## Static Grid Model Handbook

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## Core Flow-Based DA Capacity Calculation

**General principles:**

This Handbook was released by the Core TSOs to provide Market Participants with a comprehensive guide to the Core Static Grid Model.

The Core Static Grid Model is a list of relevant grid elements of the transmission system, including their electrical properties, that is published every six months by the Core TSOs in accordance with Article 25(2)(f) of the Day-ahead capacity calculation methodology of the Core capacity calculation region.

It consists of an Excel table with a list of relevant grid elements of the transmission system of Core TSOs, including their electrical properties.

**Scope of the published data:**

Core TSOs understand that the scope of the Static Grid Model should be defined broadly enough to satisfy Market Participants’ wish to perform meaningful capacity calculation analysis using this model. For this particular reason, the public consultation on Entso-e websites was launched (from 19th February 2021 – till 29th February 2021). The aim was to discover what improvements beyond the CWE practice would be welcomed by the market participants (both in scope and format).

Feedback received via the public consultation was thoroughly analyzed by the Core TSOs. Many improvements to the CWE practice were introduced thanks to the suggestions from Market Participants. Not all the proposed changes could be incorporated into the Core Static Grid Model due to legal and technical difficulties, though.

An example of extra data which cannot be published is the information about the generation units. Core TSOs are not owners of these data and cannot, therefore, publish them. Unfortunately, the suggestion to change the data format to CGMES could have not been satisfied due to technical difficulties associated. This format is not used in the Core Capacity Calculation process and the introduction of a new conversion would be highly demanding from a technical and time perspective.

The final scope of the Core Static Grid Model represents a compromise between the relevant suggestions from Market Participants and the technical and legislative possibilities of the Core TSOs.

The detailed description of the data sheets of the Core Static Grid Model can be found in the next pages.

**Lines** (Internal Lines)

This sheet includes information about internal lines in the Core CCR. Listed are only those assets which are strictly the property of the Core TSOs.

**For every line, the following data fields are included:**

* **NE name:** Name of a line[[1]](#footnote-1);
* **EIC Code:** EIC code of the line;
* **TSO:** Short name of the TSO owner of the line;
* **Substation 1 & Substation 2:** Full name of the substations the line is connecting;
* **Voltage level (kV):** Voltage level under which the line is operated (380/220kV);
* **Maximal Current Imax (A):** Maximum current that the line can withstand during a time limit:
	+ **Period 1, 2, …:** specific value for a given period[[2]](#footnote-2);
	+ **Fixed:** fixed value for the whole year;
* **Dynamic line rating (DLR):** Maximum current that the line can withstand is a variable based on ambient conditions:
	+ **DLRmin (A):** Lower band for the DLR range;
	+ **DLRmax (A):** Upper band for the DLR range;
* **Electrical Parameters:**
	+ **Resistance R (Ω):** Direct resistance in ohm;
	+ **Reactance X (Ω):** Direct reactance in ohm;
	+ **Suceptance B (µS):** Susceptance in microsiemens;
* **Length (km):** Length of the line in kilometers;
* **Comment:** Open field for comments.

**Tie-lines**

This sheet includes information about tie-lines in the Core CCR. Listed are only those assets which are strictly the property of the Core TSOs.[[3]](#footnote-3)

**For every line, the following data fields are included:**

* **NE name:** Name of a line;
* **EIC Code:** EIC code of the line;
* **TSO:** Short name of the TSO owner of the line;
* **Substation 1 & Substation 2:** Full name of the substations the line is connecting;
* **Voltage level (kV): V**oltage level under which the line is operated (380/220kV);
* **Maximal Current Imax (A):** Maximum current that the line can withstand during a time limit:
	+ **Period 1, 2, …:** specific value for a given period[[4]](#footnote-4);
	+ **Fixed:** fixed value for the whole year;
* **Dynamic line rating (DLR):** Maximum current that the line can withstand is a variable based on ambient conditions:
	+ **DLRmin (A):** Lower band for the DLR range;
	+ **DLRmax (A):** Upper band for the DLR range;
* **Electrical Parameters:**
	+ **Resistance R (Ω):** Direct resistance in ohm;
	+ **Reactance X (Ω):** Direct reactance in ohm;
	+ **Susceptance B (µS):** Susceptance in microsiemens;
* **Lenth TSO share until border (km):** Length of the line until borders in kilometers;
* **Comment:** Open field for comments.

**Transformers**

This sheet includes information about auto-transformer under-voltage level 380/220 kV and Phase Shifting Transformers under-voltage level 380kV or 220kV in the Core CCR. Listed are only those assets which are strictly the property of the Core TSOs.

**For every transformer, the following data fields are included:**

* **Location:** Full name and short name of the substation the transformer is located in;
* **EIC Code:** EIC code of the transformer;
* **TSO:** Short name of the TSO owner of the transformer;
* **Voltage level U (kV):** Voltage level of the primary and secondary winding of the transformer;
* **Maximal Current Imax (A):** Maximum current that the transformer can withstand during the time limit:
	+ **Min, Max:** minimum and maximum value on the temperature-dependent asset;[[5]](#footnote-5)
	+ **Fixed:** fixed value for the whole year;
* **Electrical Parameters:**
	+ **Resistance R (Ω):** Direct resistance in ohm;
	+ **Reactance X (Ω):** Direct reactance in ohm;
	+ **Susceptance B (µS):** Susceptance in microsiemens;
	+ **Capacitance G (µS):** Direct capacitance in microsiemens;
* **Phase Shifting Properties (for PST only):**
	+ **Taps used for nRAO:** Standard PST taps range used for non-costly RA optimization;
	+ **Theta θ (°):** The maximum phase angle of the PST;
	+ **Symmetrical/Asymmetrical:** Type of PST. It indicates whether both the phase angle and the amplitude of output voltage is altered (asymmetrical), or only phase angle is altered (symmetrical);
	+ **Phase Regulation δu (%):** Relative value of vector difference of source and load voltage in case of phase regulation;
	+ **Angle Regulation δu (%):** Relative value of vector difference of source and load voltage in case of angle regulation.
* **Comment:** Open field for comments.

**Remedial Actions**

This sheet includes information about non-costly remedial actions which are provided by Core TSOs for the process of non-Costly Remedial Actions Optimization (nRAO) of the Core Capacity Calculation process.

**For every non-costly remedial action, the following data fields are included:**

* **Name of RA:** Full name of the remedial action;
* **TSO:** Short name of the TSO defining the RA;
* **Description:** Short description of the RA.

**Annex 1: Seasonal Current Limits**

Seasonal Limits for Lines and Tie-lines

|  |  |  |
| --- | --- | --- |
| Core TSO | Applicable | Description |
| 50 Hertz |  |  |
| AMPRION | Yes | Amprion applies seasonal limits for some tie-lines. The periods are not fixed and differs dependent on the framework between TSOs.  Seasonal limits for internal lines are not fixed periods but dynamic periods i.e. in the function of temperature forecast a certain rating is applied. |
| APG | No | DLR to be implemented on a number of network elements in the upcoming years |
| ČEPS | No | DLR is applied instead on many lines. |
| CREOS |  |  |
| ELES | No | DLR to be implemented for all lines. The target is to have DLR implemented in Q2 2022. |
| ELIA | Yes | Seasonal limits are not fixed periods but dynamic periods i.e. in the function of temperature forecast a certain rating is applied.On top of this: DLR is applied on most lines |
| HOPS | Yes | Not yet in the operational use while ongoing studies with testing data will soon define further use on relevant elements (mainly on 220 kV lines) |
| MAVIR | Yes | Winter: 1st December - 28th (or 29th) FebruaryInterseason 1: 1st March - 31st MaySummer: 1st June - 31s AugustInterseason 2: 1st September -30th November |
| PSE | Yes | DLR in practice. Simplification for Static Grid Model:Winter: 1st January - 31st MarchInterseason 1: 1st April- 30st JuneSummer: 1st July - 30s SeptemberInterseason 2: 1st October-31th December |
| RTE | Yes | RTE uses 4 seasonal limits: winter, summer, and interseason 1&2. Seasonal periods can vary from a line to another depending on its location |
| SEPS | Yes | SEPS uses 2 seasonal limits, seasonal limits are not fixed, mainly function of temperature |
| TENNET DE | No | DLR is applied instead on many lines. |
| TENNET NL | Yes | Summer: 1st April - 31st OctoberWinter: 1st November - 31st MarchFor the subset of lines, dynamic line rating will be used |
| TRANSELECTRICA | Yes | Seasonal limits for lines are not fixed periods but dynamic periods i.e. in the function of temperature forecast a certain rating is applied.Period1=Summer: June, July, AugustPeriod2=Interseason: March, April, May, September, October, NovemberPeriod3=Winter: December, January, February |
| TRANSNET BW | Yes | Seasonal limits are not fixed periods but dynamic periods i.e. in the function of temperature forecast a certain rating is applied.Period 1: Summer: 01.05 - 30.09 / if no interseason listed: 01.03-30.10Period 2: Winter: 01.11-28.02Period 3: Interseason: 01.03-30.04 / 01.10 - 31.10On top of this: DLR is applied on many lines  |

Seasonal Limits for Transformer

|  |  |  |
| --- | --- | --- |
| Core TSO | Applicable | Description |
| 50 Hertz |  |  |
| AMPRION | No |  |
| APG | No |  |
| ČEPS | No |  |
| CREOS |  |  |
| ELES | No |  |
| ELIA | Yes | Seasonal limits are not fixed periods but dynamic periods i.e. in the function of temperature forecast a certain rating is applied |
| HOPS | No |  |
| MAVIR | No |  |
| PSE | No |  |
| RTE | No |  |
| SEPS | No |  |
| TENNET DE | No |  |
| TENNET NL | No |  |
| TRANSELECTRICA | No |  |
| TRANSNET BW | No |  |

1. Names (of lines, substations, transformers and remedial actions) in the Core Static Grid Model are defined in accordance with the naming convention presented in the Core Publication Tool Handbook. [↑](#footnote-ref-1)
2. Periods are defined individually by every Core TSO and are included in the Annex 1 of this document. [↑](#footnote-ref-2)
3. For the purpose of NIB CCR the Italian tie-lines are included. These lines are marked accordingly in the *TSO* field. [↑](#footnote-ref-3)
4. Periods are defined individually by every Core TSO and are included in the Annex 1 of this document. [↑](#footnote-ref-4)
5. Min, Max values are applicable only to some Core TSOs, see the Annex 1 of this document. [↑](#footnote-ref-5)