

# The OpenEnergy Database (oedb)

A database concept to improve transparency in energy system analyses

## Objectives and Technical Properties

### Main Objectives

The main objective of the **oedb** is to store, manage and provide international data for energy system modelling. It is designed to host input data, exogenous model data and result data in an organised and standardised (relational) database system. It also provides the possibility to directly connect a model to the database to import and export data using an API. Due to the web interface in the **OpenEnergy Platform** (OEP) it can be used to publish and visualize data using unique URL.

### Technical Properties

The database server is hosted by the *Institute for Intelligent Cooperating Systems* (IKS) of the *Otto von Guericke Universität Magdeburg*. It is a *PostgreSQL* database with several extension (e.g. *PostGIS*). The server has 32 cores, 256GB RAM and currently 10TB HDD. There are regular full backups, a developed built-in versioning system to track changes and is connected to other modules of the OEP.

## Related Projects



## Structure & Content

The **oedb** is structured through schemas in order to organize the database into logical groups and to make the data more manageable. Schemas are analogous to directories but with only one level. It corresponds with the *ISO 19115 Topic Category* definition. The following table shows the current selection and definitions.

Table: Schema structure of the oedb

Schema	Definition & Example
boundaries	Legal land descriptions <i>examples: political and administrative boundaries</i>
climate	Processes and phenomena of the atmosphere <i>examples: cloud cover, weather, climate</i>
economy	Economic activities, conditions and employment <i>examples: production, industry, tourism, prices</i>
environment	environmental resources, protection and conservation <i>examples: nature, landscape, land use, pollution</i>
society	Characteristics of society and cultures <i>examples: population, demographics, education</i>
policy	Regulations in governmental or private sector <i>examples: Laws, rules, targets</i>
(energy) supply	Conversion (generation) of energy <i>examples: power stations, renewables</i>
(energy) grid	Energy transmission infrastructure <i>examples: power lines, substation, pipelines</i>
(energy) demand	Consumption and use of energy <i>examples: peak loads, load curves</i>
model_draft	modelling sandbox <i>examples: specific model data, temporary tables</i>
Scenario	Scenario data <i>examples: assumptions, scenario results</i>
Reference	Literature <i>examples: studies, journal papers, citations</i>

## Metadata & Licenses

Metadata is data that provides information about other data. In the **oedb**, the metadata is stored as a JSON string in a comment on every table. It stores **basic information** like the title and a description, the **used sources** with links and copyright information, the **contributions** by different authors, a description of the **columns** and the information about the chosen open **license**.

On one side this collection helps to classify the data sets and on the other hand it fulfills the license condition to properly acknowledge the copyright owner. It corresponds to *ISO 19115* and follows the *Data Packages* standard.

```
-- metadata
COMMENT ON TABLE schema.table IS '{
  "title": "Title of the table",
  "description": "Description of the title and additional information",
  "language": [ "eng", "ger", "fre" ],
  "reference_date": "2017-01-01",
  "sources": [
    { "name": "", "description": "", "url": "", "license": "", "copyright": "" },
  ],
  "spatial": [
    { "extend": "europe",
      "resolution": "100m" },
  ],
  "license": [
    { "name": "Open Data Commons Open Database License 1.0",
      "url": "https://opendatacommons.org/licenses/odbl/1.0/",
      "instruction": "You are free to: Share, Create, Adapt; As long as you: Attribute, Share-Alike, Keep open!",
      "copyright": "© Reiner Lemoine Institut" },
  ],
  "contributors": [
    { "name": "Ludee", "email": "", "date": "2016-06-16", "comment": "Create metadata" },
    { "name": "Ludee", "email": "", "date": "2016-11-22", "comment": "Update metadata" },
  ],
  "resources": [
    { "schema": {
      "fields": [
        { "name": "id", "description": "Unique identifier", "unit": "" },
        { "name": "year", "description": "Reference year", "unit": "" },
        { "name": "geom", "description": "Geometry", "unit": "" },
      ],
      "meta_version": "1.3"
    }
  ]
};
```

SQL example of the metadata documentation (JSON)  
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## Versioning

### Revisions

Changes in the database (adding, deleting and modifying data) are tracked as **revisions**. They are stored as differences (similar to GIT) and can be accessed for each table. Before being taken, they must be reviewed and accepted by members of the community in an open peer-review process. The history of a data set is stored and can be discussed in order to increase data quality.

### Backups

Daily backups of the entire database are stored on an additional server to prevent data loss. The copies are stored for 7 days and can be restored on request.

## Access & Participate

### OpenEnergy Platform (OEP)

- A created online user interface with **search** and **tag** functionalities
- Viewing and editing tables, maps and plots
- Upload and download data, tracking of changes

### Application Programming Interface (API)

- A defined HTTP POST-request using URL: „/api/[command]“
- Based on the SQLAlchemy package
- Python templates available

You are welcome to use, participate and contribute!

## Acknowledgment

## Contact & Copyright

Contact: Berit Müller  
Mail: Berit.Mueller@rl-institut.de

Authors: Ludwig Hülk, Editha Kötter, Berit Müller, Martin Glauer (OvGU)  
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