

OLF ENERGY SUMMIT 2023

Deep Decarbonization



A unified data standard for power grids

<https://powersystemsdata.carbondataspec.org>

Pierre Segonne / @pierre_segonne

Stephen Suffian / @ssuffian





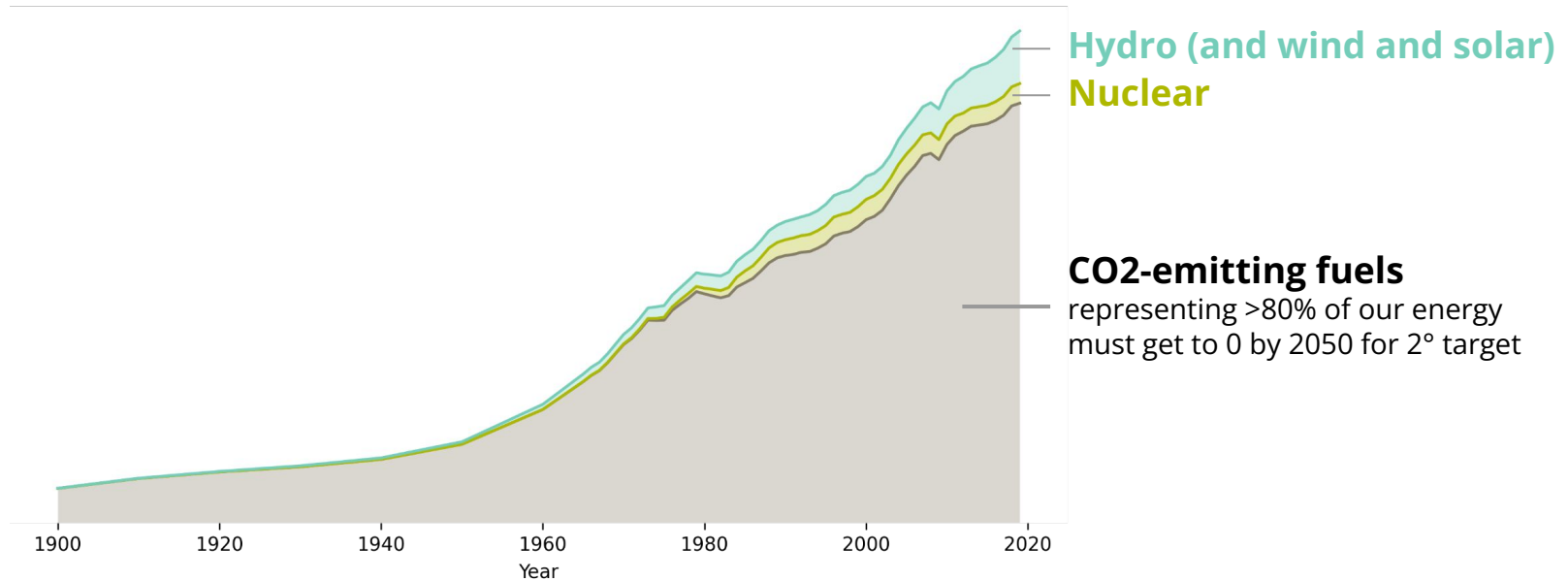
- Pierre Segonne
 - Tech lead at ⚡ **ELECTRICITY MAPS**
 - Former maintainer of the WG (2022-2023)
- Stephen Suffian
 - Principal software engineer at ⚡ **WattCarbon**
 - Maintainer of the WG (2023-)

Climate change, caused by fossil fuels

and our world is powered by them

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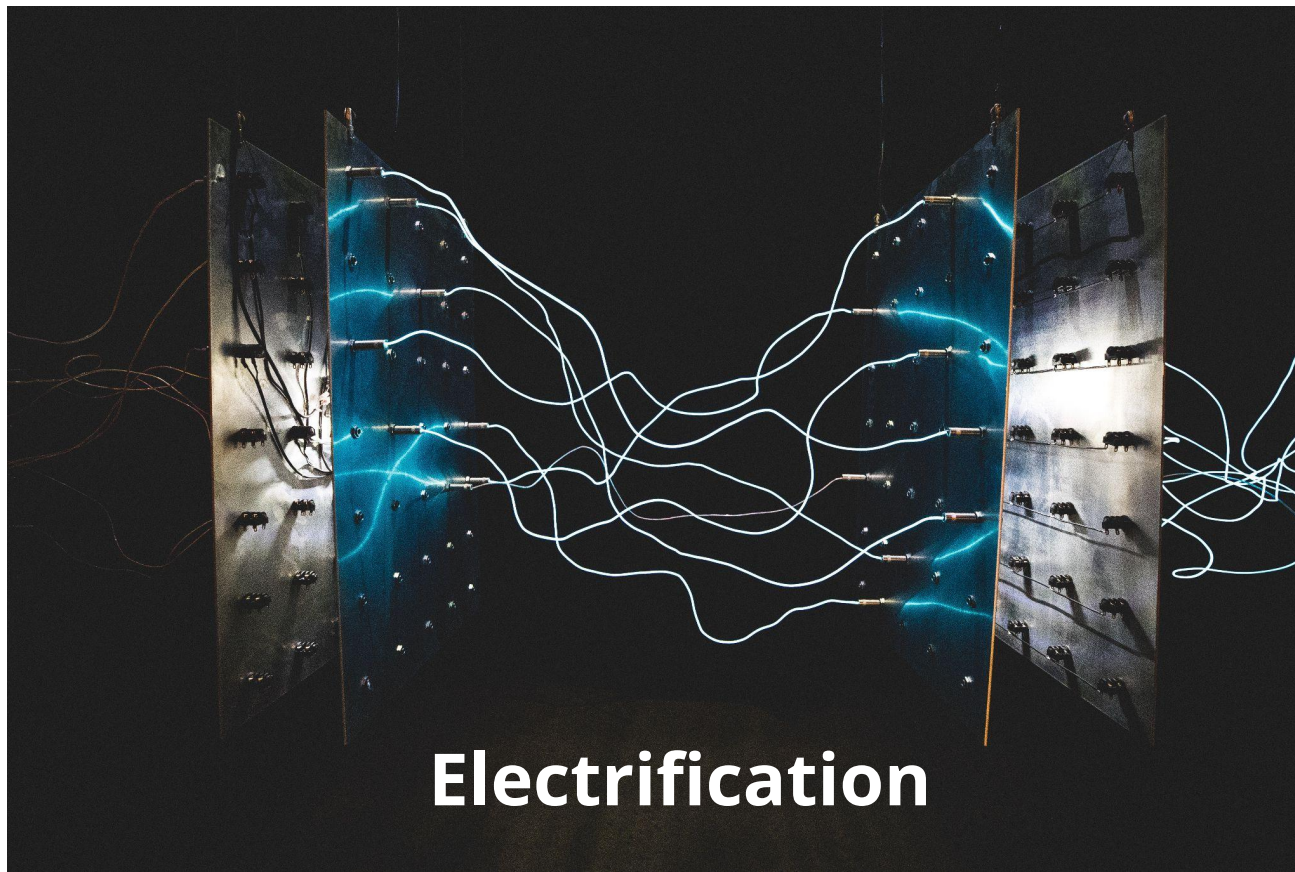
Deep Decarbonization



A key part of the solution

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Deep Decarbonization



Electrification

On the need for power data

Electricity generation can have vastly different impacts

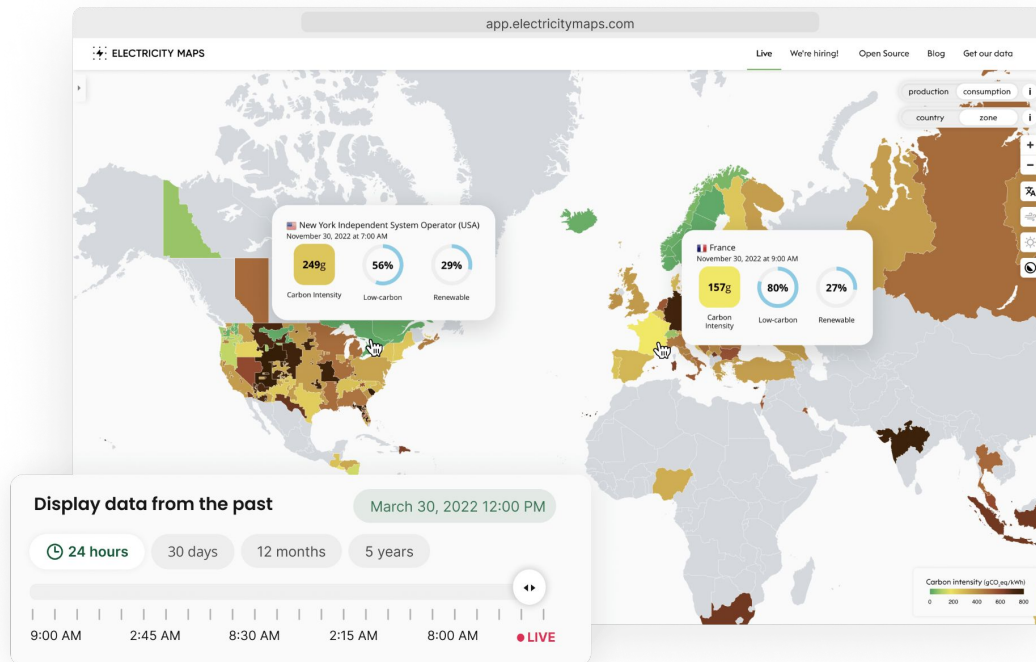


Source for coal (left): <https://www.eia.gov/tools/faqs/faq.php?id=74&t=11>

Source for wind (right): https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_annex-iii.pdf#page=7

Electricity Maps provides unified and real-time access to the **world's** electricity data

- **Global coverage**
100+ data sources to cover more than 180+ zones across the world
- **Open-source core**
1000+ contributors have helped us identify data sources and build parsers for them



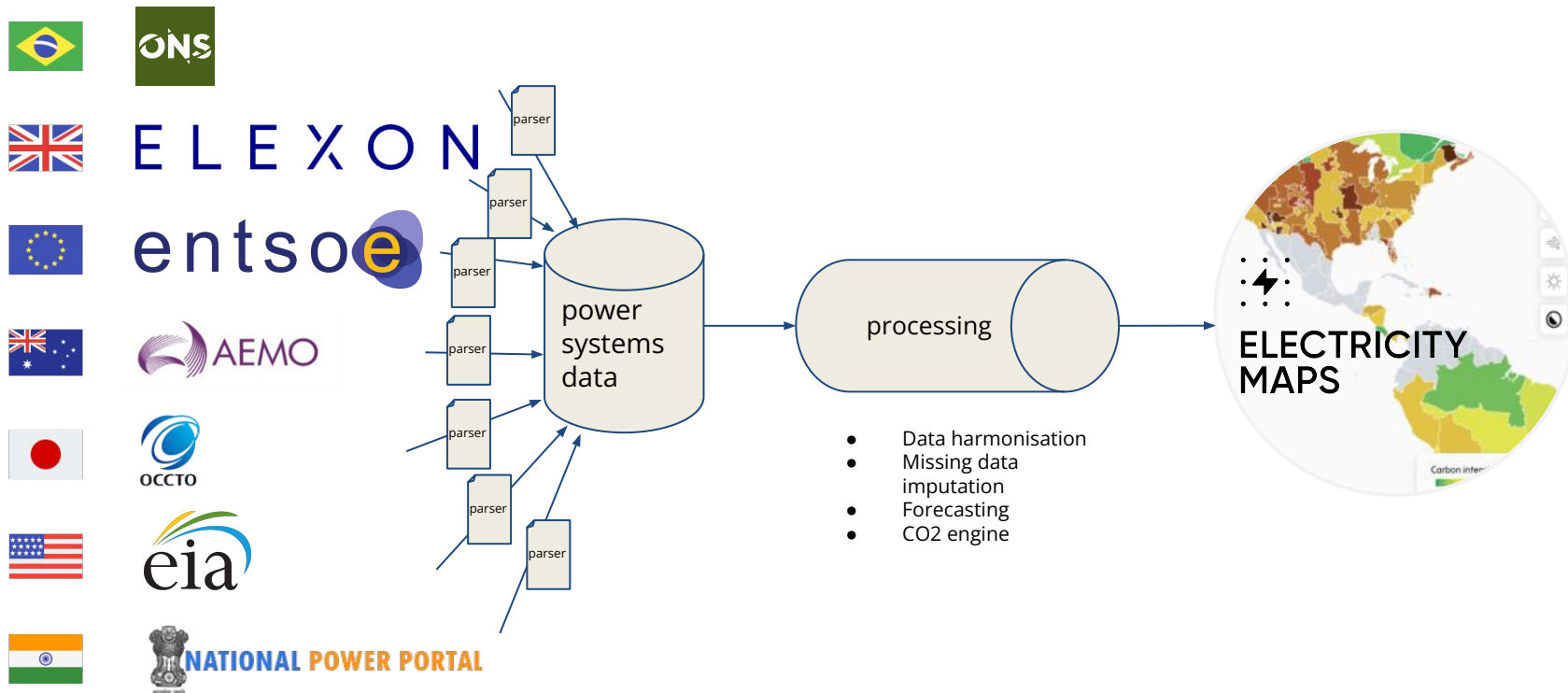
Electricity Maps

organising power data worldwide

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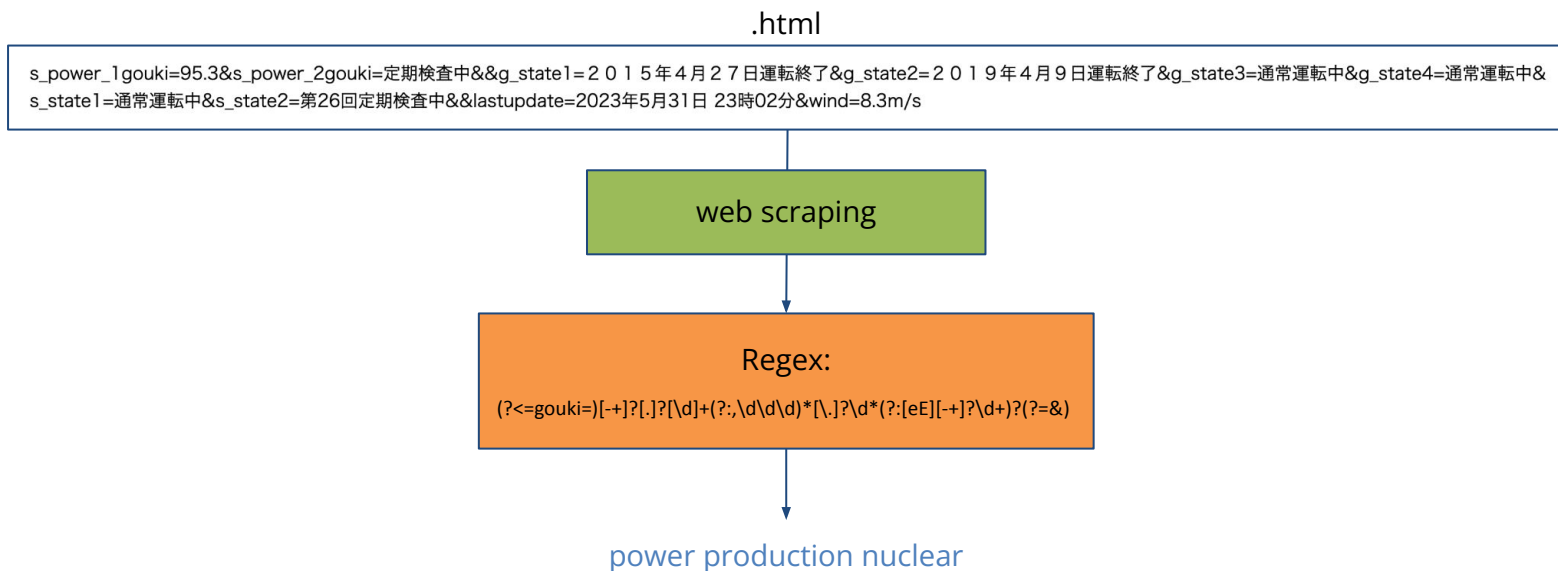
The data pipeline, roughly speaking




```
curl --location
"https://opendata.reseaux-energies.fr/api/records/1.0/search/?dataset
=eco2mix-national-tr&q=date_heure%20%3E%3D%202023-05-30T15%3
A50%20AND%20date_heure%20%3C%3D%202023-05-31T15%3A50&ti
mezone=Europe%2FParis&rows=2&apikey=XXXX"
```

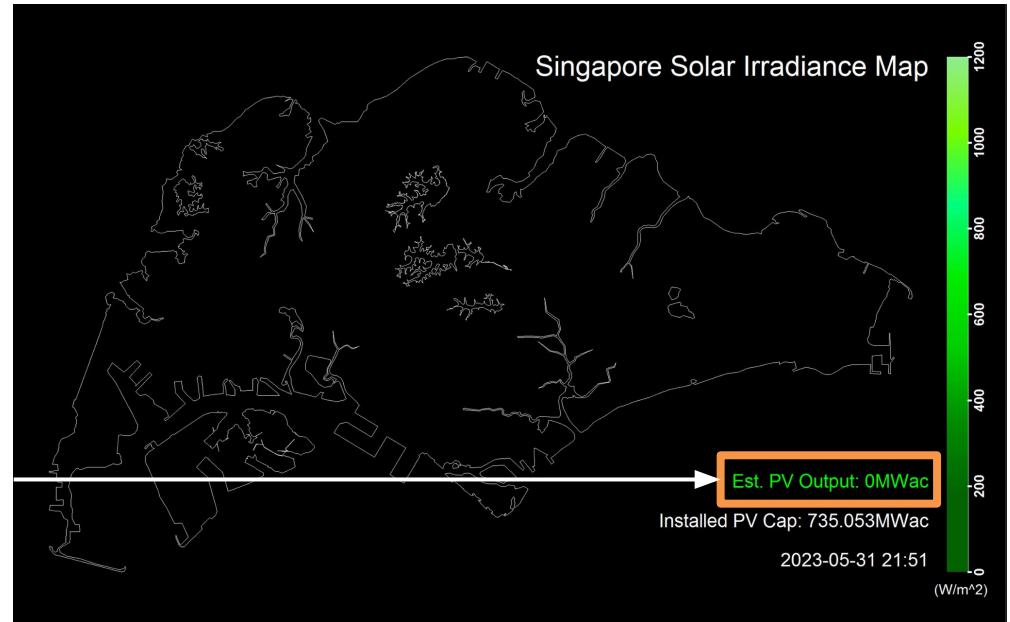
Power mix

To harder to fetch power data – Japanese nuclear power production



To *!\$*€%* – Singapore solar power production

Running optical character recognition (OCR)



Small utilities may not even have data available

% Renewable numbers are rough estimates:

[MISO taken from their API on 2023-05-31](#)

[Minnesota power taken from self reporting for 2021](#)

HPU taken from their capacity as purely biomass

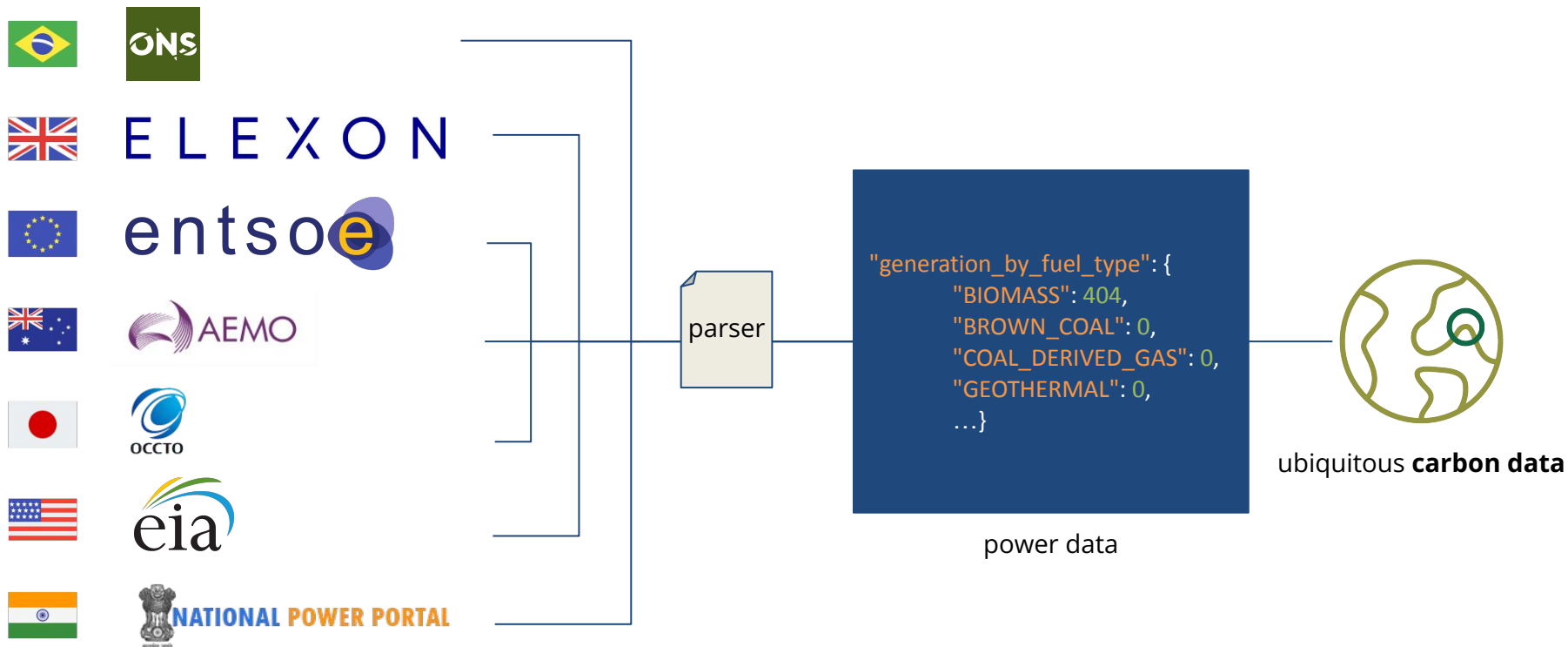


 **WattCarbon** uses this granular data to form a demand-side decarbonization marketplace

Learn more at **17:05 today in the Auditorium:** [Incorporating Demand Response Into Clean Energy Procurement - McGee Young, WattCarbon](#)

The vision

Power data sources sharing the same interface



An API demonstrator

Search...

How to use

Useful links

Data sources

grid data >

monitoring >

API docs by Redocly

Power Systems Data - API Demonstrator (0.1.0)

Download OpenAPI specification: [Download](#)



Welcome to the **Power Systems Data API Demonstrator**!

This demonstrator is an API that serves power systems data according to the specification of the [Linux Foundation Carbon Data Specification Consortium](#).

Its goal is to demonstrate how the specification can be implemented by power system operators to share openly data about their power systems.

The demonstrator has been seeded with real power systems data from different operators.

How to use

This page provides an overview of all the routes available in the API. For each route, you can find a description of the route, the parameters it accepts, and the response it



Search...

How to use

Useful links

Data sources

grid data ▾

- GET List all available grid nodes
- GET Describe a given grid node
- GET Get installed generation capacity for a grid node
- GET Get generation for a grid node
- GET Get demand for a grid node
- GET Get day ahead price for a grid node
- GET Get imports for a grid node
- GET Get exports for a grid node

API docs by Redocly

Get generation for a grid node

PATH PARAMETERS

id required string (Id)

QUERY PARAMETERS

start_datetime string <date-time> (Start Datetime)

end_datetime string <date-time> (End Datetime)

Responses

> 200 Successful Response

> 422 Validation Error

Get demand for a grid node

PATH PARAMETERS

GET /api/generation/{id}

Response samples

200 422

Content type: application/json

Copy Expand all Collapse all

```
{
  "grid_node_id": "string",
  "start_datetime": "2019-08-24T:",
  "end_datetime": "2019-08-24T14:",
  "value": 0,
  "unit": "string",
  "generation_by_fuel_type": { -
}
```

GET /api/demand/{id}

Response samples

<https://carbon-data-specification.onrender.com/redoc>

An API demonstrator

grid data

GET /api/list List all available grid nodes

Parameters

Cancel

Name	Description
limit integer (query)	10

Execute Clear

Responses

Curl

```
curl -X 'GET' \  
  'https://carbon-data-specification.onrender.com/api/list?limit=10' \  
  -H 'accept: application/json'
```

Request URL

```
https://carbon-data-specification.onrender.com/api/list?limit=10
```

Server response

Code	Details
200	Response body <pre>[{ "id": "US-WECC-MALC", "parent_id": null, "children_ids": null, "name": "Western Area Power Administration - Desert Southwest Region", "type": "SYSTEM" }]</pre>

Live in an interactive environment with real data
<https://carbon-data-specification.onrender.com/docs>

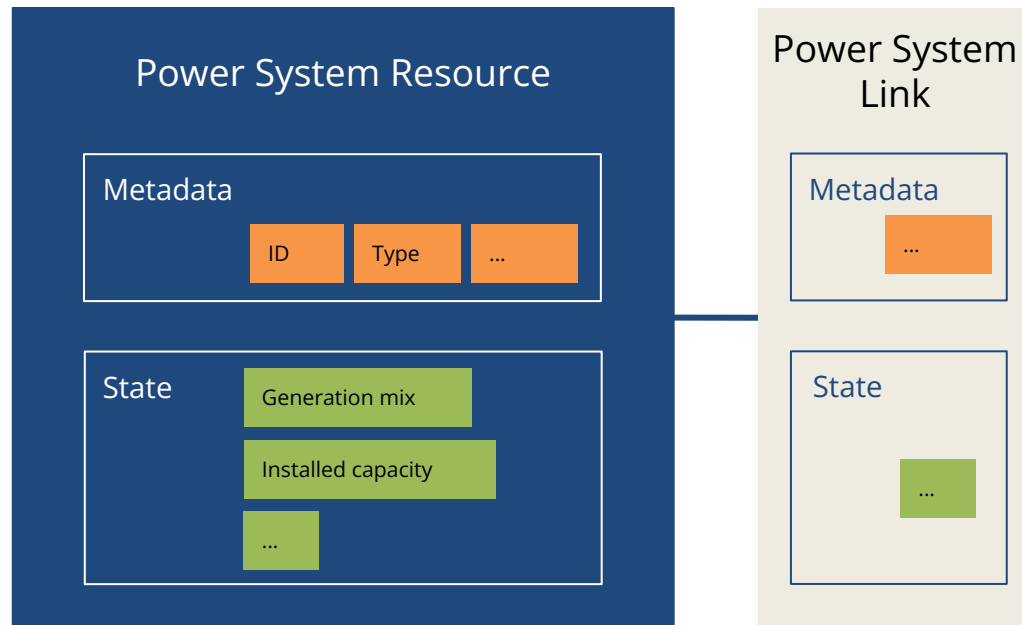
The underlying specification

defining an abstract power grid

An electricity grid can be seen as a graph of **Power System Resources** (nodes) connected by **Power System Links** (edges)

- **Specification of the topology model**
First output of the WG
- **Examples with real life hierarchy**
Europe + U.S.

<https://powersystemsdata.carbondataspec.org/specs/cdsc-wg2-01>



The underlying specification

defining all relevant data types

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The standard must specify the content of the expected state data for **Power System Resources**

- **Definition per type of resource**
2nd output of the WG
- **Definition of all power modes**
- **Definition of fuel types**
(combining from TSO libraries)

Generation mix

OR?

```
{  
  "BIOMASS": 404,  
  "COAL": 0,  
  "GEOTHERMAL": 0,  
  ...}
```

```
{  
  "BIOMASS_WOOD": 204,  
  "BIOMASS_PULP": 190,  
  "BIOMASS_TIRES": 10,  
  "...": ...,  
  "BROWN_COAL": 0,  
  "COAL_DERIVED_GAS": 0,  
  ...}
```

Upcoming challenges

and how ****you**** can help

- Creating momentum amongst power system operators
 - Verifying that the proposed standard can align with different information models
 - CIM vs EBIX Harmonised Role Model vs NERC
 - Upcoming carbon disclosure mandates is a great opportunity
 - [IIJA bill](#) in the US
 - Article 20a of [REDIII](#) in the EU
- We are looking for
 - Power System operators (thanks ETNSO-E!)
 - Other Power system experts
 - Developers
 - Enthusiasts

- Members
 - Power data providers
 - Large corporate buyers of electricity
 - Clean energy solutions providers
 - Interested individuals
- Open-source
 - learn more <https://powersystemsdata.carbondataspec.org/>
 - Come to our next meeting on June 13th at 5 PM CET
 - contributions welcome <https://github.com/carbon-data-specification/Power-Systems-Data> or <https://github.com/carbon-data-specification/Power-Systems-Data-API-Demonstrator>

Thank you for listening

<https://powersystemsdata.carbondataspec.org>

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