

Talk pages ecoinvent v3

Datasets related to electricity production and supply in ecoinvent version 3 – Short overview

This talk page refers to the activities in ecoinvent version 3 (ev3) related to electricity production. It gives a short overview on the technology and market datasets, important updates and new issues. More detailed information will be published in a special issue on ecoinvent v3 in the International Journal of Life Cycle Assessment (Treyer and Bauer 2013a, 2013b). Minimum knowledge on the new structure and terminology of ev3 is recommended for the understanding of this documentation¹. This talk page does not address the changes compared to v2.2 electricity datasets – these can be found in the ecoinvent Change Report (Moreno Ruiz et al. 2013). Related to electricity datasets, especially the new naming of datasets should be considered when searching datasets from ev2. Information on the naming and other important overview information are summarised in Table 4.

For further information on the electricity datasets in ecoinvent version 3, please contact Karin Treyer (Paul Scherrer Institute): karin.treyer@psi.ch

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¹ See the ecoinvent Data Quality Guidelines (Weidema et al. 2013), the FAQ and other helpful information on the ecoinvent homepage (www.ecoinvent.org).

Ecoinvent reports No. 6 on energy systems

The previous ecoinvent reports No. 6 on energy systems are no longer updated as all relevant detailed information is directly integrated into the inventory datasets. However, english versions of specific parts of the ecoinvent v2 reports are available on the ecoinvent homepage as supporting information for datasets not substantially modified in terms of content for v3 and not fully adapted to v3 standards. These documents are condensed english versions of the corresponding original energy systems ecoinvent reports No. 6 and are supposed to serve as a documentation of the ecoinvent data v2.0 for users of the ecoinvent database not familiar with the German language. Changes made to ecoinvent v2.0 and implemented in ecoinvent v3 are NOT part of the translations. This should, however, only concern a minor fraction of the inventory data and its documentation in the reports, since the LCI data documented in the reports have not been subject to major modifications compared to ecoinvent v2 unless noted so in the documentation within the v3 dataset itself.

Geographical coverage of electricity production in ev3

Ecoinvent v2 included datasets for electricity generation in 32 countries producing about 64% of global electricity. In ecoinvent v3, 18 new countries were included with big producers such as Canada, Russia and India. No country producing more than 1% of global electricity is omitted anymore. Due to the split of the United States into 10 "electricity regions" and the split of Canada into the 13 provinces, 71 geographical regions for electricity production and supply are available in ecoinvent v3.

Country codes

The following table shows all countries or regions with electricity production and supply modelled in ev3. Newly implemented geographical regions are marked in grey.

Table 1: Geographical regions with electricity generation and supply datasets in ecoinvent v3.

Australia	AU	Malaysia	MY	Alberta	CA-AB
Austria	AT	Mexico	MX	British Columbia	CA-BC
Belgium	BE	Netherland	NL	Manitoba	CA-MB
Bosnia and Herzegovina	BA	Norway	NO	Québec	Québec
Brazil	BR	Peru	PE	New Brunswick	CA-NB
Bulgaria	BG	Poland	PL	Newfoundland and Labrador	CA-NF
Chile	CL	Portugal	PT	Northwest Territories	CA-NS
China	CN	Romania	RO	Nova Scotia	CA-NT
Croatia	HR	Russia	RU	Nunavut	CA-NU
Czech Republic	CZ	Saudia Arabia	SA	Ontario	CA-ON
Denmark	DK	Serbia ¹	RS	Prince Edward Island	CA-PE
Finland	FI	Slovakia	SK	Saskatechwan	CA-SK
France	FR	Slovenia	SI	Yukon	CA-YK
Germany	DE	South Africa	ZA	Alaska Systems Coordinating Council	ASCC
Greece	GR	South Korea	KR	Florida Reliability Coordinating Council	FRCC
Hungary	HU	Spain	ES	Hawaiian Islands Coordinating Council	HICC
India	IN	Sweden	SE	Midwest Reliability Organization	MRO, US only ²
Indonesia	ID	Switzerland	CH	Northeast Power Coordinating Council	NPCC, US only ²
Iran	IR	Taiwan	TW	Reliability First Corporation	RFC
Ireland	IE	Tanzania	TZ	SERC Reliability Corporation	SERC
Italy	IT	Thailand	TH	Southwest Power Pool	SPP
Japan	JP	Turkey	TR	Texas Regional Entity	TRE
Luxembourg	LU	Ukraine	UA	Western Electricity Coordinating Council	WECC, US only ²
Macedonia	MK	United Kingdom	GB		

¹This was “CS – Serbia and Montenegro” in v2. However, information on electricity production is only available for Serbia, so that the datasets in v3 are valid for “RS – Serbia”.

²As the electricity regions MRO, NPCC and WECC geographically overlap with some parts of Canada, ecoinvent v3 has integrated the geographies “MRO, US only”, “NPCC, US only” and “WECC, US only”, which exclude the Canadian parts of these regions. The electricity production data used are therefore valid for the US parts only.

Time period

The electricity markets (=mixes) in the release version of v3, i.e. the annual production volumes of the power generation activities, are valid for the year 2008, with the exception of Switzerland and the US regions, which are valid for 2009. Data on production volumes are taken from Itten et al. 2012 and IEA 2012. The datasets for countries already existing in v2 have only been updated with the 2008 production volume; most of the exchanges in these activities remain as in v2.2. A large fraction of inventories for the new countries (those technologies, which were already part of v2.2) are based on v2.2 data; key parameters and exchanges have been modified considering country-specific conditions and these refer to 2008/2009 as reference year. Details can be found in the individual datasets.

Technologies represented in ev3

Ecoinvent v3 includes inventories of all current major fossil, renewable and nuclear technologies as shown in Table 2. One dataset for each technology used in a specific geography exists now, i.e. no proxy datasets from other countries are used as inputs to the electricity markets in ev3.

Table 2: Electricity producing technologies modeled in ecoinvent version 3.

Fossil fuels		Renewables	
Coal	Hard coal	Hydropower	Reservoir power plants: alpine/non-alpine/tropical region
	Lignite		Run-of-river power plants
	Peat		Pumped storage power plants
Industrial gases	Blast furnace gases	Geothermal	Hot-Dry-Rock (EGS)
	Coke (coal) gases	Solar	Photovoltaic: Building integrated and open ground
Oil			<i>Solar thermal (no data available)</i>
Natural gas	Conventional gas power plant, with/without CHP	<i>Wave and tidal energy</i>	<i>(no data available)</i>
	Combined cycle gas power plant, with/without CHP	Wind	Onshore, capacity class <1MW / 1-3MW / >3MW
Nuclear			Offshore, capacity class 1-3MW
	Pressurised water reactor (PWR)	Wood	Wood chips, with/without extensive emission control
	Boiling water reactor (BWR)	Biogas	Biogas from biowaste, sewage sludge and landfill gases
		Waste	Waste incineration of municipal and industrial waste

Infrastructure datasets and fuel supply chains

Infrastructure and fuel supply chain datasets related to electricity production have not been updated for ev3.

Transformation, market, and import activities

For each of the geographies in Table 1, there exist two electricity transformation datasets and three market datasets on different voltage levels representing electricity supply in addition to all activities producing electricity. The market datasets include transmission losses.

Electricity which is imported into a certain geography is modelled in specific datasets. These are named “electricity, high voltage, import from YY, XX”, whereas “YY” stands for the exporting geography and “XX” is the target geography. Figure 1 shows a scheme of electricity supply on the different voltage levels.

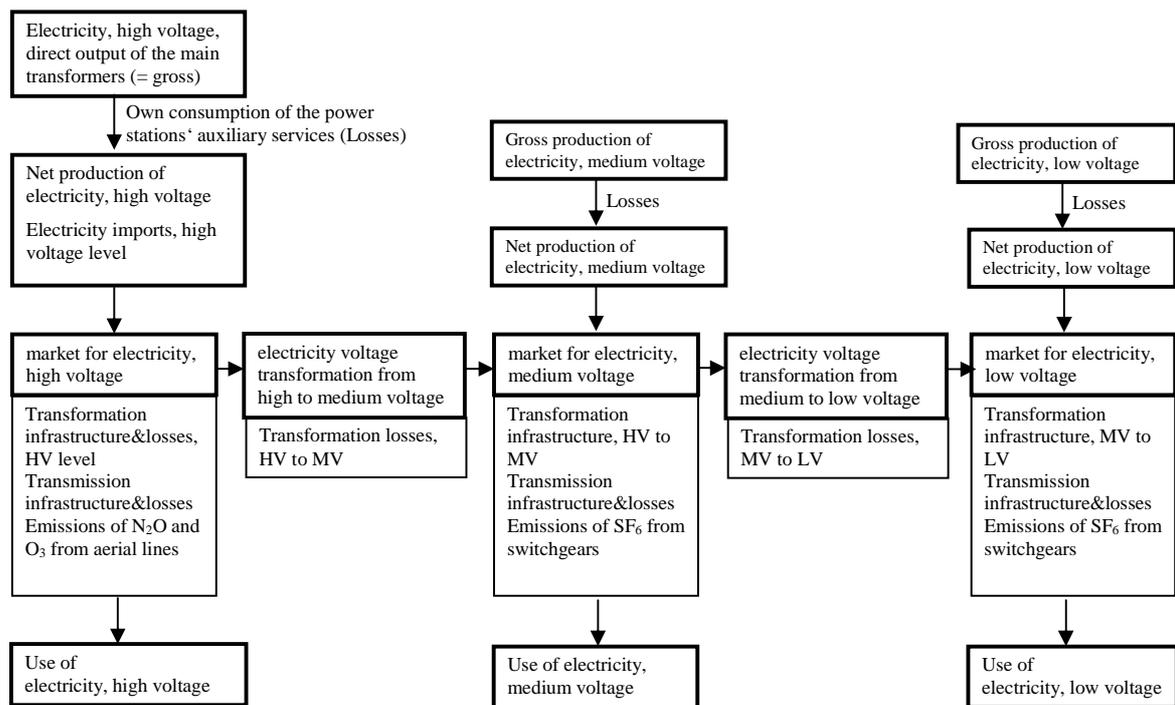


Figure 1: Scheme of electricity supply on the different voltage levels in ecoinvent v3.

Production mixes, supply mixes, consumption mixes, electricity markets

Geographical regions in ev3 are defined by the Keyhole Markup Language (KML), so that no overlapping market regions are allowed anymore. For example, there is no US electricity market in v3 because it would overlap with the electricity markets for all US sub-regions. The same is valid for e.g. RER or UCTE. However, it is possible to create overlapping production or supply mixes because these are not linked to any market, but are self-standing datasets. A comparison of such mixes and their contents in ev2 and ev3 is provided in Table 3.

Table 3: Definitions of production mixes, supply mixes, consumption mixes and electricity markets in ecoinvent version 2 and 3.

	Ecoinvent version 2	Ecoinvent version 3
Electricity production mix	Domestic electricity production + transmission infrastructure + associated emissions + transmission, distribution and transformation losses	Domestic electricity production (high voltage only)
Electricity supply mix/consumption mix	Domestic electricity production + imports from neighbouring geographies + transmission infrastructure + associated emissions + transmission, distribution and transformation losses	equivalent to electricity markets
Electricity markets	-	Domestic production + imports from neighbouring geographies + transmission infrastructure + associated emissions + transmission and distribution losses

In ev3, the electricity markets correspond to the previous v2 electricity supply mixes (“electricity, at grid”). Production mixes of v2 and v3 are not entirely the same, as the v3 datasets only collect all electricity produced in a specific geography, but does not account for transmission of the electricity. Production mixes are available for all 71 geographies on the high voltage level in v3. Further, the production mixes for bigger regions in v2 have been reproduced, i.e. for CA (new), CENTREL, ENTSO-E, NORDEL, UCTE, US. They are only of informative character and it is NOT recommended to use the production mixes in your life cycle analysis, because the electricity markets represent electricity supply.

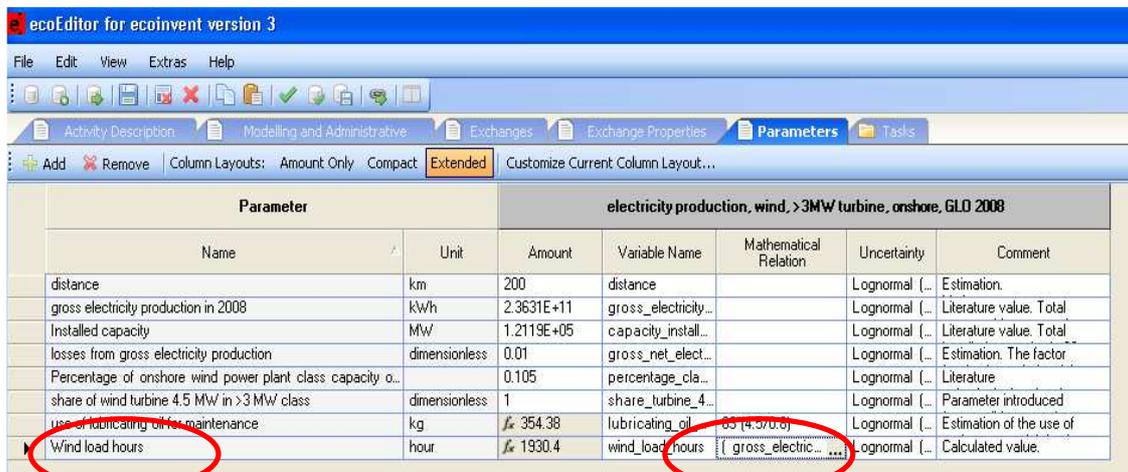
Parent-child relationship

The inheritance of local datasets from the global dataset has been implemented in the majority of the new electricity generation activities. Exception cases are where country-specific datasets for electricity production already existed in v2.2 – these have only been updated with annual production volumes for the year 2008, but have not been newly created as children. These specific datasets may not in

all aspects fulfill the requirements of the ecoinvent data quality guideline for version 3.

Use of parameters, variables and mathematical relations

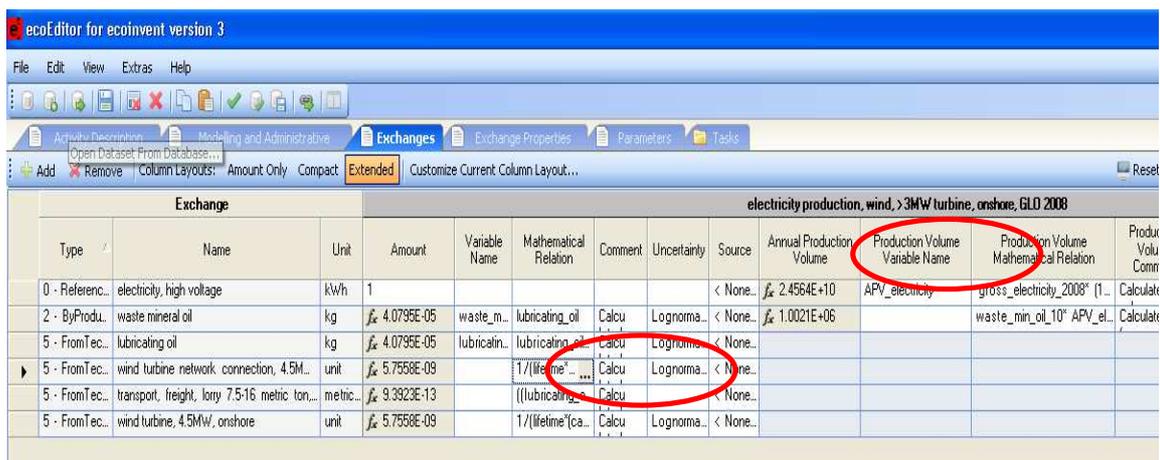
Datasets for v3 have to be submitted with the new software “ecoEditor”. It provides the possibility to make extensive use of parameters, variables and mathematical relations. This was applied for implementing key parameters such as electrical efficiencies, wind load hours, losses from gross electricity production, or lifetime (Figure 2 and Figure 3).



Parameter		electricity production, wind, >3MW turbine, onshore, GLO 2008				
Name	Unit	Amount	Variable Name	Mathematical Relation	Uncertainty	Comment
distance	km	200	distance		Lognormal [...]	Estimation.
gross electricity production in 2008	kWh	2.3631E+11	gross_electricity_2008		Lognormal [...]	Literature value. Total
Installed capacity	MW	1.2119E+05	capacity_install		Lognormal [...]	Literature value. Total
losses from gross electricity production	dimensionless	0.01	gross_net_elect		Lognormal [...]	Estimation. The factor
Percentage of onshore wind power plant class capacity o...	dimensionless	0.105	percentage_cla		Lognormal [...]	Literature
share of wind turbine 4.5 MW in >3 MW class	dimensionless	1	share_turbine_4		Lognormal [...]	Parameter introduced
usage of lubricating oil for maintenance	kg	354.38	lubricating_oil	(4.37/0.8)	Lognormal [...]	Estimation of the use of
Wind load hours	hour	1930.4	wind_load_hours	(gross_electricity_2008 * 1000) / (capacity_install * 8760)	Lognormal [...]	Calculated value.

Figure 2: Example for the implementation of parameters, variables and mathematical relations in the datasets via the software “ecoEditor”.

The wind load hours in this example are calculated from the gross electricity production and the installed capacity. The gross electricity production is also used in the calculation of the annual production volume (Figure 3).



Exchange		electricity production, wind, >3MW turbine, onshore, GLO 2008										
Type	Name	Unit	Amount	Variable Name	Mathematical Relation	Comment	Uncertainty	Source	Annual Production Volume	Production Volume Variable Name	Production Volume Mathematical Relation	Product Volume Comment
0 - Referenc...	electricity, high voltage	kWh	1					< None...	2.4564E+10	APV_electricity	gross_electricity_2008 * (1...	Calculat...
2 - ByProdu...	waste mineral oil	kg	4.0795E-05	waste_m...	lubricating_oil	Calcu	Lognorma...	< None...	1.0021E+06		waste_min_oil_10* APV_el...	Calculat...
5 - FromTec...	lubricating oil	kg	4.0795E-05	lubricatin...	lubricating_oil	Calcu	Lognorma...	< None...				
5 - FromTec...	wind turbine network connection, 4.5M...	unit	5.7558E-09		1/(lifetime*ca...	Calcu	Lognorma...	< None...				
5 - FromTec...	transport, freight, lorry 7.5-16 metric ton...	metric...	9.3923E-13		((lubricating_oil...	Calcu	Lognorma...	< None...				
5 - FromTec...	wind turbine, 4.5MW, onshore	unit	5.7558E-09		1/(lifetime*ca...	Calcu	Lognorma...	< None...				

Figure 3: Example for the implementation of parameters, variables and mathematical relations in the datasets via the software “ecoEditor”.

Merging of datasets for electricity production with fossil fuels

In version 2, electricity production with fossil fuels was modelled with two datasets:

- combustion of 1 MJ fuel (“fuel XY, burned in...”)
- production of 1 kWh of electricity (“electricity, at...”)

In version 3, these two datasets are merged into one dataset “electricity production, *fuel type*”, which directly contains the inputs for and emissions of the production of 1 kWh of high voltage electricity.

Overview table on electricity datasets in ecoinvent v3

Table 4 gives an overview on all datasets in ev3 used for modelling the electricity production and their attributes: Category, sub-category, specification of the fuel type, dataset names in v3 and v2, dataset type, reference product, tags, technology level, and availability of geographies for a certain technology.

Table 4: Electricity production technologies present in ecoinvent v3: Categories, dataset names in v3 and in v2, reference products, tags, technology level, child datasets and no inheritance datasets. Dataset type: A = electricity generating activity, B = heat and power co-generation activity, C = treatment activity

Category	Sub-category	Specifications	Dataset name / dataset type	Dataset name v2	Reference product	Tag(s) ²	Technology level	Child datasets	No inheritance (updates from v2)
Fossil fuels³									
Coal	Hard coal	Anthracite, bituminous coal ⁴	electricity production, hard coal / A	hard coal, burned in power plant/electricity, hard coal, at power plant	electricity, high voltage [1 kWh]	hard coal power, coal power, fossil fuels	Modern	AU, ASCC, BA, BG, CA-AB, CA-NB, CA-NS, CA-ON, CL, FRCC, HICC, IN, KR, MRO, MX, MY, NPCC, PE, RFC, RU, SERC, SPP, TH, TR, TRE, TW, TZ, UA, WECC, ZA	AT, BE, BR, CN, CZ, DE, DK, ES, FI, FR, GB, HR, HU, IE, IT, JP, NL, NO, PL, PT, RO, SE, SI, SK
	Lignite (brown coal)	Sub-bituminous coal, lignite/brown coal ⁴	electricity production, lignite / A	lignite, burned in power plant/electricity, lignite, at power plant	electricity, high voltage [1 kWh]	lignite power, coal power, fossil fuels	Modern	AU, BR, CA-AB, CA-MB, CA-ON, CA-SK, HR, ID, IN, MK, RU, TH, TR, TW, UA	BA, BG, CZ, DE, GR, HU, PL, RO, RS, SI, SK
	Peat		electricity production, peat / A	peat, burned in power plant/electricity, peat, at power plant	electricity, high voltage [1 kWh]	peat power, fossil fuels	Current	RU, SE	FI, IE

² All electricity datasets in the US regions hold additionally the tag "United States". All electricity datasets in the Canadian regions hold additionally the tag "Canada". All treatment activities hold additionally the tag "treatment activity".

³ Quantities of fossil fuels for power generation are always calculated based on net calorific values (lower heating values) of the fuels.

⁴ For AU, BE, FI, FR, IS, JP, KR, MX, NZ, PT, US, the sub-category "hard coal" includes anthracite, bituminous coal and sub-bituminous coal. For these countries, sub-category "brown coal" only includes lignite

Category	Sub-category	Specifications	Dataset name / dataset type	Dataset name v2	Reference product	Tag(s) ²	Technology level	Child datasets	No inheritance (updates from v2)
Industrial Gases	Coke gases		treatment of coal gas, in power plant / C	coke oven gas, burned in power plant/electricity, industrial gas, at power plant	coal gas [- 1 MJ] ⁵	industrial gas power, fossil fuels	Current	BA, BE, CA-AB, CA-NB, CA-NS, CA-ON, CA-PE, CN, DE, ES, FR, HR, IN, IR, IT, JP, KR, MX, NL, RS, RU, TR, UA	AT, BG, BR, CZ, FI, GB, HU, NO, PL, RO, SE, SK
	Blast furnace gases		treatment of blast furnace gas, in power plant / C	-	blast furnace gas [- 1 MJ]	industrial gas power, fossil fuels	Current	AU, AT, BA, BE, CA-AB, CA-NB, CA-NS, CA-ON, CA-PE, CN, DE, ES, FR, HR, IR, IT, JP, KR, MX, RS, RU, TR, TW, UA	BG, BR, CZ, FI, GB, HU, NL, NO, PL, RO, SE, SK
Petroleum products	Oil	Fuel oil, diesel, other petroleum products	electricity production, oil / A	oil, burned in power plant/electricity, oil, at power plant	electricity, high voltage [1 kWh]	oil power	Current ⁶	AU, ASCC, BA, CA-AB, CA-BC, CA-MB, CA-NB, CA-NF, CA-NS, CA-NT, CA-NU, CA-ON, CA-PE, CA-SK, CA-YK, CL, FRCC, HICC, ID, IN, IR, KR, MRO, MX, MY, NPCC, PE, RFC, RO, RU, SA, SERC, SPP, TH, TR, TRE, TW, TZ, UA, WECC, ZA	AT, BE, BG, BR, CN, CZ, DE, DK, ES, FI, FR, GB, GR, HR, HU, IE, IT, JP, MK, NL, NO, PL, PT, RS, SE, SI, SK

⁶ Exceptions: SA, IR, RU are classified as “modern”

Category	Sub-category	Specifications	Dataset name / dataset type	Dataset name v2	Reference product	Tag(s) ²	Technology level	Child datasets	No inheritance (updates from v2)
Natural Gas	Conventional gas power plant, without combined heat and power production	Natural gas (excluding natural gas liquids), gas works gas (town gas).	electricity production, at natural gas, conventional power plant / A	natural gas, burned in power plant/electricity, natural gas, at power plant	electricity, high voltage [1 kWh]	natural gas power	Current	AU, CA-AB, CA-BC, CA-MB, CA-NB, CA-NS, CA-NT, CA-ON, CA-SK, CL, ID, IN, IR, KR, MX, MY, PE, Québec, SA, TH, TR, TW, TZ, UA	ASCC, AT, BE, BG, BR, CN, CZ, DE, DK, ES, FI, FR, FRCC, GB, GR, HR, HU, IE, IT, JP, LU, MRO, NL, NO, NPCC, PL, PT, RFC, RO, RS, SE, SERC, SI, SK, SPP, TRE, WECC
	Conventional gas power plant, with combined heat and power production	Natural gas (excluding natural gas liquids), gas works gas (town gas).	heat and power co-generation, natural gas, conventional power plant, 100 MW electrical / B	-	heat, district or industrial, natural gas [MJ ⁷] /	natural gas power	Current	AU, CA-AB, CA-BC, CA-MB, CA-NB, CA-NS, CA-NT, CA-ON, CA-SK, KR, Québec, RU, TR, UA	None
	Combined cycle gas power plant, without combined heat and power production	Natural gas (excluding natural gas liquids), gas works gas (town gas).	electricity production, natural gas, combined cycle power plant / A	-	electricity, high voltage [1 kWh]	natural gas power	Modern	AU, CA-AB, CA-BC, CA-MB, CA-NB, CA-NS, CA-NT, CA-ON, CA-SK, CL, ID, IN, IR, KR, MX, MY, PE, SA, TH, TR, TW	None

⁷ The amount of the reference product is partly scaled to the production of 1 kWh of electricity as by-product.

Category	Sub-category	Specifications	Dataset name / dataset type	Dataset name v2	Reference product	Tag(s) ²	Technology level	Child datasets	No inheritance (updates from v2)
	Combined cycle gas power plant, with combined heat and power production	Natural gas (excluding natural gas liquids), gas works gas (town gas).	heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical / B	-	heat, district or industrial, natural gas [MJ]	natural gas power	Modern ⁸	AU, KR, RU, TR	None
Nuclear	Pressurised-water reactor (PWR)		electricity production, nuclear, pressure water reactor / A	electricity, nuclear, at power plant pressure water reactor	electricity, high voltage [1 kWh]	nuclear power	Modern ⁹	BE, BG, BR, CA-NB, CA-ON, CZ, ES, FI, FRCC, GB, HU, IN, JP, KR, MRO, NL, NPCC, Québec, RFC, RO, RU, SE, SERC, SI, SK, SPP, TRE, TW, UA, WECC, ZA	CH, CN, DE, FR
	Boiling-water reactor (BWR)		electricity production, nuclear, boiling water reactor / A	electricity, nuclear, at power plant boiling water reactor	electricity, high voltage [1 kWh]	nuclear power	Modern ⁹	ES, FI, FRCC, IN, JP, MRO, MX, NPCC, RFC, RU, SE, SERC, SPP, TRE, TW, WECC	CH, DE

⁸ Even if classified as “modern”, the electricity from these datasets do not supply the marginal mix, as it is only a by-product.

⁹ Exceptions: CH, DE and JP are classified as “current”

Category	Sub-category	Specifications	Dataset name / dataset type	Dataset name v2	Reference product	Tag(s) ²	Technology level	Child datasets	No inheritance (updates from v2)
Renewables									
Hydropower	Reservoir power plants (storage type hydropower plants)	Alpine region	electricity production, hydro, reservoir, alpine region / A	electricity, hydropower, at reservoir power plant, alpine region	electricity, high voltage [1 kWh]	hydro power	Modern	ASCC, AT, BA, CA-AB, CA-BC, CA-NT, CA-YK, CH, FR, HR, IN, IT, JP, MK, MRO, NO, NPCC, PE, RFC, RS, SERC, WECC	None
		Non-alpine region	electricity production, hydro, reservoir, non-alpine region / A	electricity, hydropower, at reservoir power plant, non alpine regions	electricity, high voltage [1 kWh]	hydro power	Modern	CA-MB, CA-NB, CA-NF, CA-NS, CA-ON, CA-SK, CZ, DE, ES, FI, FRCC, HICC, KR, PT, Québec, RU, SE, SK, SPP, TR, TRE, TZ, ZA	CN
		Tropical region	electricity production, hydro, reservoir, tropical region/ A	-	electricity, high voltage [1 kWh]	hydro power	Modern	ID, MY, TH, BR	None
	Run-of-river power plants		electricity production, hydro, run-of-river / A	electricity, hydropower, at run-of-river power plant	electricity, high voltage [1 kWh]	hydro power	Modern	CH: No inheritance. All other are children: ASCC, AT, AU, BA, BE, BG, CA-AB, CA-BC, CA-MB, CA-NB, CA-NS, CA-NT, CA-ON, CA-SK, CA-YK, CL, CN, CZ, DE, DK, ES, FI, FR, FRCC, GB, GR, HICC, HR, HU, IE, IN, IR, IT, JP, KR, LU, MK, MRO, MX, NL, NPCC, PL, PT, Québec, RFC, RO, RS, RU, SE, SERC, SI, SK, SPP, TR, TRE, TW, UA, WECC	

Category	Sub-category	Specifications	Dataset name / dataset type	Dataset name v2	Reference product	Tag(s) ²	Technology level	Child datasets	No inheritance (updates from v2)
	Pumped storage power plants		electricity production, hydro, pumped storage / A	electricity, hydropower, at pumped storage power plant	electricity, high voltage [1 kWh]	hydro power	Modern	ASCC,AU, CA-AB, CA-BC, CA-MB, CA-NB, CA-NS, CA-NT, CA-ON, CA-SK, CA-YK, FRCC, HICC, IN, KR, MRO, NPCC, RFC, SERC, SPP, TRE, WECC, ZA	AT, BE, CH, CZ, DE, ES, FR, GB, GR, HR, IE, IT, JP, LU, NO, PL, PT, RS, SE, SK
Geothermal		Hot-Dry-Rock	electricity production, geothermal / A	-	electricity, high voltage [1kWh]	geothermal power	Modern	AT, DE, HICC,ID, IT, JP, MX, PT, RU, TH, TR, WECC	None
Solar	Photovoltaic	Different cell types and mounting systems, building integrated and open ground (17 datasets in total)	electricity production, photovoltaic, 3kWp [...] / at 570kWp open ground installation, multi-Si / A	Starting with "electricity, PV, at 3kWp [...]"	electricity, low voltage [1 kWh]	photovoltaic power	Current ¹⁰	AT,AU,BE,CA-AB,CA-BC,CA-MB,CA-NB,CA-NS,CA-NT,CA-NU,CA-ON,CAPE,CA-SK,CA-YK,CN,CZ,DE,DK,ES,FI,FR,FRCC,GB,GR,HICC,HU,IN,IT,JP,KR,LU,MX,MY,NL,NPCC,PT, Québec,RFC,SE, SERC,SI,TH, TW,WECC,ZA	CH
	<i>Solar thermal</i>	<i>No dataset</i>			-	-	-	-	-
	<i>Wave and tidal energy</i>	<i>No dataset</i>							

¹⁰ Only temporarily - photovoltaics will be specified as "modern" in v3.1 together with the voltage transformation activities. Due to the fact that voltage transformation activities are currently specified as "current", photovoltaics would be the only unconstrained supplier on the low voltage level, if categorized as "modern".

Category	Sub-category	Specifications	Dataset name / dataset type	Dataset name v2	Reference product	Tag(s) ²	Technology level	Child datasets	No inheritance (updates from v2)
Wind	Onshore, capacity class <1 MW		electricity production, wind, >1MW turbine, onshore / A	Electricity, at wind power plant 800 kW	electricity, high voltage [1 kWh]	wind power	Current	Children only: AU, ASCC, AT, BE, BG, BR, CA-AB, CA-MB, CA-NS, CA-ON, CA-PE, CA-SK, CA-YK, CH, CL, CN, CZ, DE, DK, ES, FI, FR, GB, GR, HICC, HR, HU, IE, IN, IR, IT, JP, KR, LU, MRO, MX, NL, NO, NPCC, PE, PL, PT, Québec, RFC, RO, RU, SE, SERC, SK, SPP, TR, TRE, TW, UA, WECC, ZA	
	Onshore, capacity class 1-3 MW		electricity production, wind, 1-3MW turbine, onshore / A	-	electricity, high voltage [1 kWh]	wind power	Modern		
	Onshore, capacity class >3 MW		electricity production, wind, >3MW turbine, onshore / A	-	electricity, high voltage [1 kWh]	wind power	Modern		
	Offshore, capacity class 1-3 MW		electricity production, wind, 1-3MW turbine, offshore / A	-	electricity, high voltage [1 kWh]	wind power	Modern	BE, CN, DK, FI, DE, IE, JP, NL, NO, SE, GB	None
Wood	Wood chips	With and without extensive emission control	heat and power co-generation, wood chips, 6400kWth, with extensive emission control / with multicyclone emission control / B	electricity, at cogen 6400kWth, wood, allocation exergy	heat, district or industrial, other than natural gas [1 MJ]	wood power	Modern ⁸	Children only: ASCC, AT,AU, BE, BR, CA-AB, CA-BC, CA-NS, CA-ON, CA-PE, CH, CN, CZ, DE, DK, ES, FI, FR, FRCC, GB, HICC, HU, IE, IT, JP, KR, MRO, NL, NO, NPCC, PL, PT, Québec, RFC, RO, SE, SERC, SI, SK, SPP, TRE, WECC, CL, IN, MX, PE, RU, TH, TR, TW, ZA	

Category	Sub-category	Specifications	Dataset name / dataset type	Dataset name v2	Reference product	Tag(s) ²	Technology level	Child datasets	No inheritance (updates from v2)
Biogas		Biogas from biowaste, sewage sludge and landfill gases.	heat and power co-generation, biogas, in gas engine / C	electricity, at cogen with biogas engine, allocation exergy	biogas [- 1 m ³]	biogas power	Modern ⁸	AU, CA-AB, CA-NB, CA-NS, CA-ON, CA-PE, FI, GB, GR, IE, KR, NO, MX, Québec, TH, TR	AT, BE, CH, CZ, DE, DK, ES, FI, FR, HU, IT, LU, NL, PL, PT, SE, SI, SK
Waste									
Waste incineration		Municipal and industrial waste	treatment of municipal solid waste, incineration / C	disposal, municipal solid waste, 22.9% water, to municipal incineration	municipal solid waste [- 1 kg]	waste power	Current	Children only: AT, BE, BG, CA-AB, CA-NB, CA-NS, CA-ON, CA-PE, CH, CZ, DE, DK, ES, FI, FR, GB, HU, IT, JP, KR, LU, NL, NO, PL, PT, RU, SE, SK, TR, TW	

Further datasets for smaller-scale technologies producing electricity

There exist some more datasets in the database which model electricity production, but do not supply the “normal” electricity markets (or only to a very minor extent). These are the following:

- electricity production, natural gas, 10MW
- heat and power co-generation, diesel, 200kW electrical, SCR-NOx reduction
- heat and power co-generation, natural gas, 160kW electrical, Jakobsberg
- heat and power co-generation, natural gas, 160kW electrical, lambda=1
- heat and power co-generation, natural gas, 200kW electrical, lean burn
- heat and power co-generation, natural gas, 500kW electrical, lean burn
- heat and power co-generation, natural gas, 50kW electrical, lean burn
- heat and power co-generation, natural gas, mini-plant 2KW electrical
- natural gas, burned in micro gas turbine, 100kWe
- natural gas, burned in solid oxide fuel cell 125kWe, future
- natural gas, burned in solid oxide fuel cell, with micro gas turbine, 180kWe, future
- petroleum refinery operation
- heat and power co-generation, wood chips, organic Rankine cycle, 1400kW thermal, with extensive emission control
- heat and power co-generation, wood chips, organic Rankine cycle, 1400kW thermal
- wood pellets, burned in stirling heat and power co-generation unit, 3kW electrical, future
- ethanol production from sweet sorghum
- ethanol production from wood
- treatment of digester sludge by municipal incineration
- sawing and planing, paraná pine, kiln dried
- label-certified electricity in Switzerland with different technologies (separate markets for certified electricity)
- electricity production in the aluminium industry

Rest-of-the-World (ROW) datasets for electricity production

Since global electricity production datasets are not (yet) calculated as averages from all local datasets, exchanges in the automatically created ROW datasets were negative or had unrealistic high amounts. A temporary procedural exception has therefore been applied under the supervision of the LCI experts in order to produce more realistic ROW datasets by creating the electricity related ROW datasets as a direct copy of the GLO dataset.

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