Open Energy Metadata (OEMetadata): Publishing Energy Data Enriched with Ontology References

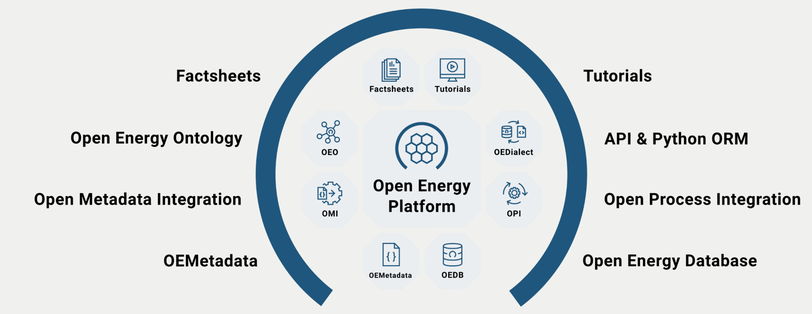
Development of a state-of-the-art metadata standard for energy, climate and modelling data

Objectives and Context

Open Energy Family and **Open Energy Platform (OEP)**
The Open Energy Family is a framework for research data management and collaborative development. The OEP is a community database for open data that increases transparency, reproducibility and ensures quality in energy system research.

SIROP
This research project develops and improves features to represent energy system scenarios and make the heterogenous energy scenarios comparable and interoperable.

Related Project



Open Energy Family

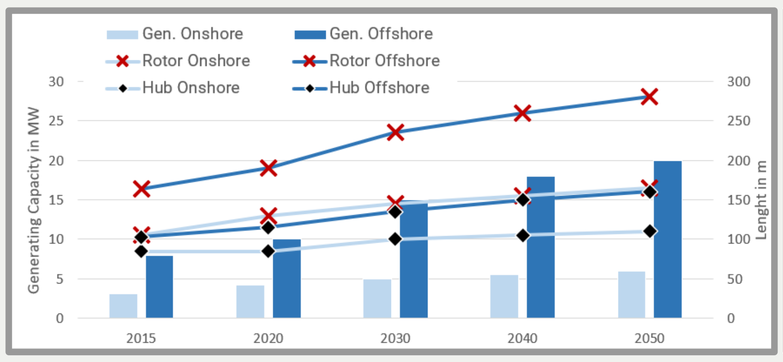
Open Energy Metadata (OEMetadata)

Open Energy Metadata is a metadata standard for energy and technology data. It is an extensive set of metadata based on the tabular data package and the FAIR principles.

OEMetadata

It describes the content, structure and of adjacent files or database tables. In its latest version (v1.5.1) we have refined it to allow references to ontologies.

The number of energy scenario and data publications is growing rapidly. However, the data utilized is often not well described. Therefore, accessible, reusable, and interpretable metadata is required. We believe the strength of the OEMetadata facilitates better reproducibility and productivity in energy research.



The **Open Energy Ontology** is a domain ontology of the energy system modelling context. It contains a formal naming and a definition of classes, properties and their relationships. It serves as a reference for concepts, terms and definitions in energy and climate research.

OEO

Table | Graphs | Maps — Show 10 entries

"RLI - Danish Energy Agency - Technology Data for Generation of Electricity and District Heating - Technology Data Catalogue for Electricity and district heating production - Updated April 2020 - Wind Turbine (Selected Parameter)" | © Danish Energy Agency 2021 © Reiner Lemoine Institut | CC-BY-4.0

id	model	scenario	region	type	year	generating_capacity	full_load_hours	nominal_investment	rotor_diameter	hub_hight
1	dea_technology_data_generation	wind_turbine_2015	Europe	onshore	2015	3.1	3100	1.326	106	85
2	dea_technology_data_generation	wind_turbine_2020	Europe	onshore	2020	4.2	3400	1.119	130	85
3	dea_technology_data_generation	wind_turbine_2030	Europe	onshore	2030	5	3600	1.036	145	100
4	dea_technology_data_generation	wind_turbine_2040	Europe	onshore	2040	5.5	3700	0.978	155	105
5	dea_technology_data_generation	wind_turbine_2050	Europe	onshore	2050	6	3800	0.963	165	110
6	dea_technology_data_generation	wind_turbine_2020_uncertainty_lower	Europe	onshore	2020	2	2000	0.77	90	85
7	dea_technology_data_generation	wind_turbine_2020_uncertainty_upper	Europe	onshore	2020	6	4000	1.156	130	120
8	dea_technology_data_generation	wind_turbine_2050_uncertainty_lower	Europe	onshore	2050	1.5	2000	0.796	100	85
9	dea_technology_data_generation	wind_turbine_2050_uncertainty_upper	Europe	onshore	2050	8	4500	1.193	150	150
10	dea_technology_data_generation	wind_turbine_2015	Europe	offshore	2015	8	4400	2.86	164	103

Showing 1 to 10 of 18 entries — Previous 1 2 Next

The OEO is openly developed on GitHub by a cross-project community. It helps standardizing language and terminology. The data annotation allows flexible, content-oriented data integration and aggregation. It adds the possibility of enhanced searching functions and logical querying across datasets.

Data and Metadata Review
We developed a community driven review process to ensure completeness, comparability, and quality of the published material. The process is based on Open Peer Review and is documented and linked with the data.

Metadata Description - selected keys

https://github.com/OpenEnergyPlatform/oemetadata/blob/master/metadata/latest/metadata_key_description.md

	ID	Key	Description	Example
General	1	name	A file name or database table name.	*rli_dea_td_generation_wind_turbine*
	2	title	A human readable full title including author.	*RLI- Techn. Data for Generation of Electricity*
	4	description	A description or abstract of the data package.	*Data catalogue for ren. Technologies ….*
Context	6	subject	An array of objects with topics of the data in OEO terms.	*OEO_00000044: wind energy converting unit*
	9	context	About the research project like homepage and funding.	*grantNo: 03EI1005D*
	19	spatial	The spatial context like location or extend and resolution.	*Europe*
	11	temporal	Temporal information about the reference date or timeseries.	*Reference: 2021; Start: 2015; End: 2050*
License	12	sources	Used and underlying sources of the data and metadata.	*Danish Energy Agency - Technology Data*
	13	licenses	License(s) under which the data is provided.	*CC-BY-4.0*
	14	contributors	People who contributed to the data or metadata.	*2022-02-11 Create data and Metadata*
Resource	15.6	fields	An array (list) describing all columns.	
	15.6.1	name	The name of the column (field).	*generating_capacity*
	15.6.2	description	A text describing the field.	*Generation capacity for one unit*
	15.6.3	type	The data type of the field.	*decimal*
	15.6.4	unit	Preferably a SI unit.	*MW*
	15.6.5	isAbout	An array of objects with describe the field in OEO terms.	*OEO_00230002: declared net capacity*
	15.6.6	valueReference	Extended description of the values in the column in OEO terms.	*type - OEO_00000447: wind farm*
	15.7	foreignKeys	A foreign key is a field that refers to a column in another table.	*null*
Review	18	review	Based on the completeness and quality badges are rewarded.	*Platinum*

https://openenergyplatform.org/ontology/oeo/OEO_00000044
Definition:
A wind energy converting unit is a **power generating unit** that uses **wind energy**.

https://openenergyplatform.org/ontology/oeo/OEO_00230002
Definition:
Declared net capacity is a **power value** stating the maximum power a **power generating unit** or **a power plant** can deliver to the **electrical grid**. It equals the sum of the rated powers of all plant generators minus all power used internally within the plant.

https://openenergyplatform.org/ontology/oeo/OEO_00000447
Definitions:
•An onshore wind farm is a **wind farm** that is build on **land**.
•An offshore wind farm is a **wind farm** that is build in a **body of water**, usually the **ocean**.

Access & Publication

Open Energy Platform
https://openenergy-platform.org/

GitHub
https://github.com/OpenEnergyPlatform

Booshehri, M., Emele, L., Flügel, S., Förster, H., Frey, J., et.al (2021). **Introducing the Open Energy Ontology: Enhancing data interpretation and interfacing in energy systems analysis**. Energy and AI, 5, 100074.

https://doi.org/10.1016/j.egyai.2021.100074

Acknowledgment

oemof ['ø:mɔf] open energy modelling framework
openmod open energy modelling initiative
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SzenarienDB
SIROP
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