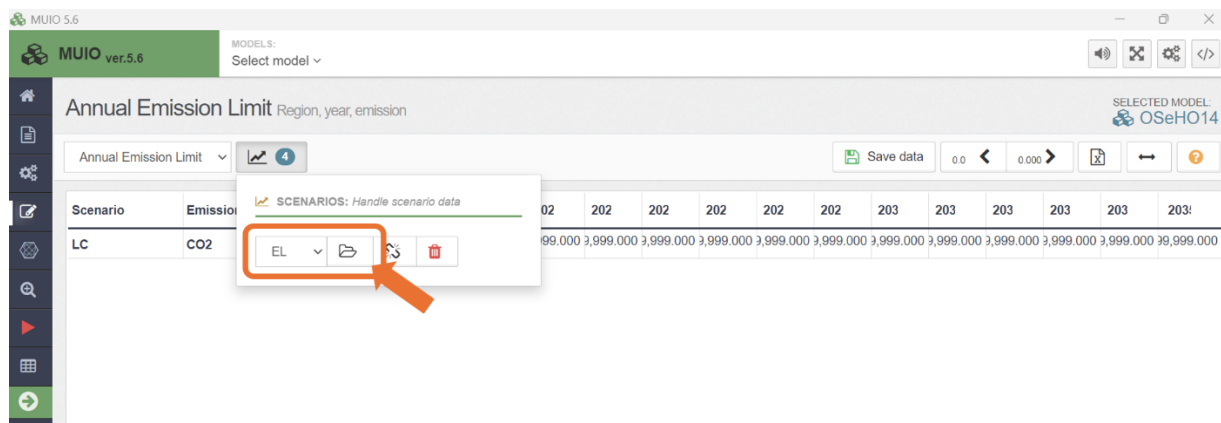
In the Emission Limit (EL) scenario, we will introduce a carbon budget to systematically reduce emissions. This type of scenario is commonly modeled in Nationally Determined Contributions (NDC) assessments. To create a carbon budget, the national emissions inventory for each country or region can be used to define the initial emissions level and determine the rate of reduction over time based on the desired level of ambition. In OSeMOSYS, this is achieved by defining the Annual Emission Limit parameter, which specifies the maximum allowable amount of a particular emission type for each year.

Try It: Add the Annual Emission Limit parameters for the EL scenario.

1. Click on the data entry button, and in the search bar, type '**Annual Emission Limit.**' Then, navigate to that parameter.
2. Click the line diagram button located next to the parameter name, as illustrated in the image below.



3. Select the EL scenario in the drop-down list and click on the folder icon to open the scenario data.



4. Once the EL scenario data is activated, the parameters for this scenario will appear below those of the first scenario. By default, these parameters will be empty and marked as 'n/a.'

- Copy and paste the data for the years 2021–2035 from the [Data Preparation file OSeHO14](#). The input should resemble the image shown below. The first years are unconstrained since they are the calibration years.

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MODELS:
Select model ▾



Annual Emission Limit Region, year, emission

SELECTED MODEL:
 OSeHO14

Annual Emission Limit ▾  EL

 Save data

0.0 < 0.000 >



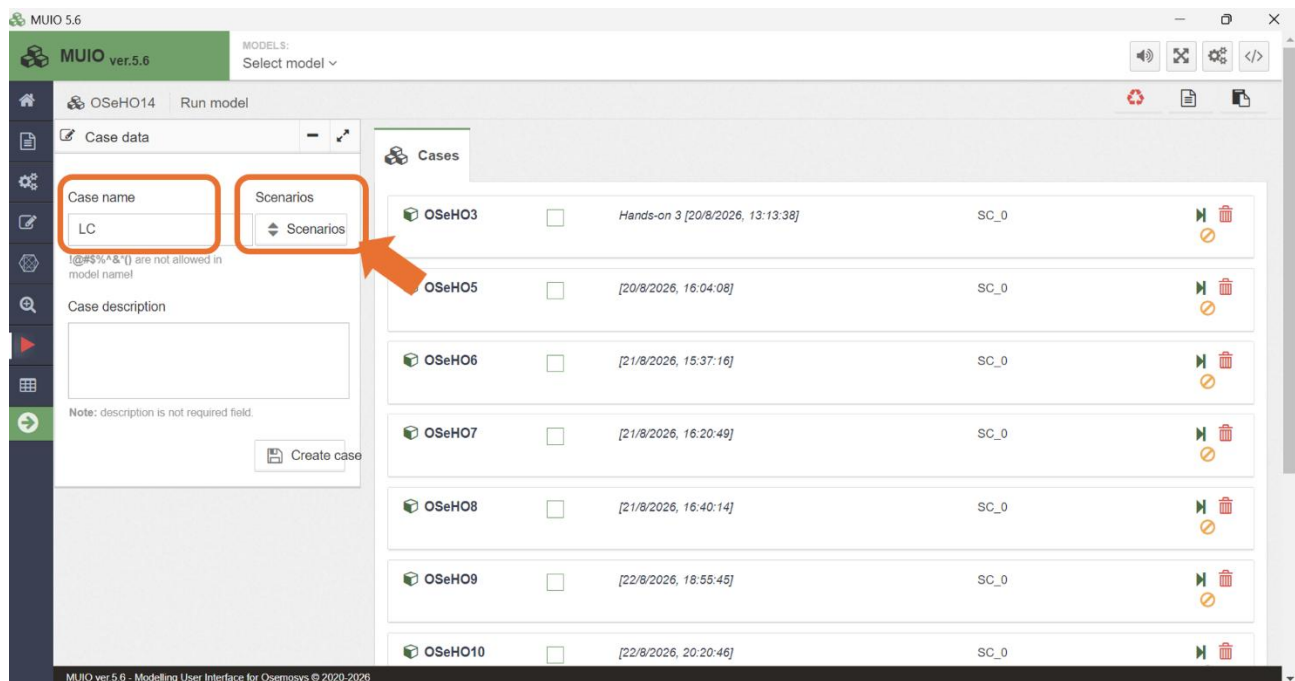
Scenario	Emission	Unit	202	202	202	202	202	202	202	202	202	202	203	203	203	203	203	203
LC	CO2	kTon	999,999	999,999	999,999	999,999	999,999	999,999	999,999	999,999	999,999	999,999	999,999	999,999	999,999	999,999	999,999	999,999
EL	CO2	kTon	999,999	999,999	999,999	14,000	14,250	14,500	14,750	14,250	13,750	13,000	12,500	12,000	11,500	11,000	10,500	

- Save the data and update the model.

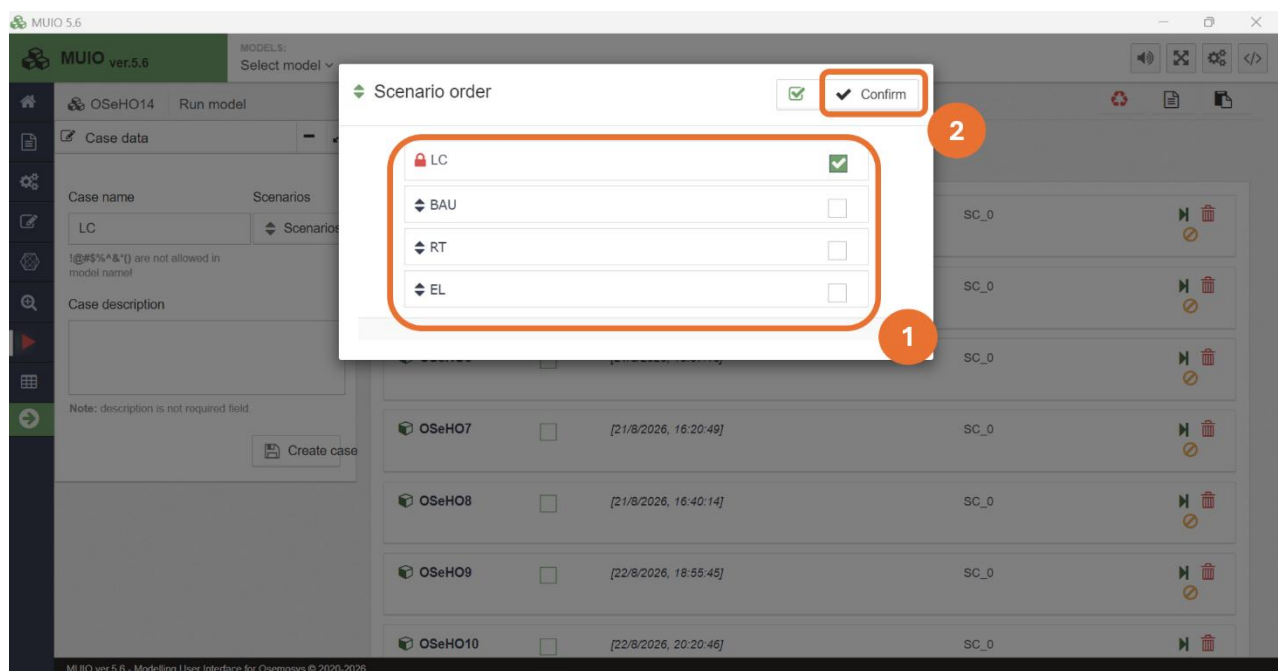
Run the model and check the results

Running the model this time will differ slightly to incorporate scenarios. Follow these steps:

- Click the red play button as usual to start a case.
- Name the scenario "LC" and optionally add a description.
- Click the Scenarios button, as shown in the image below.



4. Uncheck all scenarios except the LC scenario and click Save.



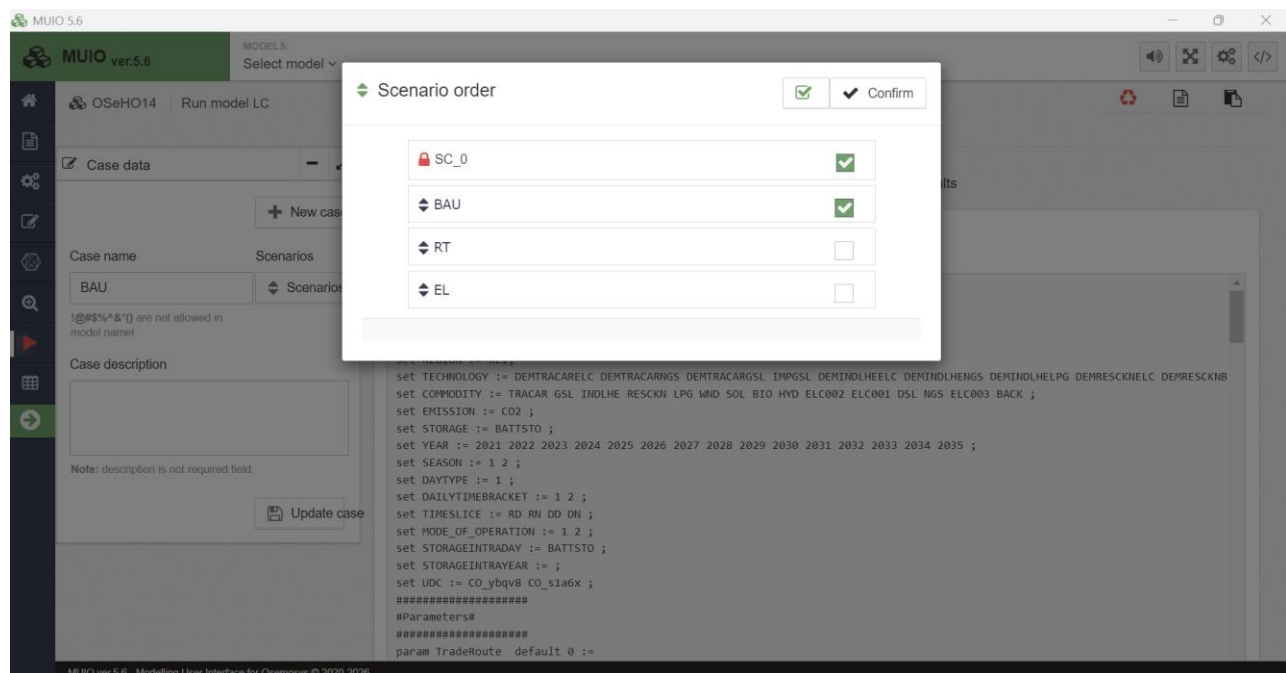
Note: All scenarios might be selected by default, meaning the modified parameters in each scenario overwrite the baseline scenario.

Important: If two scenarios have different values for the same parameter, the values from the latest scenario in the list will take precedence.

- Follow the usual procedure by pressing the corresponding button to create a case. Then press the Data file button to generate the input data file for the optimization process. Finally click RUN MODEL.

Once this step is completed, the case for the LC scenario will be created. Next, we need to create three additional cases for the corresponding scenarios. Assign each case its respective scenario name (BAU, RT, and EL) and select the appropriate scenario from the scenario list.

For example, in the BAU scenario, the selection should match the example shown in the image below. Then, follow the previously reviewed steps for each case.



At the end of the process, you should have four successful runs in your data cases. The list should look similar to the image below.

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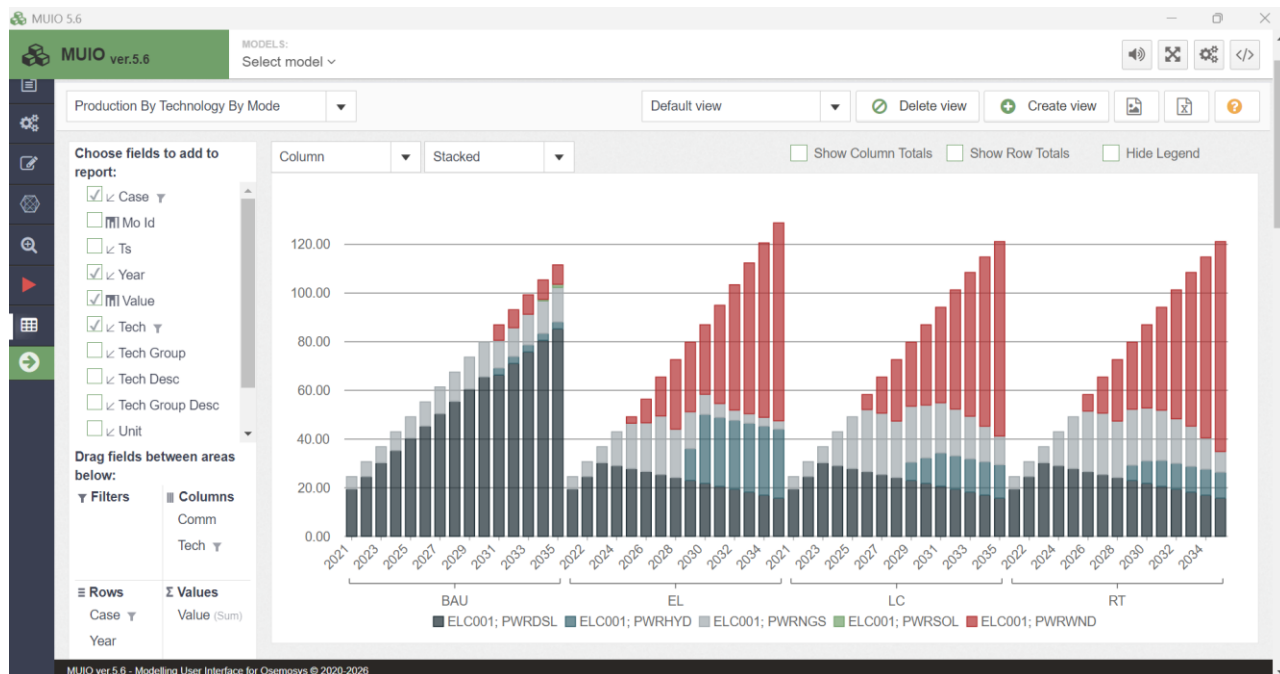
MODELS: Select model

Model	Case	Time	Scenario	Actions
OSeHO11	☐	[25/8/2026, 16:34:23]	SC_0	
OSeHO12	☐	[25/8/2026, 17:17:03]	SC_0	
OSeHO13	☐	[26/8/2026, 20:06:16]	SC_0	
LC	☐	[27/8/2026, 14:01:08]	SC_0	
BAU	☐	[27/8/2026, 14:02:18]	SC_0.BAU	
RT	☐	[27/8/2026, 14:02:40]	SC_0.RT	
EL	☐	[27/8/2026, 14:03:01]	SC_0.EL	

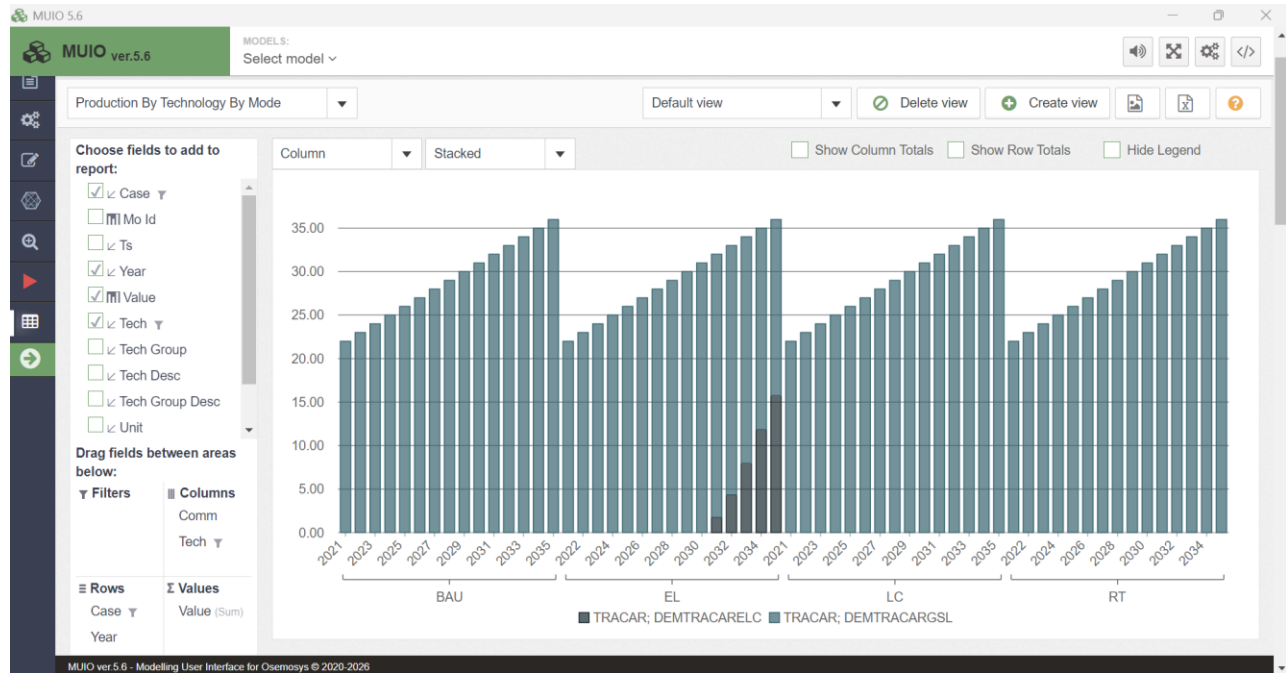
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The results of Production By Technology By Mode are the following:

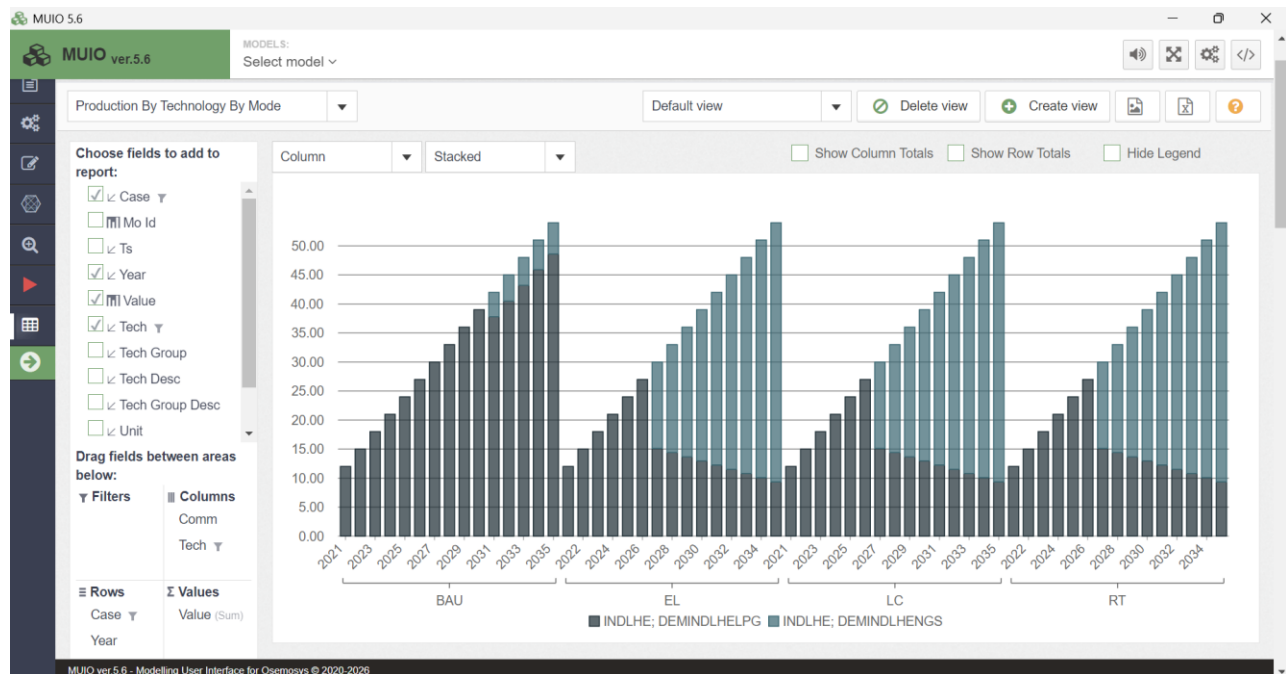
Energy production in the power sector



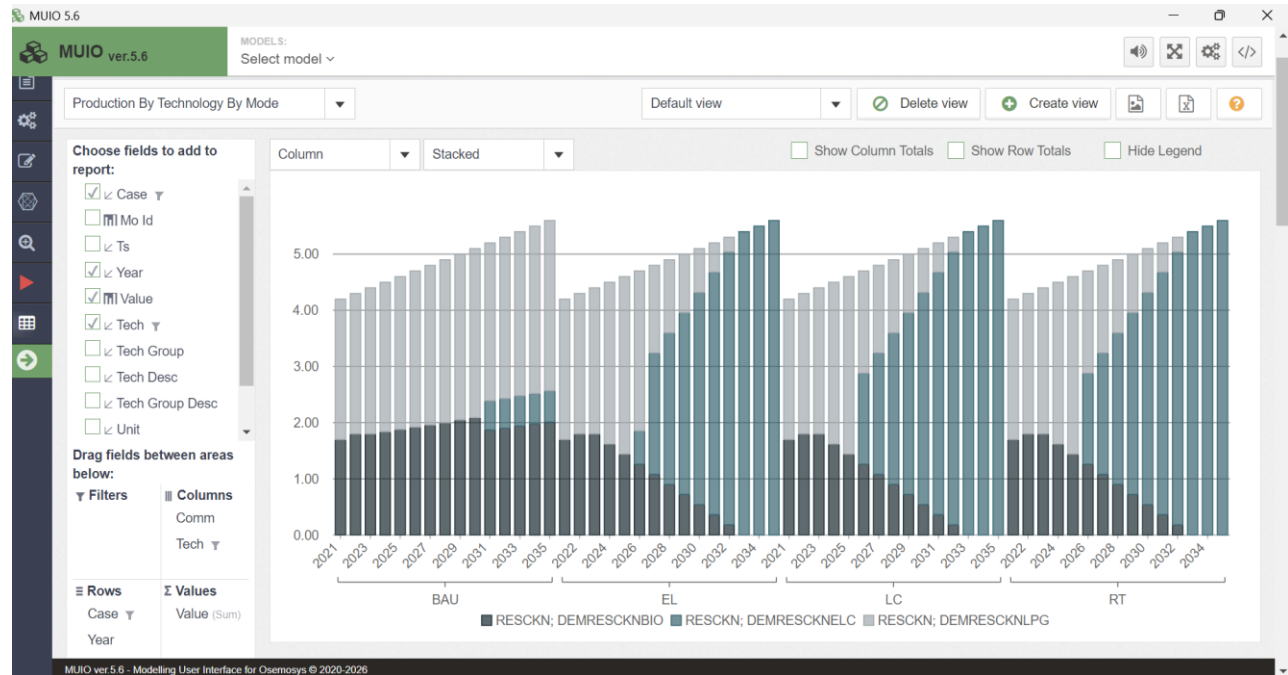
Energy production in the transport sector



Energy production in the industrial sector



Energy production in the residential sector



Question to consider: Based on the scenario results, could you provide a summary of key insights for energy planning?