VOLT
POWER ANALYTICS

VOLT POWER ANALYTICS PORTAL USERGUIDE

Updated 09. September 2024

CONTENTS

Authors: Katinka Bogaard & Tom Donnelly

Version: 1.1

Last Edited:2024-09-09

For any feedback, comments or questions, please get in touch with us at contact@voltpoweranalytics.com.

VOLT POWER ANALYTICS PORTAL

From Q2 2024, Volt Power Analytics have released their online portal and API for clients to log into, analyze and download the latest power data relevant for European markets. The core of the portal page is split into two sections: **Dashboard** and **Curves**.

1. DASHBOARD

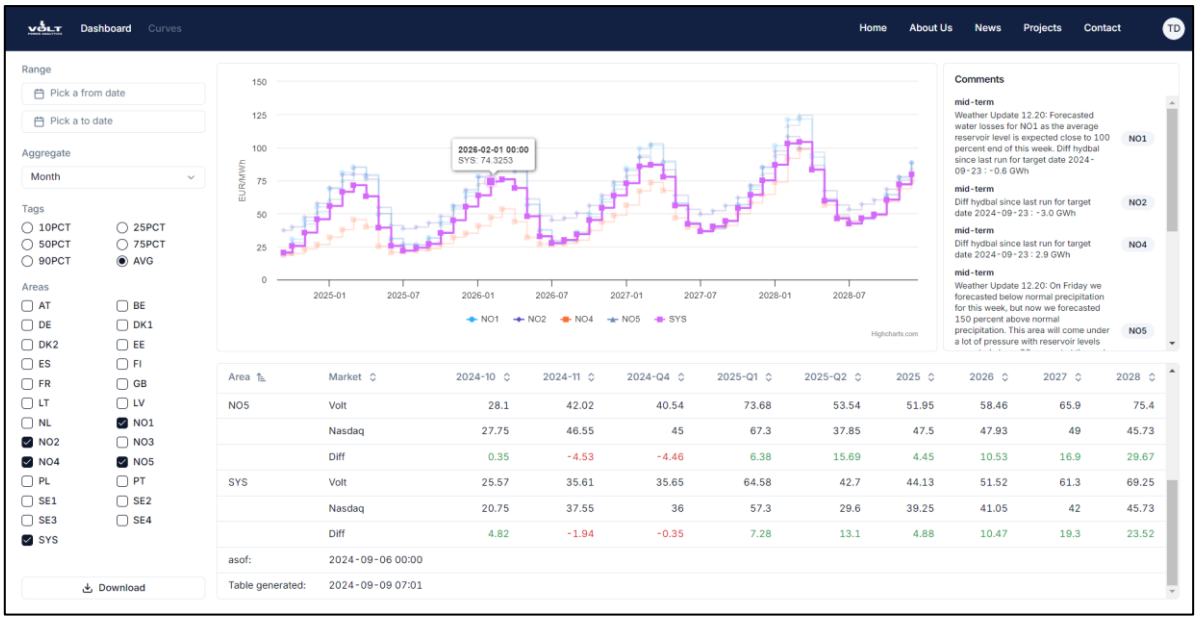

Figure 1 The Volt Portal Dashboard presenting the AVG for NO1, NO2, NO4 and NO5, with the System Price highlighted

Our homepage for the portal is an easy to understand dashboard, showing our newest price forecast for the price areas selected in areas.

1.1. Range

Range, located at the top left, allows users to select a specified range from a calendar, or alternatively manually typed in. **Please note**, if the date is not correctly typed in the correct format, no data will be retrieved.

1.2. Aggregate

The dashboard allows you to choose the resolution of the data presented (e.g. week, month, quarter, year).

1.3. Tags

Tags allow the user to swap between the different percentiles. By default this is set to the average.

1.4. Areas

Areas shows the user which areas are currently on display, and includes the **System Price.** Toggle areas on and off by clicking on the relevant tick boxes. **Please note:** to get the best results out of the dashboard, only select several areas at a time.

1.5. Download

Click on the download button, located at the bottom left, to extract the data currently being presented. Upon clicking on the button, users will be given the option of downloading the data in .xlsx format (Excel), or comma separated values (CSV). Clicking will begin the download immediately.

1.6. Graph

At the top of the dashboard is an interactive chart showing data for all areas currently selected. To single out the data series for an individual area, hover over one of the data points within the series. This will also show you the value of the point.

It is also possible to zoom into an area of the graph. To do so, click and drag the area you want to view using the left mouse button – doing so will highlight the area in blue. To cancel the zoom, click on **Reset zoom** on the top right of the graph.

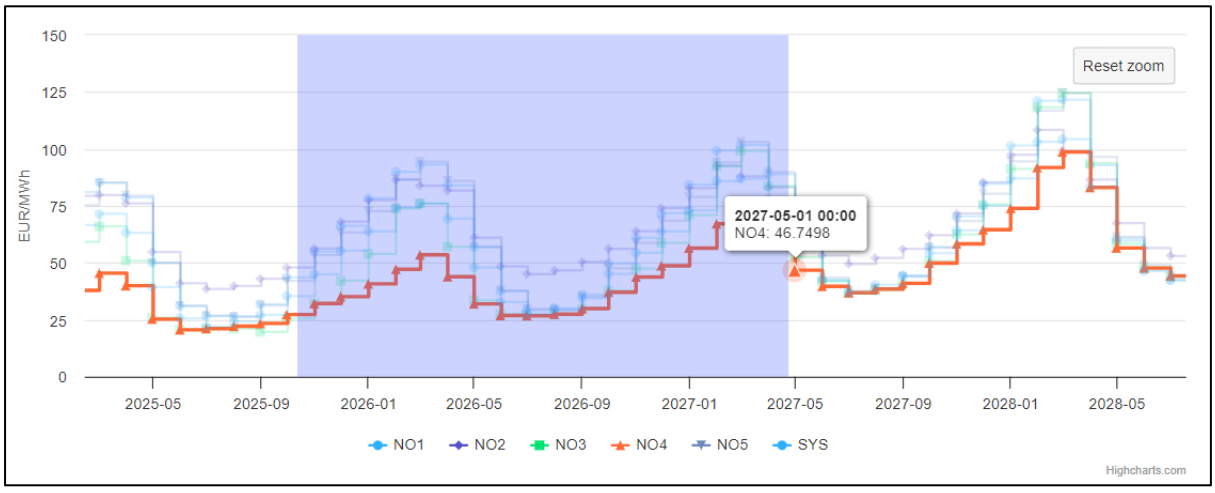

Figure 2 A selection of the chart has been highlighted. Once the mouse button is released, the chart will zoom on this area.

1.7. Comments

Any accompanying comments published by displayed on the right of the graph.

1.8. Table

Below the graph is a table containing the raw data. The prices are shown together with Nasdaq's closing prices for the Nordic price areas, and the difference between the two.

At the bottom of the table, users can see the timestamp in which the table was generated as well as the forecast date (asof), in CET/CEST. The table is updated every evening after our mid-term run and at 5 AM UTC.

2. CURVES

Search and find for curves in Volt's database. This section is used to both find data and also visualization each individual curve in a way that users easily can investigate the data. See the section "Naming Convention" to get an introduction to how we give unique names to each curve in our database.

2.1. Searching

Users can either select filters from the menu on the left hand side (covering **Area**, **Curve_type**, **Groups**, and **Provider**. Click on each group to expand or minimize it.

Curves can also be searched using the **Fuzzy filter**, seen at the top of the search results. This will retrieve any curves containing the text entered into the box.

Answer: Lastly, it is possible to use a **Strict search**, using the the arrow next to the "Name" column. This will return only the exact hits for the text entered.

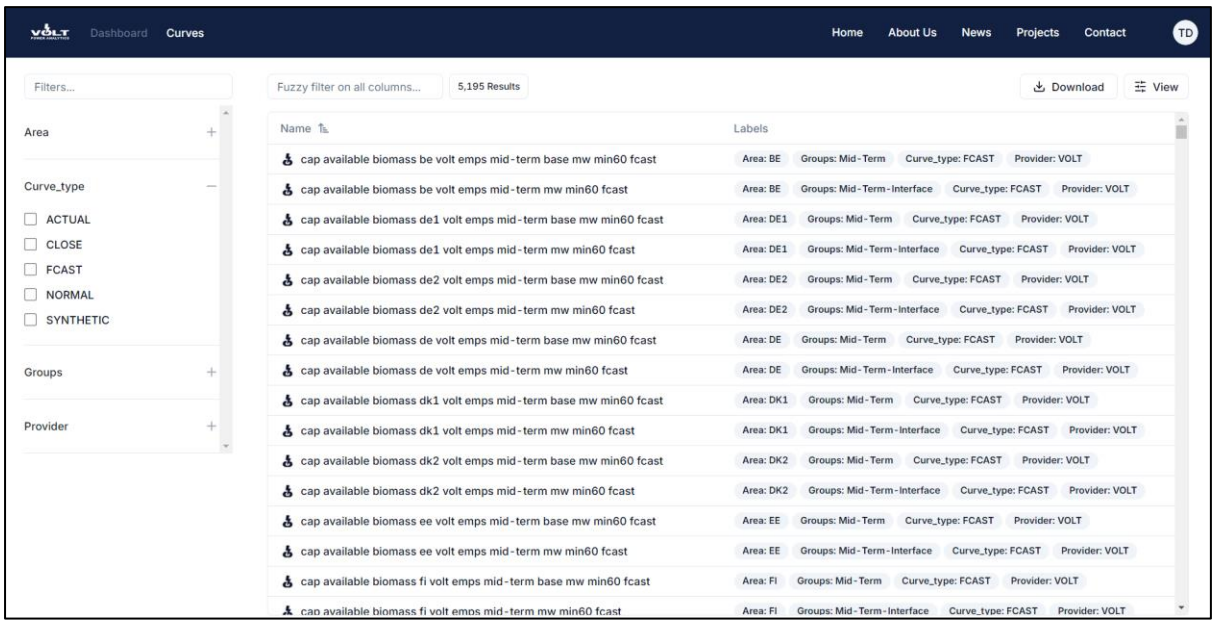

Figure 3 The Curves search page

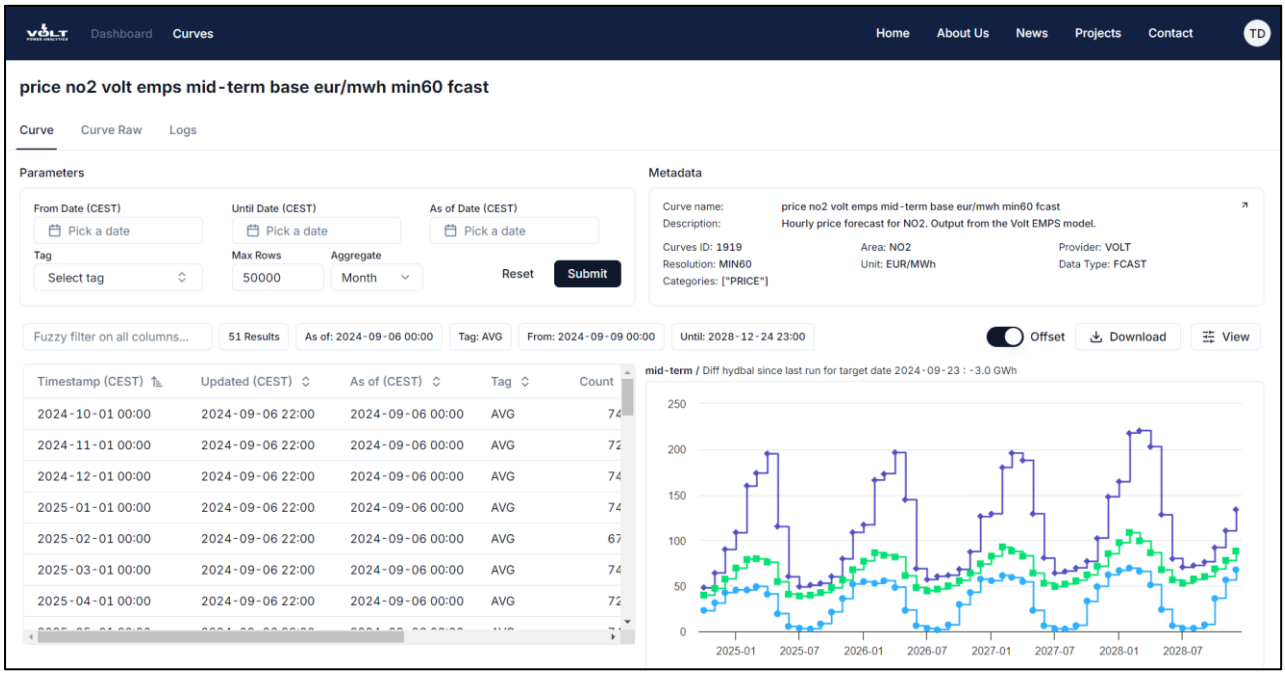

Figure 4 An example of the portal curves page

2.2. Graph

The graph in the bottom right corner shows the data, alongside the observed minimum and maximum in within the given period. E.g. Obs max for June 2025 shows the maximum observed hourly price in June 2025. Users can also zoom in by highlighting the area.

2.3. Parameters

Input for subsetting data and choosing which data you want to look at. Users can set the data range to be shown (From Date, Until Date), the forecast date (As of Date), the tag (predefined with AVG, MIN, MAX and percentiles.

Users can also choose each individual weather year between 1991 and 2020 by adding them manually). MaxRows specifies the maximum number of data points you want to return in each API call. The maximum allowed value here is 50 000 data points.

Aggregation allows the user to set the resolution they want to see the data in (e.g. hour, day, week, month, quarter, year). As of today, the aggregation shows the average of the data. Soon, we will also add sum.

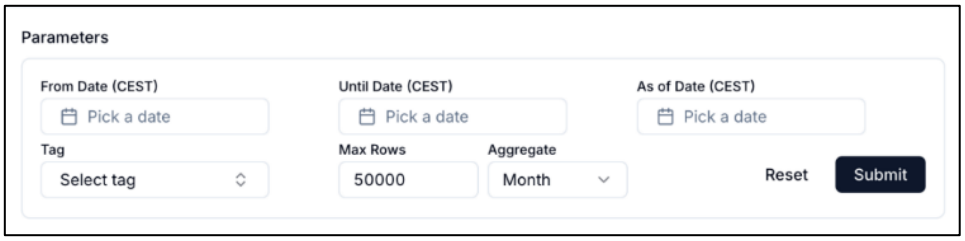

Figure 5 The parameters search function

2.4. Download

To download the current data selection on the Curves page, click on the Download button located on the right hand side of the portal. Upon clicking on the button, users will be given the option of downloading the data in .xlsx format (Excel), or comma separated values (CSV). Clicking will begin the download immediately.

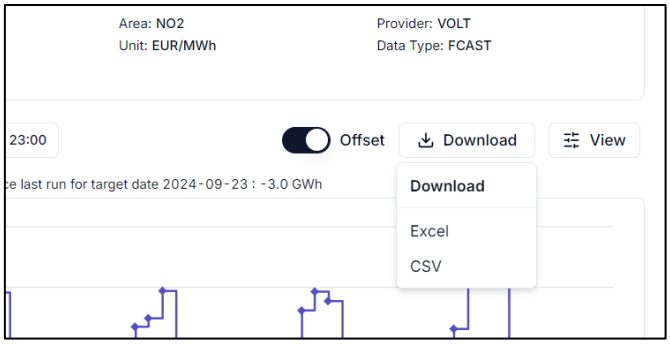

Figure 6 The location of the download button

2.5. Metadata

The descriptors of the data are stored in the metadata table. Each curve has its own unique combination of metadata, giving it a unique name. The metadata is joined in the structured way that gives a consistent naming convention across Volt's database.

Included in the metadata is also a description, that is meant to give a written description of what the data covers. The curve ID is also shown. This ID can be used when querying data, if one does not want to use the unique name.

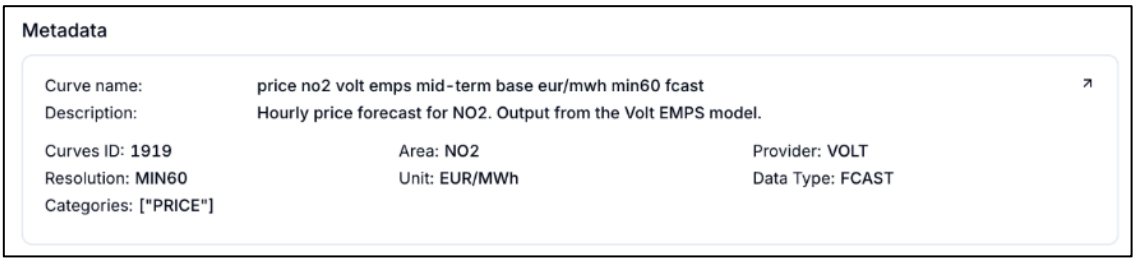

Figure 7 The Metadata curve information

In addition, we also show the raw data under “Curves Raw” as shown in the screenshot below. This is a simplified presentation of the data and is meant to give insight into the data if one were to extract it “as is” via the API.

Figure 8 An example of a raw data curve

3. VOLT’S DATABASE STRUCTURE AND API

Volt’s database contains all data relevant for our model runs, input and output, that you need to get full insight into our model. The portal is structured so that you can easily find the data and a dashboard is provided for the forward model runs, summarizing the latest price forecast from Volt compared to the Nasdaq closing prices.

PLEASE NOTE!

Aggregations in the API and in the data portal are only average today. We will add sum soon, so that users can also see the total monthly production of a given production type, for example.

3.1. Naming Convention

Volt uses a naming convention that gives a unique name for each timeseries, making it possible to query the data directly by its unique name. The name is generated using a combination of the metadata that defines the data and is of the format:

<cat 1> <cat 2> <cat x*> <area> <provider> <model_type*> <scenario*> <unit> <resolution> <data type>

*elements marked are only included in the naming convention if it is applicable for the data (e.g. actual data does not have a model_type).

Example: "price no2 volt emps mid-term base eur/mwh min60 fcast"

3.2. Metadata Fields

Metadata is used to describe the data by different attributes In Volt's database, there is always a unique combination of the metadata fields, making it easy to search and find data.

- **Categories:** Used to define the data, first in the most general term to group the data (e.g. category 1 is production or consumption) and up to 3 categories are used to specify the underlying data. For more information on category descriptions, see **Appendix 1 on page 18**
- **Area:** Refers to the price area, country or region the data applies for.
- **Provider:** The source of the data. E.g. Entso-e, Volt, Energinet, Fingrid.
- **Model Type:** Describes the model that has been used to generate the data. Only relevant for forecasts and backcasts.
- **Scenario:** Describes which set of data we are looking at. E.g. Base, High, Low.
- **Unit:** A standard in terms of which other quantities may be expressed. E.g. EUR/MWh, MW, MWh.
- **Resolution:** Describes the frequency of the data and observations. E.g. MIN60 -> One observation each hour of the day, MIN15 -> One observation for each 15 minutes interval.
- **Data Type:** Describes if we are looking at actual data, forecasts or closing data.

3.3. Data Storage and Format

All curves have a unique name and a unique ID (CurvesId via Api query, Curve ID in portal) which can be used to query data instead of the name directly.

All curves have the attributes:

- **Curve Name:** a unique name that describes the dataset and underlying values. Follows a standard naming convention across Volt Power Analytics' database.

- **Timestamp:** the time in which an associated value belongs to. Datetimes in this column are always in UTC.
- **Asof:** the timestamp in which a forecast curve applies for. All forecast curves have the asof column active and the user can query data based on a given asof date. All datetimes are in UTC.
- **Tag:** A field which indicates which data you are looking at, e.g. a specific weather year, percentile, minimum observed value, maximum observed value, average.

3.4. Connecting to the API

Users can create a personal API user directly in the portal. Click on your initials in the top right corner of the portal. Select “New API user” and a client ID and client secret will appear. Take good care of these, as this is the only time they will be shown together.

If you misplace your client id or secret, you can easily generate a new pair, but your old credentials will be deactivated. The client ID and secret access rights are updated once per day, meaning there may be a time lag between creating the API user and when your access rights are delegated.

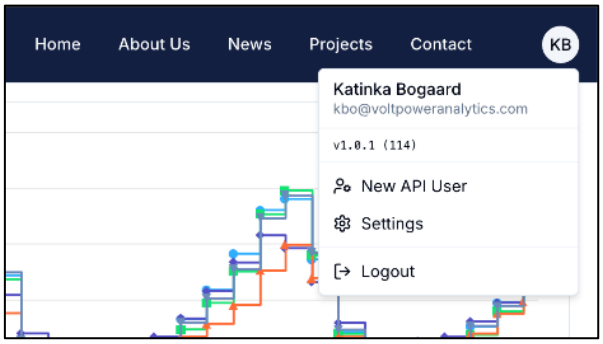

Figure 9 The menu at the top right showing the New API User option

3.5. Other API Documentation

Complete documentation of the API will be made available soon, including Postman queries.

In the meantime, clients are encouraged to use the Python API code connector as a basis for building their own queries either in Python or in other programming languages.

4. FREQUENTLY ASKED QUESTIONS: MID-TERM

Question: **What weather years is your EMPS mid-term model using?**

Answer: Our model currently uses the 30 weather years from 1991 to 2020, to be in line with the Norwegian NVE latest weather year data set for hydro profiles.

Question: **Is 30 weather-years sufficient for hydro power areas?**

Answer: Based on recent weather developments and tests conducted using 40 weather years with our model, our findings indicate that 30 weather years is sufficient. If you would like to see this analysis, please get in touch with us at contact@voltpoweranalytics.com.

Question: **What price areas do you cover?**

Answer: We cover all prices areas shown in the map below. We also plan to expand to cover Italy North soon. Our model is also prepared to simulate with a German, Dutch or British market split.

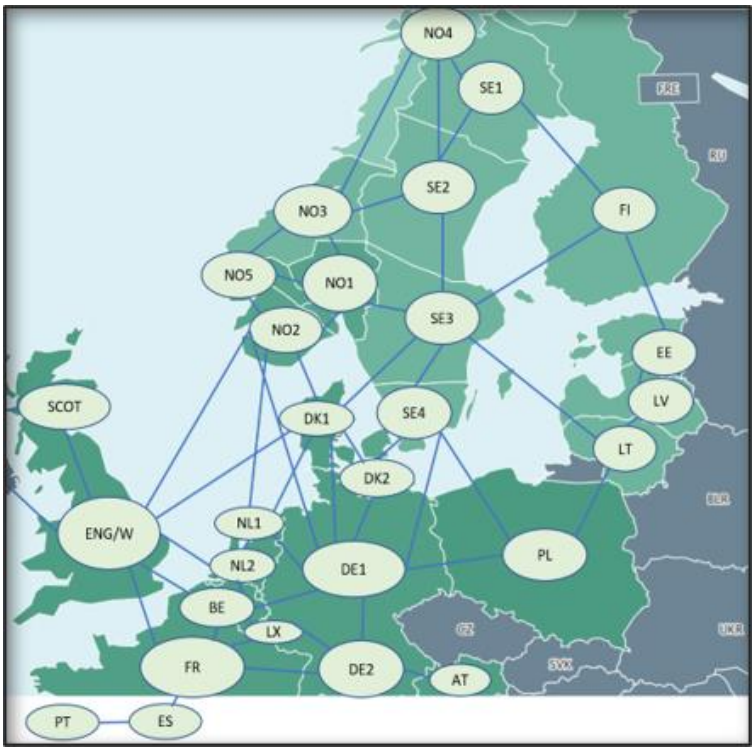

Figure 10 An overview of the model stucture, connecting the bidding areas

Question: **What is input data and what is output data from the EMPS model?**

Answer: Please see the following tables.

Input data

	Definition	Curve Name Format	Resolution	Comment
Inelastic Consumption	Non-price sensitive consumption.	cons inelastic <area> volt emps mid-term base gw min60 fcast	Hourly	Avg, min, max, percentiles only.
Onshore Wind		prod wind onshore <area> volt emps mid-term base gw min60 fcast	Hourly	Avg, min, max, percentiles only.
Offshore Wind		prod wind offshore <area> volt emps mid-term base gw min60 fcast	Hourly	Avg, min, max, percentiles only.
Solar PV		prod solar pv <area> volt emps mid-term base gw min60 fcast	Hourly	Avg, min, max, percentiles only.
Gas price	Closing price for gas from Nasdaq	price future gas ttf nasdaq eur/mwh <resolution> close		
EUAs	Closing price for EUAs from Nasdaq	price future co2 eua nasdaq eur/mwh y close		
Thermal availabilities per production type	Installed capacity minus UMMs	cap available <type> <area> volt emps mid-term base mw min60 fcast	Hourly	Will be made available shortly.

Output data

	Definition	Curve Name Format	Resolution	Comment
Price		price <area> volt emps mid-term base eur/mwh min60 fcast	Hourly	All 30 weather years.
Hydro power production	Non-price sensitive consumption	prod hydro total <area> volt emps mid-term base gw min60 fcast	Hourly	Avg, min, max, percentiles only.
Electrolyser consumption		cons electrolyser <area> volt emps mid-term base gw min60 fcast	Hourly	Avg, min, max, percentiles only.
Thermal production per production type	Includes UMMs. E.g. coal, gas, biomass, waste	prod <type> <area> volt emps mid-term base gw min60 fcast	Hourly	Avg, min, max, percentiles only.
Nuclear production	Where relevant. Includes UMMs	prod nuclear <area> volt emps mid-term base gw min60 fcast	Hourly	Avg, min, max, percentiles only.
Inflow profiles	Net inflow	river discharge <area> volt emps mid-term base mwh w fcast	Weekly	Avg, min, max, percentiles only.
Per border flows		flow area_from>area volt emps mid-term base gw min60 fcast	Hourly	Avg, min, max, percentiles only.
Hydropower reservoir level	Per price area		Hourly	Will be made available shortly.
Water values	Per price area		Weekly	Will be made available shortly.

All 30 weather years are written to the database per run for prices. For the rest of the data, we write the average, min, max and percentiles to the database for each run. All data in the curves are of hourly resolution, excluding the inflow profiles, which are in weekly resolution.

Question: **What horizon does the forecast cover?**

Answer: For now, the simulations cover the period from now (from front week onwards) and until end 2028. We plan to expand to cover 2029 as well in the near future.

Question: **When is the EMPS model run and with what input?**

Answer: Our EMPS mid-term model is run every business day, with results in the database at the latest midnight CET each evening, excluding Friday runs, which are published before the following Sunday midnight CET.

The latest closing prices from Nasdaq for fuels and EUAs are fed into the model each evening after closing time.

Updated UMMs for thermal plants are updated and fed into the model daily.

Hydropower reservoir levels are updated every week upon the publication of final actual reservoir levels from NVE every Thursday.

Question: **How is the data structured?**

Answer: All data for the mid-term EMPS run are stored in under the access group "mid-term". This means that any data with mid-term in the name, is associated with the EMPS mid-term model run.

Data has been structured across Volt's database so that the asof dates are aligned. This means that a given asof date for the mid-term run has the same asof date as the fuel prices from Nasdaq and the closing prices/EPADs for the different price areas. This has been done to ensure that the data is easy to map across the model runs and that you can be sure that you are looking at the correct input data compared to the output.

Question: **What is the best way to search for data?**

Answer: When using the portal, there are multiple ways to search for data under "Curves". The main search bar is a "fuzzy search", meaning the search does a general search and returns all results that contain the text entered. For a strict search, the arrow next to "Name" can be used. This will return only the exact hits for the text entered.

When subsetting data based on different metadata (e.g. price area, access group), one can also search, in order to quickly be able to find the metadata field you are looking for and narrow down the hits.

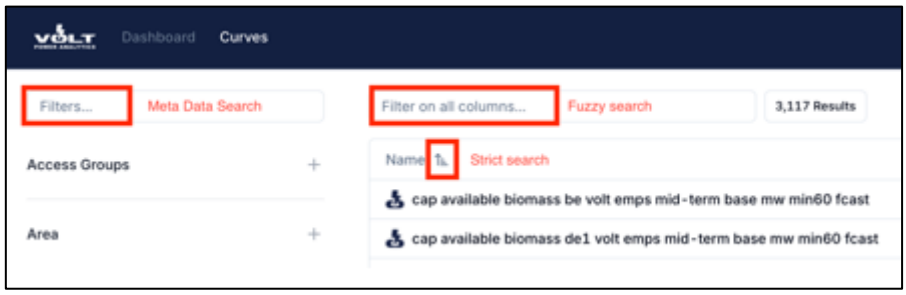

Figure 11 Filtering columns within the portal

5. FREQUENTLY ASKED QUESTIONS: DATA

Question: **How can I access data?**

Answer: Data can be accessed through our rest API via Python or your preferred programming language. Data can also be accessed through our portal at portal.voltpoweranalytics.com, by looking up the curve that you are interested in and viewing it directly there. See the example code and Python API connector code for more information.

Postman documentation will be made available soon.

Question: **What timezone is the data stored in?**

Answer: All data in our database is stored in UTC, to ensure reliable operational processes around day-light savings and to be consistent in which timezone the data is in.
Users can easily specify to get data in another timezone in our Python API code by specifying the output timezone in the function.

Question: **Is it possible to pre-aggregate the data on the API side?**

Answer: Yes, you can use a separate function called that is designed to aggregate the data from the given resolution to hourly, daily, weekly, monthly, quarterly, yearly. You can easily choose the resolution yourself. The output is, as of today, the average of the values for the chosen curve and resolution. Soon, we plan to add functionality for taking the sum as well.

Question: **Do you have historical data available as well?**

Answer: Yes, we have historical data in our database for several different providers. See the screenshot below for a complete list. This data is updated continuously and always contains the most recent data published. For access to the data, send us a request directly at contact@voltpoweranalytics.com.

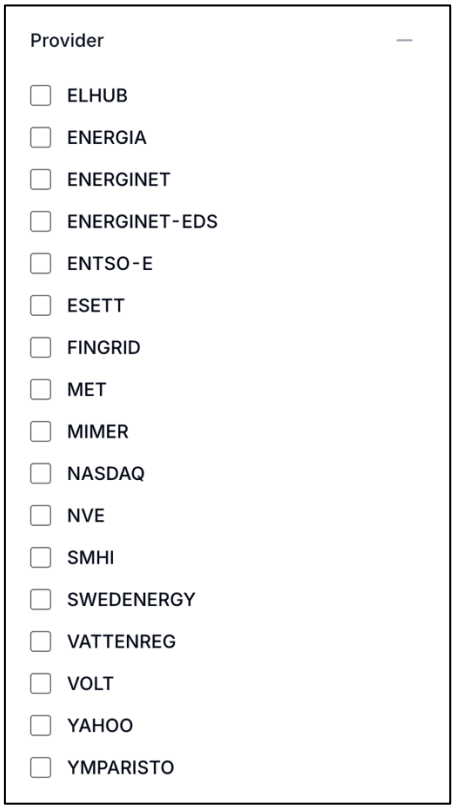

Figure 12 The list of all historical data providers available through Volt's Portal

6. FEATURES UNDER DEVELOPMENT

The following features are in the pipeline as of June 3rd 2024:

1. **New output data from the mid-term EMPS model:**
    - Cross-border flows, reservoir filling level and water value output from our mid-term run will be added to the database.
    - Capture prices for wind and solar generation covering the same time horizon as the mid-term run, updated weekly (separate subscription)
2. **Portal and API Features and Functionality:**
    - Aggregation choice between sum and average in the portal under curves and via the API
    - API queries with data aggregated on the API-side to a specified frequency (e.g. monthly average, weekly sum, etc)
3. **Dashboard Features:**
    - Archive functionality for dashboard (e.g. go back in time and see the dashboard for a given date)
    - Last two forecasts shown in the dashboard table.
    - Separate graph showing a given price area with spreads (e.g. average price + percentiles)
    - Visualization of power balance and cross-border flows in the dashboard
    - SRMC for coal and gas in the dashboard

7. APPENDIX 1: CATEGORY DESCRIPTIONS:

Category Label	Description
AVAILABLE	Available Production or Consumption of a Type or Unit
BIOMASS	Production of Power from Biomass
BOILER	Boiler units
CAP	Capacity for Power
CHP	Production of Power from Combined Heat and Power Units.
CHP HEAT	Production of Power from Combined Heat and Power District Heating Units.
CHP INDUSTRY	Production of Power from Combined Heat and Power Industrial Units.
CO2	Carbon Dioxide
COAL	Production of Power from Thermal Fossil Coal
COAL-DERIVED GAS	Production of Power from Fossil Coal-Derived Gas
COM	Commercial Interconnector Flow of Power
CONS	Consumption of Power
DA	Day-Ahead Values
ELASTIC	Price-Sensitive Production or Consumption
ELECTROLYSER	Electrolyser Consumption or Production
EPAD	Electricity Price Area Differential
FLOW	Interconnector flow of Power
FORWARD	Forward Forecasts
FUTURE	Future Contract traded in a market
FX	Foreign Exchange
GAS	Gas
GROUNDWATER	Groundwater
HYDBAL	Hydrological balance: Sum of hydro reservoir deviation and snow, soil- and groundwater deviation
Category Label	**Description**

HYDRO	Production of Power from Hydro Sources
HYDRO PUMPED STORAGE	Production or Consumption of Power from Hydro Pumped Storage
HYDRO RESERVOIR	Production of Power from Hydro Reservoirs
HYDRO ROR AND POUNDAGE	Production of Power from Hydro Run-Of-River and Poundage
INDUSTRY	Power Usage Associated with Industrial Use
INELASTIC	Price-Insensitive Production or Consumption
INSTALLED	Installed Production or Consumption of a Type or Unit
LEARNING RATE	Learning rate used to account for improvements in technology.
LIGNITE	Production of Power from Thermal Brown Coal/Lignite
NON-RENEWABLE INDUSTRIAL HEAT	Excessive energy in the form of heat or gas from the process industry originating from non-renewable sources, used to produce electricity
NTC	Net Transfer Capacity on Interconnectors
NUCLEAR	Production of Power from Nuclear
OIL	Production of Power from Thermal Fossil Oil
OIL SHALE	Production of Power from Thermal Fossil Oil Shale
OTHER	Production of Power from Other Sources
OTHER RENEWABLE	Production of Power from Other Renewable Sources
OWN-USE	Own use of a consumption of production asset
PEAT	Production of Power from Fossil Peat
PHY	Physical Interconnector Flow of Power
PRECIP	Precipitation
PRICE	Price of Power per unit
PROD	Production of Power

Category Label	Description

RENEWABLE INDUSTRIAL HEAT	Excessive energy in the form of heat or gas from the process industry originating from renewable sources, used to produce electricity
RESBAL	Hydro reservoir deviation from normal
RESERVOIR LEVEL	Reservoir Level
RESIDENTIAL	Power Usage Associated with Residential Use
RESIDUAL LOAD	Residual Load
RIVER DISCHARGE	River Discharge or Inflow
SGWBAL	Snow, soil- and groundwater deviation
SNOW	Snow
SNOW DEPTH	Snow depth
SOLAR PV	Production of Power from Solar PV
SPOT	Spot Prices
STORAGE	Storage associated with Hydro Power
TEMP	Temperature
TERTIARY	Power Usage Associated with Public and Private Services
THERMAL	Production of Power from Thermal Power
TOTAL	Sum of Production or Consumption of Power from All Relevant Sources
WASTE	Production of Power from Waste
WIND OFFSHORE	Production of Power from Offshore Wind
WIND ONSHORE	Production of Power from Onshore Wind