SIROP LOD-GEOSS Open Energy Platform

REINER LEMOINE INSTITUT

Publication of FAIR Data and Metadata

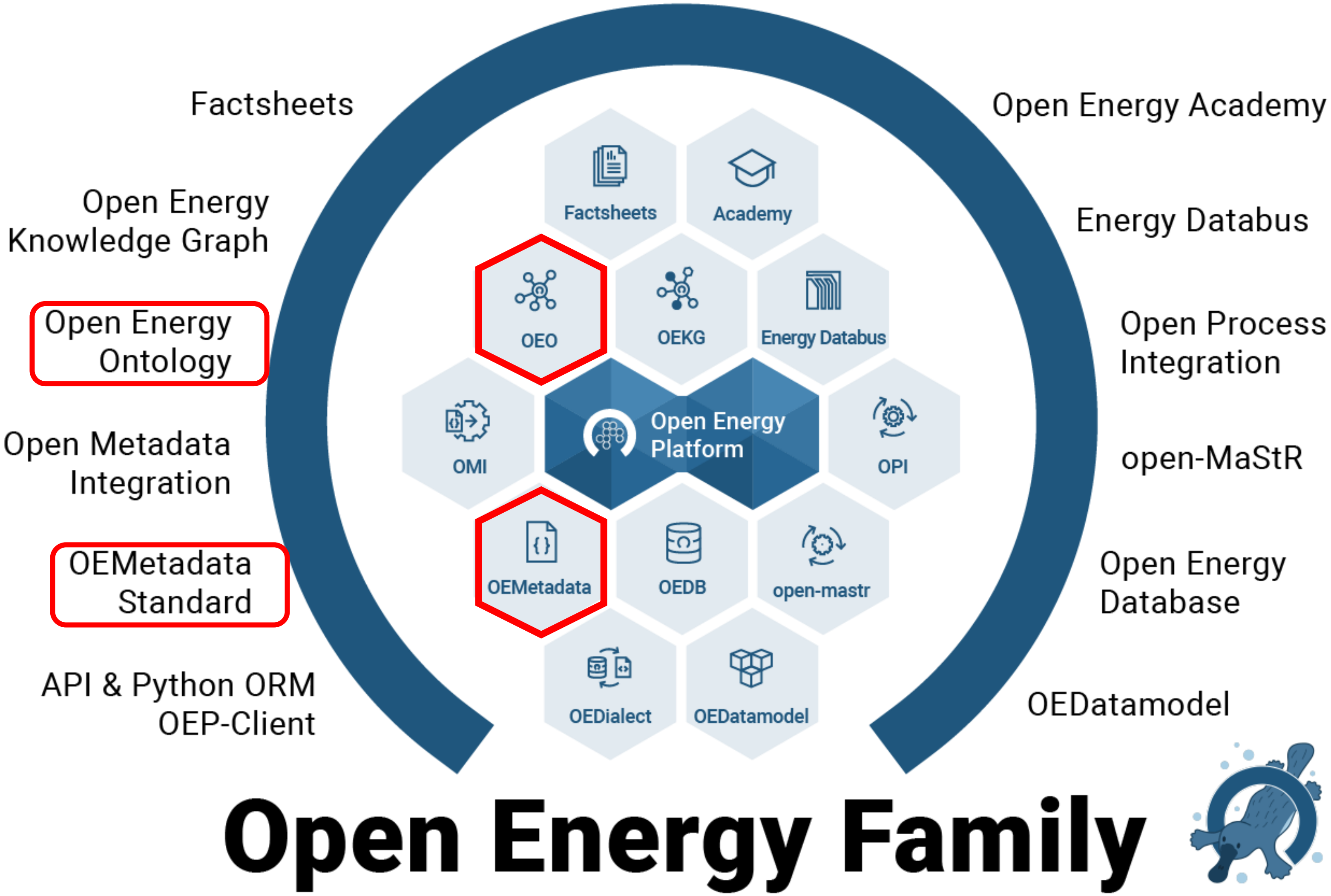
Part 1: Open Energy Metadata and Data Annotations

Ludwig Hülk

2023-03-22

Version-RLI-openmod-FAIR1-2023-03-22-001

Open Energy Family



Open Energy Metadata

OEMetadata

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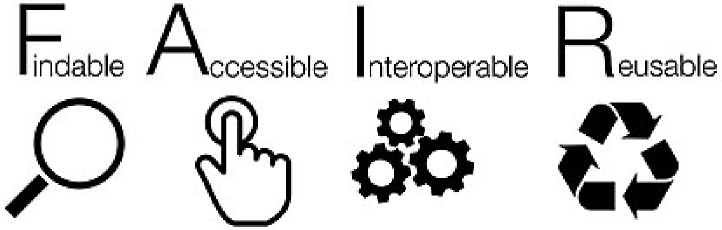
- A Metadata Standard for energy data
- Based on established technologies und standards
- Latest version (v1.5.3) is “ontology ready”

OEMetadata

FRICTIONLESS DATA

DataCite



https://github.com/OpenEnergyPlatform/oemetadata

Open Energy Metadata

OEMetadata

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Categories

- **General** (name, title, description)
- **Context** (homepage, funding, contact)
- **Spatial** (location, extent, resolution)
- **Temporal** (referenceDate, timeseries)
- **Source** (origin, licenses)
- **Provenience** (contributors)
- **Resource** (fields, type, description)
- **Review** (context and badge)

➢ ~ 70 keys

Prioritisation

- **Iron** – Technically required for data structure

- **Bronze** – Basic description of the data
- **Silver** – Supplement description of the data
- **Gold** – Extended description of the context
- **Platinum** – Ontological annotation

Open Energy Metadata - Example

OEMetadata

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Danish Energy Agency

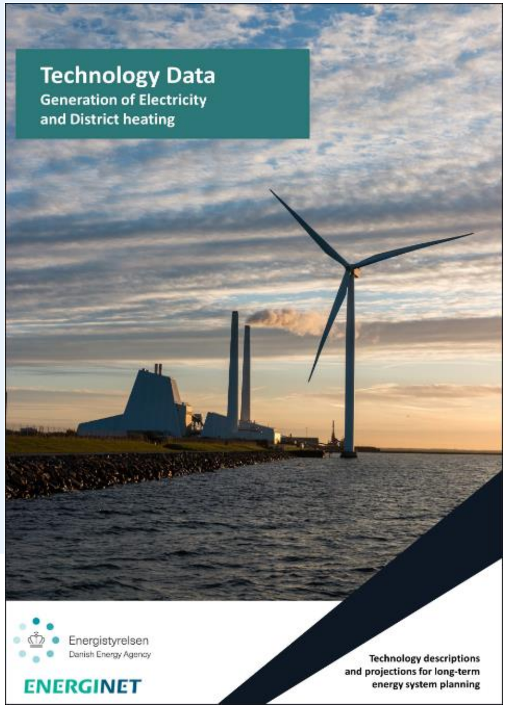
OUR RESPONSIBILITIES OUR SERVICES ABOUT US PRESS DA

Technology Data for Generation of Electricity and District Heating

This Technology Data catalogue includes technology data for technologies for centralized and decentralized production of electricity and district heat. Technology data concerns more or less mature technologies.

Home > Our Services > Projections and models > Technology Data > Technology Data for Generation of Electricity and ...

There is currently one combined Technology Data catalogue concerning generation of electricity and district heating. The catalogue was first published in August 2016, and is updated continuously. Technology descriptions in the previous catalogue from May 2012 have now been included in the catalogue from 2016 although some are not updated since 2015. It is mentioned in the beginning of the specific chapters, when each technology has been updated the last time.



https://ens.dk/en/our-services/projections-and-models/technology-data/technology-data-generation-electricity-and

Open Energy Metadata - Example

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PDF

Data sheets

Technology	20 Large wind turbines on land										
Year of final investment decision	2015	2020	2030	2040	2050	Uncertainty (2020)		Uncertainty (2050)		Note	Ref
Energy/technical data						Lower	Upper	Lower	Upper		
Generating capacity for one unit (MW)	3,1	4,2	5	5,5	6	2,0	6,0	1,5	8,0	A1	3
Average annual full-load hours	3100	3400	3600	3700	3800	2000	4000	2000	4500	A, L	3
Forced outage (%)	3,0%	2,5%	2,0%	1,8%	1,5%	1,0%	5,0%	1,0%	5,0%	B	4
Planned outage (%)	0,3%	0,3%	0,3%	0,3%	0,3%	0,1%	0,5%	0,1%	0,5%	C	4
Technical lifetime (years)	25	27	30	30	30	25	35	25	40	D	14
Construction time (years)	1,5	1,5	1,5	1,5	1,5	1	3	1	3	E	4
Space requirement (1000m2/MW)	---	---	---	---	---	---	---	---	---	F	
Regulation ability											
Primary regulation (% per 30 seconds)										G	
Secondary regulation (% per minute)										G	
Financial data (in 2015€)											
Nominal investment (M€/MW)	1,33	1,12	1,04	0,98	0,96	0,77	1,16	0,80	1,19		16, 2, 4
- of which equipment	0,89	0,71	0,64	0,59	0,58	0,57	0,86	0,46	0,69		25
- of which installation/development	0,12	0,09	0,08	0,08	0,07	0,07	0,11	0,06	0,09		25
- of which is related to grid connection	0,06	0,05	0,05	0,05	0,05	0,04	0,06	0,04	0,06		25
- of which is related to rent of land	0,09	0,09	0,09	0,09	0,09	0,07	0,10	0,07	0,10		25
- of which is related to decommissioning of existing turbines	0,04	0,04	0,04	0,04	0,04	0,03	0,04	0,03	0,04		25
- of which is related to other costs (i.e. compensation of neighbours, etc.)	0,13	0,14	0,14	0,14	0,14	0,11	0,17	0,11	0,17	I	25,26
Fixed O&M (€/MW/year)	25.600	14.000	12.600	11.592	11.340	11.200	16.800	9.072	13.608	I	25,26
Variable O&M (€/MWh)	2,80	1,50	1,35	1,24	1,22	1,20	1,80	0,97	1,46		
Technology specific data											
Rotor diameter	106	130	145	155	165	90	130	100	150	K	4, 26
Hub height	85	85	100	105	110	85	120	85	150		4, 26
Specific power (W/m2)	351	316	303	291	281	314	452	191	453		
Average capacity factor	35%	39%	41%	42%	43%	23%	46%	23%	51%		4, 26
Average availability (%)	97%	97%	98%	98%	98%	99%	95%	99%	95%		4, 26

Notes:

A1 The capacity is set to 3.5 MW in 2015 and 2020 based on data of current wind turbines and under the anticipation that the maximum height will not exeed 150m before 2020. From 2030 a slight increase in generator size, and hub height is assumed, where the effect of expected removal of present max. 150m tip height.

A The full load hours (annual produktion (MWh) per installed power (MW)) depending on the actual location of the wind farm, wake losses and technological characteristics of the individual turbine. The value is an average for the expected locations of the wind farms. FLH also depends on wake losses, noise reduction and technological characteristics of the individual turbine. The level for 2020 is based on expectations from the November 18 auction winners locations and the 2019 prefered technology choice. For 2030 and 2050 a slight increase is assumed based on decrease in specific power and increase in hub height.

B Modern turbines has typically higher forced outage than older smaller turbines had when they were newer due to more complex technology.

Excel

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Technology		Onshore wind turbine, utility - renewable power - wind - large										
2	year		2015	2020	2030	2040	2050	2020	2020	2050	2050	-	-
3	est		ctrl	ctrl	ctrl	ctrl	ctrl	lower	upper	lower	upper	note	ref
4	ca par												
5	Energy/technical data												
6		Generating capacity for one unit [MW_e]	3.1	4.2	5	5.5	6	2	6	1.5	8	A1	3
7		Forced outage []	3%	3%	2%	2%	2%	1%	5%	1%	5%	B	4
8		Planned outage [weeks per year]	0.16	0.16	0.16	0.16	0.16	0.05	0.26	0.05	0.26	C	4
9		Technical lifetime [years]	25	27	30	30	30	25	35	25	40	D	14
10		Construction time [years]	1.5	1.5	1.5	1.5	1.5	1	3	1	3	E	4
11		Space requirement [1000 m2/MW_e]										F	
12	Regulation ability												
13		Primary regulation (of full load, per 30 seconds) []										G	
14		Secondary regulation (of full load, per minute) []										G	
15	Financial data												
16		Nominal investment (*total) [2015-MEUR/MW_e]	1.33	1.12	1.04	0.98	0.96	0.77	1.16	0.8	1.19		[16, 2, 4]
17		Nominal investment (equipment) [2015-MEUR/MW_e]	0.89	0.71	0.64	0.59	0.58	0.57	0.86	0.46	0.69		25
18		Nominal investment (installation) [2015-MEUR/MW_e]	0.12	0.09	0.08	0.08	0.07	0.07	0.11	0.06	0.09	M	25
19		Nominal investment (decommissioning of existing turbines) [2015-M	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.03	0.04		25
20		Nominal investment (grid connection) [2015-MEUR/MW_e]	0.06	0.05	0.05	0.05	0.05	0.04	0.06	0.04	0.06		25
21		Nominal investment (other, i.e. compensation of neighbours) [2015-	0.13	0.14	0.14	0.14	0.14	0.11	0.17	0.11	0.17	I	[25, 26]
22		Nominal investment (land rent) [2015-MEUR/MW_e]	0.09	0.09	0.09	0.09	0.09	0.07	0.1	0.07	0.1		25
23		Variable O&M (*total) [2015-EUR/MWh_e]	2.8	1.5	1.35	1.24	1.22	1.2	1.8	0.97	1.46		
24		Fixed O&M (*total) [2015-EUR/MW_e/y]	25600	14000	12600	11592	11340	11200	16800	9072	13608	I	[25, 26]
25	Technology-specific data												
26		Availability []	97%	97%	98%	98%	98%	99%	95%	99%	95%		
27		Hub height [m]	85	85	100	105	110	85	120	85	150		[4, 26]
28		Rotor diameter [m]	106	130	145	155	165	90	130	100	150	K	[4, 26]
29		Specific power [W_e/m2]	351.29	316.43	302.79	291.48	280.6	314.38	452.04	190.99	452.71		
30		Average capacity factor []	35%	39%	41%	42%	43%	23%	46%	23%	51%		[4, 26]
31		Average annual full-load hours [MWh_e/MW_e]	3100	3400	3600	3700	3800	2000	4000	2000	4500	[A, L]	3
32													
33													

34 Notes:
35 A1. The capacity is set to 3.5 MW in 2015 and 2020 based on data of current wind turbines and under the anticipation that the maximum height will not exeed 150m before 2020. From 2030 a slight increase in generat
36 A. The full load hours (annual produktion (MWh) per installed power (MW)) depending on the actual location of the wind farm, wake losses and technological characteristics of the individual turbine. The value is an ave
37 B. Modern turbines has typically higher forced outage than older smaller turbines had when they were newer due to more complex technology.
38 C. Planned outage is typically 1-2 service visits a year, with a maximum duration of one work day, but there can also be planned outage due to shadow flicker stop or sector management (protect turbines at given wind
39 D. The life time depends on the wind conditions; average annual speed and turbulence, relative to the design class of the turbine
40 E. The construction time is the periode from FID to commissioning. But from first "dig" to turbines are in operation less than ½ a year is needed for smaller wind farms (clusters), where the similar periode for larger winc
41 F. An area of around 50 m x 50 m is needed for a modern wind turbine. Another way of defining the "area use" could be the noise zone, which ranges up to 600-800 m from the wind turbine in worst case.
42 G. Wind turbines can be downward regulated within very short time and can therefore (if the wind is blowing) be used in both the primary and secondary downward regulation.
43 H. 2015 Investment costs are based on a number of prospects for projects published in relation to Køberetsordningen. 2020 investment costs are based on updated data from Køberetsordningen. Note that the invest
44 I. 75 % of the total yearly O&M costs are assumed to be fixed cost and 25 % are assumed to be variable cost.
45 K. Currently only turbines up to 150 m total height is installed commercially in Denmark because of strict demands to higher turbines. No change in the national regulation is assumed until after 2020. Some test sites
46 L. It is expected that the production (FLH) increase 13% from 2015 to 2020 and 3% from 2020-2030 and 1% per decade from 2030-2050
47 M. Includes development cost.
48 *. Subscript abbreviations used in the datasheets: input = _i, electricity production = _e, heat production = _h
49 **. The empty square brackets [] denote parameters expressed in terms of a proportion. The raw data is in the raw decimal form, but note that these values are formated as percentage in the wide report tables for rea
50

51 References:
52 2. DTU International Energy Report - Wind Energy, DTU, 2014
53 3. Master data register of wind turbines at end of December 2014, Danish Energy Agency, 2015
54 4. Nielsen, P. et. al., Vindmøllers økonomi EUDP projekt 33033-0196, 2010
55

Intro | alldata_flat | 01 Coal CHP | 02 LTE existing plant | 03a Coal to wood pellets exi bo | 03b Coal to wood chips n. boile | 03c coal to wood

https://ens.dk/sites/ens.dk/files/Analyser/technology_data_catalogue_for_el_and_dh.pdf
https://ens.dk/sites/ens.dk/files/Analyser/technology_data_for_el_and_dh.xlsx

Open Energy Metadata - Example

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Challenges of energy data:

1. Open data license
2. Data structures not machine readable
3. Mixture of data and metadata
4. Link to a controlled vocabulary (ontology)

Open Energy Metadata - Example

OEMetadata

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General Keys

Meta Information

Download JSON | Edit

Name	rli_dea_td_generation_wind_turbine
Title	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)
Id	http://openenergyplatform.org/dataedit/view/model_draft/rli_dea_td_generation_wind_turbine
Description	This Technology Data catalogue includes technology data for technologies for centralized and decentralized production of electricity and district heat. Technology data concerns more or less mature technologies. There is currently one combined Technology Data catalogue concerning generation of electricity and district heating. The catalogue was first published in August 2016, and is updated continuously. Technology descriptions in the previous catalogue from May 2012 have now been included in the catalogue from 2016 although some are not updated since 2015. It is mentioned in the beginning of the specific chapters, when each technology has been updated the last time. Index: 20 Wind turbines on-shore (updated May 2019) On-shore turbines and Domestic turbines. 21 Wind turbines off-shore (updated May 2019) Off-shore turbines and Near shore turbines (minor adjustment September 2019).

https://openenergy-platform.org/dataedit/view/model_draft/rli_dea_td_generation_wind_turbine

Open Energy Metadata - Example

OEMetadata

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Context Keys

Subject	**wind energy converting unit** • **Name:** wind energy converting unit • **Path:** https://openenergy-platform.org/ontology/oeo/OEO_00000044
Keywords	• RLI • Danish Energy Agency • Technology Data Catalogue • Wind • Review • CC-BY-4.0
PublicationDate	2022-02-11
Context	• **Homepage:** https://reiner-lemoine-institut.de/lod-geoss/ • **SourceCode:** https://github.com/LOD-GEOSS • **Contact:** https://github.com/Ludee • **GrantNo:** 03EI1005D • **FundingAgency:** Bundesministerium für Wirtschaft und Klimaschutz • **FundingAgencyLogo:** https://commons.wikimedia.org/wiki/File:BMWi_Logo_2021.svg#/media/File:BMWi_Logo_2021.svg • **PublisherLogo:** https://reiner-lemoine-institut.de//wp-content/uploads/2015/09/rlilogo.png

Open Energy Metadata - Example

https://openenergy-platform.org/dataedit/view/model_draft/rli_dea_td_generation_wind_turbine

Open Energy Metadata - Example

OEMetadata

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Spatial & Temporal Keys

Spatial	• **Extent:** Europe
Temporal	• **ReferenceDate:** 2015-01-01 • **Timeseries:** timeseries element ○ **Start:** 2015-10-05T00: ○ **End:** 2050-10-05T00: ○ **Resolution:** 10 years
Review	• **Path:** https://github.com/OpenEnergyPlatform/data-preprocessing/issues/92 • **Badge:** Platinum
Language	• en-GB

https://openenergy-platform.org/dataedit/view/model_draft/rli_dea_td_generation_wind_turbine

Open Energy Metadata - Example

OEMetadata

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Source Keys

Sources

Homepage

Danish Energy Agency - Technology Data

- **Title:** Danish Energy Agency - Technology Data
- **Description:** The Danish Energy Agency and Energinet publish catalogues of technology data for energy technologies. Technology Data provides information about technology, economy and environment for a number of energy installations and are among other things used by the Danish Energy Agency for energy projections.
- **Path:** https://ens.dk/en/our-services/projections-and-models/technology-data
- **Licenses:**
  Null
  - **Attribution:** © Danish Energy Agency 2021
  - **Name:** Null

PDF

Danish Energy Agency - Technology Data for Generation of Electricity and District Heating

- **Title:** Danish Energy Agency - Technology Data for Generation of Electricity and District Heating
- **Description:** TThis Technology Data catalogue includes technology data for technologies for centralized and decentralized production of electricity and district heat. Technology data concerns more or less mature technologies.
- **Path:** https://ens.dk/en/our-services/projections-and-models/technology-data/technology-data-generation-electricity-and
- **Licenses:**
  Null
  - **Attribution:** © Danish Energy Agency 2021
  - **Name:** Null

Excel

Technology Data Catalogue for Electricity and district heating production - Updated April 2020

- **Title:** Technology Data Catalogue for Electricity and district heating production - Updated April 2020
- **Description:** Data collection for electricity generation and district heating plants, last update: April 2020
- **Path:** https://ens.dk/sites/ens.dk/files/Analyser/technology_data_for_el_and_dh.xlsx
- **Licenses:**
  Null
  - **Attribution:** © Danish Energy Agency 2021
  - **Name:** Null

https://openenergy-platform.org/dataedit/view/model_draft/rli_dea_td_generation_wind_turbine

Open Energy Metadata - Example

License Keys

Licenses **Creative Commons Attribution 4.0 International**

- **Instruction:** You are free: To Share, To Create, To Adapt; As long as you: Attribute! See: https://tldrlegal.com/license/creative-commons-attribution-4.0-international-(cc-by-4)
- **Attribution:** © Danish Energy Agency © Reiner Lemoine Institut
- **Name:** CC-BY-4.0
- **Title:** Creative Commons Attribution 4.0 International
- **Path:** https://creativecommons.org/licenses/by/4.0/legalcode

Challenge 1: Open data license ✓

https://openenergy-platform.org/dataedit/view/model_draft/rli_dea_td_generation_wind_turbine

Open Energy Metadata - Example

Provenience Keys

Contributors

Christoph Muschner

- **Title:** Christoph Muschner
- **Email:** christoph.muschner@rl-institut.de
- **Object:** metadata
- **Comment:** Transpose the original table
- **Date:** 2021-06-29

Ludee

- **Title:** Ludee
- **Email:** datenzentrum@rl-institut.de
- **Object:** metadata
- **Comment:** Create table with updated data structure
- **Date:** 2022-02-11

Ludee

- **Title:** Ludee
- **Email:** datenzentrum@rl-institut.de
- **Object:** metadata
- **Comment:** Update to OEMetadata version 1.5.0
- **Date:** 2022-02-11

Ludee

- **Title:** Ludee
- **Email:** datenzentrum@rl-institut.de
- **Object:** metadata
- **Comment:** Update to OEMetadata version 1.5.1
- **Date:** 2022-02-15

Ludee

- **Title:** Ludee
- **Email:** datenzentrum@rl-institut.de
- **Object:** metadata
- **Comment:** Add data annotation
- **Date:** 2022-10-04

https://openenergy-platform.org/dataedit/view/model_draft/rli_dea_td_generation_wind_turbine

Open Energy Metadata - Example

OEMetadata

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Resources Keys

Resources **model_draft.rli_dea_td_generation_wind_turbine**

- **Profile:** tabular-data-resource
- **Name:** model_draft.rli_dea_td_generation_wind_turbine
- **Path:** https://openenergy-platform.org/dataedit/view/model_draft/rli_dea_td_generation_wind_turbine
- **Format:** PostgreSQL
- **Encoding:** UTF-8
- **Schema:**
  - **PrimaryKey:**
    - id
  - **ForeignKeys:**
    There is no valid entry for this field
  - **Fields:**
    id
    - **Name:** id
    - **Description:** Unique identifier
    - **Type:** serial
    - **Is_about:**
      There is no valid entry for this field
    - **Value_reference:**
      There is no valid entry for this field

    model
    - **Name:** model
    - **Description:** Model name
    - **Type:** text
    - **Is_about:**
      There is no valid entry for this field
    - **Value_reference:**
      There is no valid entry for this field

https://openenergy-platform.org/dataedit/view/model_draft/rli_dea_td_generation_wind_turbine

Open Energy Metadata - Example

Resources Keys

generating_capacity

- **Name:** generating_capacity
- **Description:** Generation capacity for one unit of the technology
- **Type:** real
- **Unit:** MW

full_load_hours

- **Name:** full_load_hours
- **Description:** Average annual full load hours of the technology
- **Type:** integer
- **Unit:** h

nominal_investment

- **Name:** nominal_investment
- **Description:** Nominal investment of the technology
- **Type:** real
- **Unit:** M€/MW

rotor_diameter

- **Name:** rotor_diameter
- **Description:** Rotor diameter of the wind turbine
- **Type:** integer
- **Unit:** m

https://openenergy-platform.org/dataedit/view/model_draft/rli_dea_td_generation_wind_turbine

Open Energy Metadata - Example

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Dataset (Table)

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
11	dea_technology_data_generation	wind_turbine_2020	Europe	offshore	2020	10	4500	2.128	190	115
12	dea_technology_data_generation	wind_turbine_2030	Europe	offshore	2030	15	4650	1.935	235	135
13	dea_technology_data_generation	wind_turbine_2040	Europe	offshore	2040	18	4700	1.809	260	150
14	dea_technology_data_generation	wind_turbine_2050	Europe	offshore	2050	20	4900	1.777	280	160
15	dea_technology_data_generation	wind_turbine_2020_uncertainty_lower	Europe	offshore	2020	8	4200	1.916		
16	dea_technology_data_generation	wind_turbine_2020_uncertainty_upper	Europe	offshore	2020	12	5000	2.235		
17	dea_technology_data_generation	wind_turbine_2050_uncertainty_lower	Europe	offshore	2050	10	4500	1.422		
18	dea_technology_data_generation	wind_turbine_2050_uncertainty_upper	Europe	offshore	2050	30	5500	1.955		

Showing 1 to 18 of 18 entries

Previous 1 Next

Challenge 2: Data structures not machine readable ✓

Challenge 3: Mixture of data and metadata ✓

Open Energy Metadata - Example

Resources Keys

- **Name:** year
- **Description:** Reference year
- **Type:** integer
- **Is_about:**

  year

  - **Name:** year
  - **Path:** https://openenergy-platform.org/ontology/oeo/UO_0000036

Class label: year

Definition:

A time unit which is equal to 12 months which in science is taken to be equal to 365.25 days.

Super classes:

time unit view

https://openenergy-platform.org/ontology/oeo/UO_0000036

Open Energy Metadata - Example

OEO OEMetadata

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Resources Keys

generating_capacity

- **Name:** generating_capacity
- **Description:** Generation capacity for one unit of the technology
- **Type:** real
- **Is_about:**
  declared net capacity
  - **Name:** declared net capacity
  - **Path:** https://openenergy-platform.org/onto
- **Unit:** MW

Class label: declared net capacity

Definition:

Declared net capacity is a power capacity 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.

Sub classes:

block size view

Super classes:

power capacity view

https://openenergy-platform.org/ontology/oeo/OEO_00230002

Open Energy Metadata - Example

OEO OEMetadata REINER LEMOINE INSTITUT

Resources Keys

type

- **Name:** type
- **Description:** Type of wind turbine
- **Type:** text
- **Value_reference:**

  onshore wind farm

  - **Value:** onshore
  - **Name:** onshore wind farm
  - **Path:** https://openenergy-platform.org/ontology/oeo/OEO_00000311

  offshore wind farm

  - **Value:** offshore
  - **Name:** offshore wind farm
  - **Path:** https://openenergy-platform.org/ontology/oeo/OEO_00000308

Class label: onshore wind farm

Definition:

An onshore wind farm is a wind farm that is build on land.

Class label: offshore wind farm

Definition:

An offshore wind farm is a wind farm that is build in a body of water, usually the ocean.

Super classes:

wind farm view

https://openenergy-platform.org/ontology/oeo/OEO_00000447

Challenge 4: Link to ontology ✓

Open Energy Metadata

Summary:

- A flexible and comprehensive Metadata Standard
- Simple format and handling (JSON)
- Used and improved by an active community
- Links to ontologies possible
- High-Scores at FAIR und 5 Stars LOD

„The opposite of ‘**open**’ isn’t ‘**closed**’. The opposite of ‘**open**’ is ‘**broken**’.“

Ludwig Hülk

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