

HOW TO GUIDE

Loading climate data from online database



energyPRO



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About energyPRO

energyPRO is a Windows-based modeling software package for combined techno-economic analysis and optimisation of complex energy projects with a combined supply of electricity and thermal energy from multiple different energy producing units.

The unique programming in energyPRO optimises the operations of the plant including energy storage (heat, fuel, cold and electrical storages) against technical and financial parameters to provide a detailed specification for the provision of the defined energy demands, including heating, cooling and electricity use.

energyPRO also provides the user with a detailed financial plan in a standard format approved by international banks and funding institutions. The software enables the user to calculate and produce a report of the emissions by the proposed project.

energyPRO is very user-friendly and is the most advanced and flexible software package for making a combined technical and economic analysis of multi-dimensional energy projects.

For further information concerning the applications of energyPRO please visit www.emd.dk.

Terms of application

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Contents

Instead of importing climate time series from files and spreadsheets energyPRO offers the opportunity to download such data from an online server provided by EMD International.

This guide includes a description of the available data and a step-by-step guide on how to retrieve these data into energyPRO.

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Online climate data in energyPRO

The data from the energyPRO online server originates from three different climate models: The NCAR reanalysis project, the Climate Forecast System Reanalysis (CFSR) and the Climate Forecast System Reanalysis 2 (CFSR2). The three models offer modelled weather data in a high-resolution grid covering the whole world, based on weather measurements. The models are described in more details in the following.

NCAR Data

The data originates from the NCAR reanalysis project¹, which has provided climate data four times daily in a global grid since 1985 to present time. The NCAR data that is available in energyPRO accounts:

- **Air temperature:** Instantaneous air temperatures in Celsius degrees calculated at 0, 6, 12, 18 hour
- **Wind speed:** Mean wind speed in m/s at 10 meters altitude calculated at 0-6, 6-12, 12-18, 18-24 hour
- **Air pressure:** Mean air pressure in hPa calculated at 0-6, 6-12, 12-18, 18-24 hour
- **Relative humidity:** Mean relative humidity in % calculated at 0-6, 6-12, 12-18, 18-24 hour

energyPRO offers the possibility to convert NCAR data into 24 values per day or one value per day instead of the standard interval of four values per day.

The conversion from four times daily to 24 times daily is done using linear interpolation so if the air temperature at 0 hour is e.g. 2.0 and 8.0 in the 6th hour, the calculated air temperatures will be:

Hour	Air temperature	Source
0	2.0	From NCAR
1	3.0	Calculated
2	4.0	Calculated
3	5.0	Calculated
4	6.0	Calculated
5	7.0	Calculated
6	8.0	From NCAR

The conversion from standard four times daily to one time a day is simply done by finding the mean value of the four NCAR values from that day.

¹ The data are from the NCAR - reanalysis project. NCEP Reanalysis data provided by the NOAA-CIRES Climate Diagnostics Center, Boulder, Colorado, USA, from their web site at <http://www.cdc.noaa.gov/>.

CFSR Data

The Climate Forecast System Reanalysis (CFSR)² is a model that offers data from 1979 until 2010 on an hourly level in a grid covering the Globe with a horizontal resolution on 0.5 degree. The CFSR data available in energyPRO includes:

- **Air temperature:** Air temperatures in Celcius degrees provided as a mean value in one hour intervals
- **Solar radiation:** Solar radiation in W/m2 provided as a mean value in one hour intervals
- **Wind speed:** Wind speed in m/s modelled at 10 meters altitude provided as a mean value in one hour intervals
- **Precipitation:** Precipitation is in mm and provided as a mean value in one hour intervals
- **Humidity:** Humidity is in % and provided as a mean value in one hour intervals

CFSR2 Data

The Climate Forecast System Reanalysis 2 (CFSR2) data is very similar to the CFSR data and is also given on an hourly basis. The major difference is that the CFSR2 data functions as a prolonging of the CFSR data and has thus only been available since 2010. Another difference is the horizontal resolution, which is on 0.2 degrees instead of 0.5 degrees. As such, the CFSR2 data available in energyPRO includes:

- **Air temperature:** Air temperatures in Celcius degrees provided as a mean value in one hour intervals
- **Solar radiation:** Solar radiation in W/m2 provided as a mean value in one hour intervals
- **Wind speed:** Wind speed in m/s modelled at 10 meters altitude provided as a mean value in one hour intervals
- **Precipitation:** Precipitation is in mm and provided as a mean value in one hour intervals
- **Humidity:** Humidity is in % and provided as a mean value in one hour intervals

² For more information on the Climate Forecast System Reanalysis model go to www.ncdc.noaa.gov/

Retrieving time series from online server

There are two ways of importing data from the online server as time series. You can either use the globe icon button at the toolbar or right click on the "External Conditions"-folder in the folder structure, as shown on Figure 1.

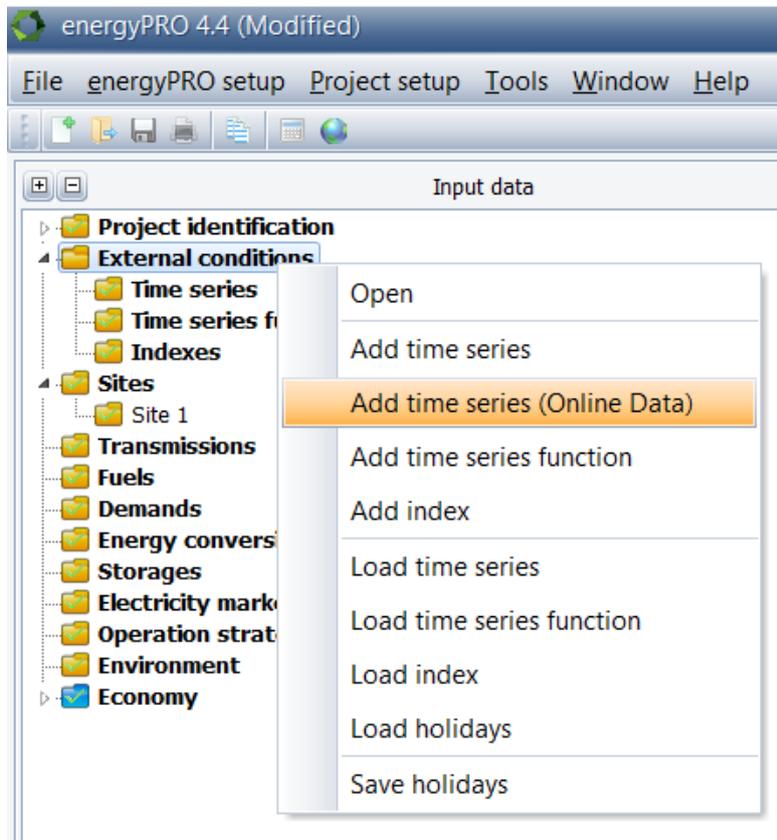


Figure 1. Retrieving data as time series from online database

After using either of the two methods you will be presented with the window shown on Figure 2 where you can select the location and the type of data to be downloaded.

In the window you can choose between using Google Maps or an offline map in the dropdown menu "Map type" in the right hand side.

In order to navigate in the map, press and hold the left mouse button on the map while dragging the mouse around. You zoom in and out using the mouse wheel or by clicking the "+" and "-" in the lower right corner of the map.

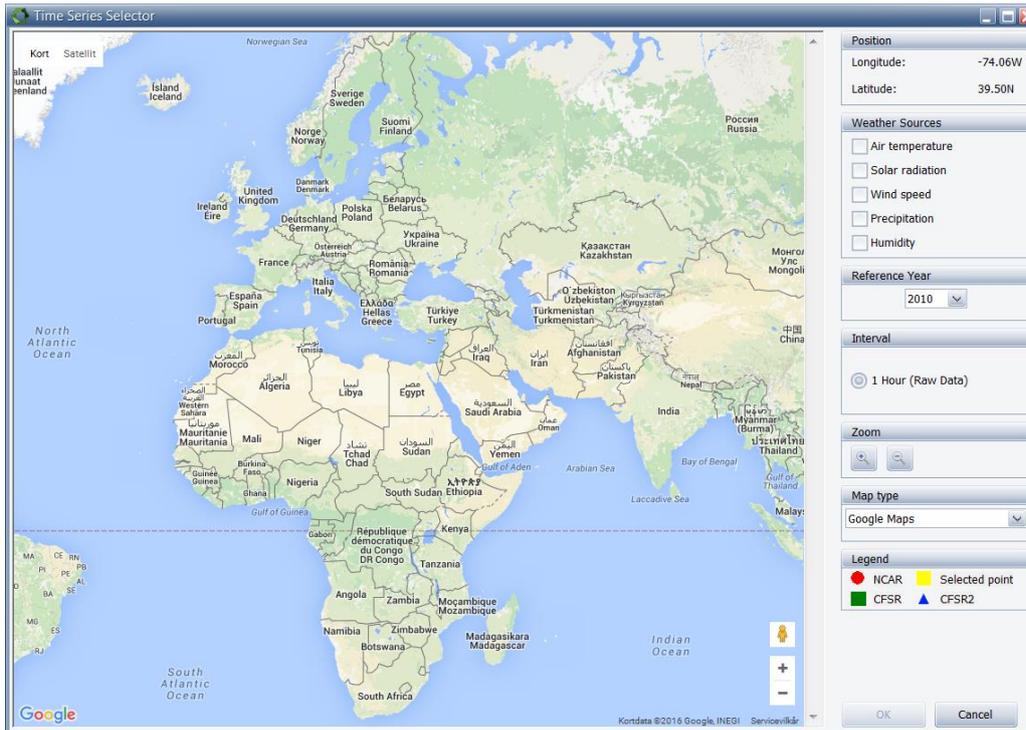


Figure 2. Using Google Maps to choose the location

Once you have the area of interest in focus you can click on the globe with the left mouse button. This will ask the online server for the nearest online weather data which will be presented on the globe with the legends shown in the lower right corner on Figure 4.

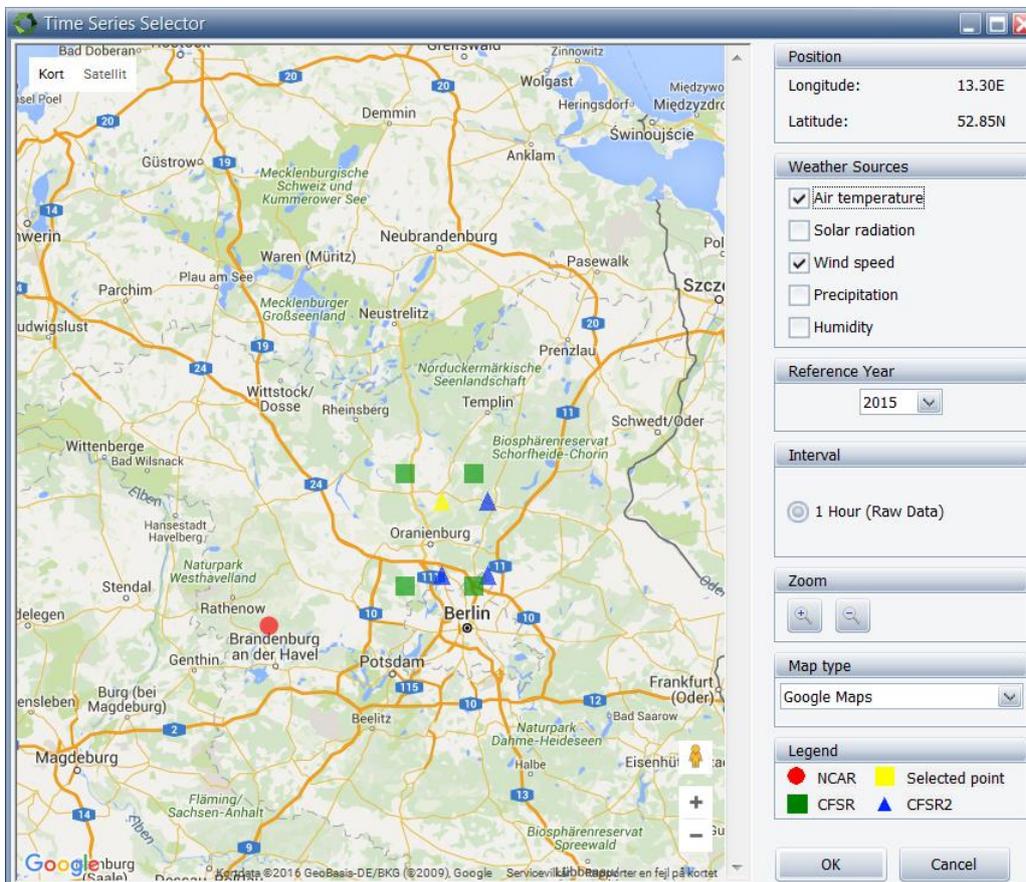


Figure 3. Shows the available data points nearest the selected location

Once the nearest data sources are shown you select one of them by clicking on it with the left mouse button. The next step is to select which climate data you are interested in by clicking the check-boxes in the "Weather Sources" group. For each checked weather source a time series will be created.

Before downloading the data from the online server, you must select the year from which data is desired. Select the desired year in the drop down box and click OK to download and create the time series.

For NCAR only. If you want the time series to be created in different intervals than the standard four times daily regarding NCAR data, you can choose a different interval in the Interval group box. For more information, see section on Online climate data in energyPRO.

Once you click the OK button energyPRO will contact the online data server provided by EMD international to fetch the selected climate data. For each weather source that is selected, a new time series with default name and symbol is created. You can rename the time series and symbols as you wish by right-clicking the time series and select rename.

Please notice, that you can find more information on how to use energyPRO in the How to Guides, User's Guide and tutorials on EMD's website:

<http://www.emd.dk/energypro/download/tutorials-and-how-to-guides/>