



Data Article

Life Cycle Inventories datasets for future European electricity mix scenarios



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ABSTRACT

Datasets concerning the European electricity mix, built employing the Ecoinvent database v.3.3 processes, are reported in this paper. Foreseen future scenarios are modelled based on acknowledged projections for energy market in Europe in 2050. These electricity mix data inventories could be useful for any academic or stakeholder interested in performing long-term prospective assessment of innovative generation technologies in the future European energy market.

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Specifications table

| | |
|--------------------------------|---|
| Subject | Renewable Energy, Sustainability and the Environment |
| Specific subject area | Life Cycle Assessment and Energy Systems |
| Type of data | Tables |
| How data were acquired | Ecoinvent 3.3 Database and scientific literature |
| Data format | Raw Analysed |
| Parameters for data collection | Technological, temporal and geographical representativeness of data are described in Ecoinvent 3.3 reports |
| Description of data collection | Data collection is performed employing the Ecoinvent database v3.3. When the required information is not available from the Ecoinvent database, secondary data are acquired from literature |
| Data source location | Institution: Ecoinvent City/Town/Region: Zurich Country: Switzerland |
| Data accessibility | The Life Cycle Inventories are reported with this article |

Value of the data

- Datasets for building Life Cycle Inventories of 2050 European electricity mix scenarios are provided.
- Comprehensive and up-to-date datasets are built based on the outcomes and recommendation of the NEEDS project and IEA-PVPS Task 12 technical reports.
- Technical data and averages concerning the energy sources for future European electricity mix scenarios are modelled and customised according to the Ecoinvent v 3.3 and ensuring easy employment and reproducibility also for successive versions of the life cycle inventory database.
- The usefulness of such data for the scientific community is fulfilled in the application of life cycle assessment for the calculation of the environmental burdens associated to different electricity generation technologies in a long-term prospective approach.

1. Data

The development of innovative technologies for energy production should be always supported by sustainability assessment to provide a reliable evaluation of their environmental performances and implications in the future energy market [1,2]. In this context, reliable Life Cycle Inventories (LCIs) of future energy mixes are pivotal in order to guarantee consistency and reproducibility of prospective Life Cycle Assessment (LCA) studies. Datasets presented in this article concern the LCIs of future European electricity mix. These datasets have been built employing the Ecoinvent database v 3.3 [3] energy production processes and modelling the three main scenarios that are foreseen to characterise the shares of energy sources employed in Europe in 2050. The three scenarios (Table 1) are business-as-usual (BAU), realistic (REAL) and optimistic (OPT) and they have been modelled according to the results of the NEEDS (New Energy Externalities Development for Sustainability) project [4–6] and as described in the IEA-PVPS (International Energy Agency Photovoltaic Power Systems Programme) reports [7,8].

To reproduce these shares of energy sources using the Ecoinvent database v 3.3 [3], a new European electricity mix process was built by specifying the percentages of the energy sources as inputs (Tables 2 and 3). This European electricity mix process features the same input and output flows of the “Electricity, high voltage [ENTSO-E] production mix” process provided by the Ecoinvent database v 3.3. The difference is the way in which each input is reported. In fact, in the Ecoinvent database, the European electricity production mix is built as a process with a long list of input flows. These input flows refer to the electricity generated by all the energy sources (e.g., hard coal, lignite, oil, natural gas, nuclear, biomass, hydropower, wind and other sources) in all the European countries. Differently, in this study the input flows referring to each

Table 1

Shares of energy sources for BAU, REAL and OPT scenarios of electricity mix production in Europe in 2050, based on the NEEDS project and IEA-PVPS reports.

| | BAU | REAL | OPT |
|-------------|-------|-------|-------|
| Hard coal | 26.4% | 5.9% | 2.9% |
| Lignite | 9.7% | 0.05% | 0.05% |
| Oil | 0.6% | 0.2% | 0.05% |
| Natural gas | 18.6% | 41.5% | 16.8% |
| Nuclear | 22.0% | 24.4% | 0.05% |
| Biomass | 3.6% | 3.3% | 15.8% |
| Hydropower | 14.3% | 15.1% | 24.2% |
| Wind | 4.6% | 7.0% | 32.3% |
| Others | 3.4% | 2.55% | 7.85% |

Table 2

Ecoinvent 3.3 dataset of electricity production mix in Europe (i.e., ENTSO-E countries).

| OUTPUT - Product | | |
|---|-------|-----|
| Electricity, high voltage {EURO} electricity production mix | 1.000 | kWh |
| INPUT - Electricity/heat | | |
| Electricity, high voltage {EURO} electricity production, hard coal | 0.148 | kWh |
| Electricity, high voltage {EURO} electricity production, lignite | 0.119 | kWh |
| Electricity, high voltage {EURO} electricity production, oil | 0.016 | kWh |
| Electricity, high voltage {EURO} electricity production, natural gas | 0.159 | kWh |
| Electricity, high voltage {EURO} electricity production, nuclear | 0.270 | kWh |
| Electricity, high voltage {EURO} electricity production, biomass | 0.024 | kWh |
| Electricity, high voltage {EURO} electricity production, hydropower | 0.182 | kWh |
| Electricity, high voltage {EURO} electricity production, wind | 0.046 | kWh |
| Electricity, high voltage {EURO} electricity production, other | 0.036 | kWh |

energy sources are grouped to give the following percentage energy sources composition for the European electricity mix:

- Hard coal: 14.77%;
- Lignite: 11.93%;
- Oil: 1.56%;
- Natural gas: 15.94%;
- Nuclear: 27.04%;
- Biomass: 2.43%;
- Hydropower: 18.18%;
- Wind: 4.60%;
- Other: 3.55%.

In this context, a specific LCI has been built for each energy source. These datasets are reported in [Tables 3–11](#). The electrical losses during the transformation of electricity from high to medium voltage have been accounted for ([Table 12](#)) and they were taken from the Worldbank data website [9].

The LCI of European electricity scenarios in 2050 are reported in [Tables 13–18](#). Datasets provided in this work can be easily customised also for more recent version of the Ecoinvent database.

2. Experimental design, materials and methods

Data are shown in Tables divided in two sections: Inputs and Outputs

- In the first column, the name of the Ecoinvent process is reported.
- In the second column, the amount of energy is provided.
- In the third column, the unit of measure is described.

Table 3

Dataset concerning European electricity production by hard coal.

| OUTPUT - Product | | |
|---|----------|-----|
| Electricity, high voltage {EURO} electricity production, hard coal | 1.000 | kWh |
| INPUT - Electricity/heat | | |
| Electricity, high voltage {AT} electricity production, hard coal | 8.97E-03 | kWh |
| Electricity, high voltage {AT} heat and power co-generation, hard coal | 7.24E-04 | kWh |
| Electricity, high voltage {BE} electricity production, hard coal | 7.53E-03 | kWh |
| Electricity, high voltage {BG} electricity production, hard coal | 5.97E-03 | kWh |
| Electricity, high voltage {CZ} electricity production, hard coal | 4.80E-03 | kWh |
| Electricity, high voltage {CZ} heat and power co-generation, hard coal | 5.40E-03 | kWh |
| Electricity, high voltage {DE} electricity production, hard coal | 2.16E-01 | kWh |
| Electricity, high voltage {DE} heat and power co-generation, hard coal | 3.17E-02 | kWh |
| Electricity, high voltage {FI} electricity production, hard coal | 6.15E-03 | kWh |
| Electricity, high voltage {FI} heat and power co-generation, hard coal | 9.31E-03 | kWh |
| Electricity, high voltage {FR} electricity production, hard coal | 4.08E-02 | kWh |
| Electricity, high voltage {GB} electricity production, hard coal | 3.15E-01 | kWh |
| Electricity, high voltage {HR} electricity production, hard coal | 4.73E-03 | kWh |
| Electricity, high voltage {IE} electricity production, hard coal | 1.20E-02 | kWh |
| Electricity, high voltage {IT} electricity production, hard coal | 1.05E-01 | kWh |
| Electricity, high voltage {NL} electricity production, hard coal | 3.85E-02 | kWh |
| Electricity, high voltage {NL} heat and power co-generation, hard coal | 1.48E-02 | kWh |
| Electricity, high voltage {NO} heat and power co-generation, hard coal | 8.30E-05 | kWh |
| Electricity, high voltage {PL} heat and power co-generation, hard coal | 1.68E-01 | kWh |
| Electricity, high voltage {SE} heat and power co-generation, hard coal | 1.07E-03 | kWh |
| Electricity, high voltage {SK} heat and power co-generation, hard coal | 2.75E-03 | kWh |

Table 4

Dataset concerning European electricity production by lignite.

| OUTPUT - Product | | |
|---|----------|-----|
| Electricity, high voltage {EURO} electricity production, lignite | 1.000 | kWh |
| INPUT - Electricity/heat | | |
| Electricity, high voltage {BA} electricity production, lignite | 2.58E-02 | kWh |
| Electricity, high voltage {BG} electricity production, lignite | 5.30E-02 | kWh |
| Electricity, high voltage {CZ} electricity production, lignite | 7.78E-02 | kWh |
| Electricity, high voltage {CZ} heat and power co-generation, lignite | 2.43E-02 | kWh |
| Electricity, high voltage {DE} electricity production, lignite | 4.07E-01 | kWh |
| Electricity, high voltage {DE} heat and power co-generation, lignite | 1.69E-02 | kWh |
| Electricity, high voltage {GR} electricity production, lignite | 5.45E-02 | kWh |
| Electricity, high voltage {GR} heat and power co-generation, lignite | 2.23E-02 | kWh |
| Electricity, high voltage {HR} electricity production, lignite | 4.80E-05 | kWh |
| Electricity, high voltage {HU} electricity production, lignite | 1.67E-02 | kWh |
| Electricity, high voltage {IT} electricity production, lignite | 2.25E-03 | kWh |
| Electricity, high voltage {MK} electricity production, lignite | 1.13E-02 | kWh |
| Electricity, high voltage {PL} heat and power co-generation, lignite | 1.40E-01 | kWh |
| Electricity, high voltage {RO} electricity production, lignite | 6.04E-02 | kWh |
| Electricity, high voltage {RS} electricity production, lignite | 6.95E-02 | kWh |
| Electricity, high voltage {SI} electricity production, lignite | 1.59E-03 | kWh |
| Electricity, high voltage {SI} heat and power co-generation, lignite | 1.13E-02 | kWh |
| Electricity, high voltage {SK} heat and power co-generation, lignite | 5.30E-03 | kWh |

Table 5

Dataset concerning European electricity production by oil.

| OUTPUT - Product | | |
|---|----------|-----|
| Electricity, high voltage {EURO} electricity production, oil | 1.000 | kWh |
| INPUT - Electricity/heat | | |
| Electricity, high voltage {AT} electricity production, oil | 4.00E-04 | kWh |
| Electricity, high voltage {AT} heat and power co-generation, oil | 1.51E-02 | kWh |
| Electricity, high voltage {BA} electricity production, oil | 5.60E-04 | kWh |
| Electricity, high voltage {BE} electricity production, oil | 1.39E-03 | kWh |
| Electricity, high voltage {BE} heat and power co-generation, oil | 5.36E-03 | kWh |
| Electricity, high voltage {BG} electricity production, oil | 8.50E-04 | kWh |
| Electricity, high voltage {BG} heat and power co-generation, oil | 3.59E-03 | kWh |
| Electricity, high voltage {CZ} electricity production, oil | 4.70E-04 | kWh |
| Electricity, high voltage {CZ} heat and power co-generation, oil | 1.32E-03 | kWh |
| Electricity, high voltage {DE} electricity production, oil | 9.48E-02 | kWh |
| Electricity, high voltage {DE} heat and power co-generation, oil | 5.89E-02 | kWh |
| Electricity, high voltage {EE} electricity production, oil | 1.09E-03 | kWh |
| Electricity, high voltage {FI} electricity production, oil | 2.55E-03 | kWh |
| Electricity, high voltage {FI} heat and power co-generation, oil | 3.87E-03 | kWh |
| Electricity, high voltage {FR} electricity production, oil | 5.68E-02 | kWh |
| Electricity, high voltage {FR} heat and power co-generation, oil | 3.16E-02 | kWh |
| Electricity, high voltage {GB} electricity production, oil | 2.42E-02 | kWh |
| Electricity, high voltage {GB} heat and power co-generation, oil | 3.96E-02 | kWh |
| Electricity, high voltage {GR} electricity production, oil | 9.54E-02 | kWh |
| Electricity, high voltage {GR} heat and power co-generation, oil | 1.92E-02 | kWh |
| Electricity, high voltage {HR} electricity production, oil | 4.96E-03 | kWh |
| Electricity, high voltage {HR} heat and power co-generation, oil | 6.77E-03 | kWh |
| Electricity, high voltage {HU} electricity production, oil | 3.55E-03 | kWh |
| Electricity, high voltage {IE} electricity production, oil | 4.24E-03 | kWh |
| Electricity, high voltage {IE} heat and power co-generation, oil | 8.90E-04 | kWh |
| Electricity, high voltage {IS} electricity production, oil | 8.00E-05 | kWh |
| Electricity, high voltage {IT} electricity production, oil | 7.29E-02 | kWh |
| Electricity, high voltage {IT} heat and power co-generation, oil | 3.16E-01 | kWh |
| Electricity, high voltage {LT} heat and power co-generation, oil | 4.84E-03 | kWh |
| Electricity, high voltage {LU} heat and power co-generation, oil | 2.00E-05 | kWh |
| Electricity, high voltage {LV} heat and power co-generation, oil | 2.00E-05 | kWh |
| Electricity, high voltage {MK} electricity production, oil | 1.77E-03 | kWh |
| Electricity, high voltage {NL} electricity production, oil | 2.27E-02 | kWh |
| Electricity, high voltage {NL} heat and power co-generation, oil | 2.27E-02 | kWh |
| Electricity, high voltage {NO} electricity production, oil | 8.50E-04 | kWh |
| Electricity, high voltage {PL} heat and power co-generation, oil | 4.03E-02 | kWh |
| Electricity, high voltage {RO} electricity production, oil | 1.51E-03 | kWh |
| Electricity, high voltage {RO} heat and power co-generation, oil | 1.36E-02 | kWh |
| Electricity, high voltage {RS} heat and power co-generation, oil | 1.35E-03 | kWh |
| Electricity, high voltage {SE} electricity production, oil | 1.32E-03 | kWh |
| Electricity, high voltage {SE} heat and power co-generation, oil | 1.23E-02 | kWh |
| Electricity, high voltage {SI} electricity production, oil | 1.70E-04 | kWh |
| Electricity, high voltage {SK} electricity production, oil | 3.30E-04 | kWh |
| Electricity, high voltage {SK} heat and power co-generation, oil | 9.65E-03 | kWh |

Table 6

Dataset concerning European electricity production by natural gas.

| OUTPUT - Product | | |
|---|----------|-----|
| Electricity, high voltage {EURO} electricity production, natural gas | 1.000 | kWh |
| INPUT - Electricity/heat | | |
| Electricity, high voltage {AT} electricity production, natural gas, combined cycle power plant | 4.32E-03 | kWh |
| Electricity, high voltage {AT} electricity production, natural gas, conventional power plant | 2.03E-03 | kWh |
| Electricity, high voltage {AT} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 1.03E-02 | kWh |
| Electricity, high voltage {AT} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 3.14E-03 | kWh |
| Electricity, high voltage {BA} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 1.03E-04 | kWh |
| Electricity, high voltage {BE} electricity production, natural gas, combined cycle power plant | 1.85E-02 | kWh |
| Electricity, high voltage {BE} electricity production, natural gas, conventional power plant | 4.31E-03 | kWh |
| Electricity, high voltage {BE} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 7.73E-03 | kWh |
| Electricity, high voltage {BE} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 1.80E-02 | kWh |
| Electricity, high voltage {BG} electricity production, natural gas, conventional power plant | 2.40E-05 | kWh |
| Electricity, high voltage {BG} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 2.76E-04 | kWh |
| Electricity, high voltage {BG} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 4.36E-03 | kWh |
| Electricity, high voltage {CH} electricity production, natural gas, 10 MW | 7.20E-14 | kWh |
| Electricity, high voltage {CH} heat and power co-generation, natural gas, 1 MW electrical, lean burn | 3.16E-04 | kWh |
| Electricity, high voltage {CH} heat and power co-generation, natural gas, 200 kW electrical, lean burn | 2.64E-04 | kWh |
| Electricity, high voltage {CH} heat and power co-generation, natural gas, 500 kW electrical, lean burn | 1.80E-04 | kWh |
| Electricity, high voltage {CZ} electricity production, natural gas, combined cycle power plant | 1.70E-05 | kWh |
| Electricity, high voltage {CZ} electricity production, natural gas, conventional power plant | 7.10E-05 | kWh |
| Electricity, high voltage {CZ} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 2.24E-03 | kWh |
| Electricity, high voltage {DE} electricity production, natural gas, 10 MW | 5.10E-13 | kWh |
| Electricity, high voltage {DE} electricity production, natural gas, combined cycle power plant | 2.85E-02 | kWh |
| Electricity, high voltage {DE} electricity production, natural gas, conventional power plant | 2.85E-02 | kWh |
| Electricity, high voltage {DE} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 1.76E-02 | kWh |
| Electricity, high voltage {DE} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 1.75E-03 | kWh |
| Electricity, high voltage {EE} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 1.05E-01 | kWh |
| Electricity, high voltage {FI} electricity production, natural gas, combined cycle power plant | 2.33E-04 | kWh |
| Electricity, high voltage {FI} electricity production, natural gas, conventional power plant | 1.84E-04 | kWh |
| Electricity, high voltage {FI} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 1.60E-05 | kWh |
| Electricity, high voltage {FI} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 2.18E-03 | kWh |
| Electricity, high voltage {FR} electricity production, natural gas, combined cycle power plant | 1.12E-02 | kWh |
| Electricity, high voltage {FR} electricity production, natural gas, combined cycle power plant | 1.24E-02 | kWh |
| Electricity, high voltage {FR} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 2.39E-03 | kWh |
| Electricity, high voltage {GB} electricity production, natural gas, combined cycle power plant | 2.87E-02 | kWh |
| Electricity, high voltage {GB} electricity production, natural gas, conventional power plant | 6.84E-02 | kWh |
| Electricity, high voltage {GB} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 9.92E-02 | kWh |
| Electricity, high voltage {GB} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 2.31E-02 | kWh |
| Electricity, high voltage {GR} electricity production, natural gas, combined cycle power plant | 1.34E-02 | kWh |
| Electricity, high voltage {GR} electricity production, natural gas, conventional power plant | 1.70E-02 | kWh |
| Electricity, high voltage {GR} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 5.20E-03 | kWh |
| Electricity, high voltage {GR} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 1.41E-03 | kWh |
| Electricity, high voltage {HR} electricity production, natural gas, combined cycle power plant | 7.00E-05 | kWh |

(continued on next page)

Table 6 (continued)

| | | |
|--|----------|-----|
| Electricity, high voltage {HR} electricity production, natural gas, conventional power plant | 1.50E-05 | kWh |
| Electricity, high voltage {HR} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 3.76E-03 | kWh |
| Electricity, high voltage {HR} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 1.12E-03 | kWh |
| Electricity, high voltage {HU} electricity production, natural gas, combined cycle power plant | 4.73E-03 | kWh |
| Electricity, high voltage {HU} electricity production, natural gas, conventional power plant | 3.02E-03 | kWh |
| Electricity, high voltage {HU} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 8.65E-04 | kWh |
| Electricity, high voltage {HU} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 9.97E-03 | kWh |
| Electricity, high voltage {IE} electricity production, natural gas, combined cycle power plant | 1.60E-02 | kWh |
| Electricity, high voltage {IE} electricity production, natural gas, conventional power plant | 7.62E-03 | kWh |
| Electricity, high voltage {IE} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 4.06E-03 | kWh |
| Electricity, high voltage {IT} electricity production, natural gas, combined cycle power plant | 8.42E-02 | kWh |
| Electricity, high voltage {IT} electricity production, natural gas, conventional power plant | 2.26E-02 | kWh |
| Electricity, high voltage {IT} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 9.51E-02 | kWh |
| Electricity, high voltage {IT} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 5.86E-02 | kWh |
| Electricity, high voltage {LT} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 2.20E-04 | kWh |
| Electricity, high voltage {LT} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 5.47E-03 | kWh |
| Electricity, high voltage {LU} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 3.96E-03 | kWh |
| Electricity, high voltage {LU} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 9.64E-04 | kWh |
| Electricity, high voltage {LV} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 1.93E-03 | kWh |
| Electricity, high voltage {LV} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 2.13E-03 | kWh |
| Electricity, high voltage {MK} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 4.97E-04 | kWh |
| Electricity, high voltage {MK} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 9.10E-05 | kWh |
| Electricity, high voltage {NL} electricity production, natural gas, 10 MW | 1.20E-13 | kWh |
| Electricity, high voltage {NL} electricity production, natural gas, combined cycle power plant | 2.13E-02 | kWh |
| Electricity, high voltage {NL} electricity production, natural gas, conventional power plant | 1.07E-02 | kWh |
| Electricity, high voltage {NL} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 4.47E-02 | kWh |
| Electricity, high voltage {NL} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 3.70E-02 | kWh |
| Electricity, high voltage {NO} electricity production, natural gas, combined cycle power plant | 2.91E-03 | kWh |
| Electricity, high voltage {NO} electricity production, natural gas, conventional power plant | 2.28E-03 | kWh |
| Electricity, high voltage {PL} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 9.08E-03 | kWh |
| Electricity, high voltage {PL} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 3.03E-03 | kWh |
| Electricity, high voltage {RO} electricity production, natural gas, conventional power plant | 4.77E-03 | kWh |
| Electricity, high voltage {RO} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 8.82E-04 | kWh |
| Electricity, high voltage {RO} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 1.16E-02 | kWh |
| Electricity, high voltage {RS} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 9.42E-04 | kWh |
| Electricity, high voltage {SE} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 1.84E-03 | kWh |
| Electricity, high voltage {SI} electricity production, natural gas, conventional power plant | 1.30E-05 | kWh |
| Electricity, high voltage {SI} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 9.80E-04 | kWh |
| Electricity, high voltage {SK} electricity production, natural gas, combined cycle power plant | 9.05E-04 | kWh |
| Electricity, high voltage {SK} electricity production, natural gas, conventional power plant | 6.90E-04 | kWh |
| Electricity, high voltage {SK} heat and power co-generation, natural gas, combined cycle power plant, 400 MW electrical | 2.22E-03 | kWh |
| Electricity, high voltage {SK} heat and power co-generation, natural gas, conventional power plant, 100 MW electrical | 1.52E-03 | kWh |

Table 7

Dataset concerning European electricity production by nuclear.

| | | |
|---|----------|-----|
| OUTPUT - Product | | |
| Electricity, high voltage {EURO} electricity production, nuclear | 1.000 | kWh |
| INPUT - Electricity/heat | | |
| Electricity, high voltage {BE} electricity production, nuclear, pressure water reactor | 4.74E-02 | kWh |
| Electricity, high voltage {BG} electricity production, nuclear, pressure water reactor | 1.86E-02 | kWh |
| Electricity, high voltage {CH} electricity production, nuclear, boiling water reactor | 1.57E-02 | kWh |
| Electricity, high voltage {BR} electricity production, nuclear, pressure water reactor | 1.78E-02 | kWh |
| Electricity, high voltage {CZ} electricity production, nuclear, pressure water reactor | 3.57E-02 | kWh |
| Electricity, high voltage {DE} electricity production, nuclear, boiling water reactor | 2.50E-02 | kWh |
| Electricity, high voltage {DE} electricity production, nuclear, pressure water reactor | 9.21E-02 | kWh |
| Electricity, high voltage {FI} electricity production, nuclear, boiling water reactor | 1.73E-02 | kWh |
| Electricity, high voltage {FI} electricity production, nuclear, pressure water reactor | 9.76E-03 | kWh |
| Electricity, high voltage {FR} electricity production, nuclear, pressure water reactor | 5.01E-01 | kWh |
| Electricity, high voltage {GB} electricity production, nuclear, boiling water reactor | 7.22E-02 | kWh |
| Electricity, high voltage {GB} electricity production, nuclear, pressure water reactor | 1.07E-02 | kWh |
| Electricity, high voltage {HU} electricity production, nuclear, pressure water reactor | 1.86E-02 | kWh |
| Electricity, high voltage {NL} electricity production, nuclear, pressure water reactor | 4.62E-03 | kWh |
| Electricity, high voltage {RO} electricity production, nuclear, pressure water reactor, heavy water moderated | 1.35E-02 | kWh |
| Electricity, high voltage {SE} electricity production, nuclear, boiling water reactor | 5.30E-02 | kWh |
| Electricity, high voltage {SE} electricity production, nuclear, pressure water reactor | 2.23E-02 | kWh |
| Electricity, high voltage {SI} electricity production, nuclear, pressure water reactor | 6.51E-03 | kWh |
| Electricity, high voltage {SK} electricity production, nuclear, pressure water reactor | 1.82E-02 | kWh |

Table 8

Dataset concerning European electricity production by biomass.

| | | |
|---|----------|-----|
| OUTPUT - Product | | |
| Electricity, high voltage {EURO} electricity production, biomass | 1.000 | kWh |
| INPUT - Electricity/heat | | |
| Electricity, high voltage {AT} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 5.24E-02 | kWh |
| Electricity, high voltage {BE} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 5.13E-02 | kWh |
| Electricity, high voltage {BG} heat and power co-generation, wood chips, 6667 kW | 9.19E-04 | kWh |
| Electricity, high voltage {CH} heat and power co-generation, wood chips, 2000 kW, state-of-the-art 2014 | 3.70E-03 | kWh |
| Electricity, high voltage {CZ} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 2.53E-02 | kWh |
| Electricity, high voltage {DE} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 1.68E-01 | kWh |
| Electricity, high voltage {EE} heat and power co-generation, wood chips, 6667 kW | 1.37E-02 | kWh |
| Electricity, high voltage {FI} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 1.49E-01 | kWh |
| Electricity, high voltage {FR} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 2.42E-02 | kWh |
| Electricity, high voltage {GB} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 9.81E-02 | kWh |
| Electricity, high voltage {HR} heat and power co-generation, wood chips, 6667 kW | 5.57E-04 | kWh |
| Electricity, high voltage {HU} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 1.86E-02 | kWh |
| Electricity, high voltage {IE} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 2.51E-03 | kWh |
| Electricity, high voltage {IT} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 3.59E-02 | kWh |
| Electricity, high voltage {LT} heat and power co-generation, wood chips, 6667 kW | 2.51E-03 | kWh |
| Electricity, high voltage {LV} heat and power co-generation, wood chips, 6667 kW | 9.75E-04 | kWh |
| Electricity, high voltage {NL} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 5.51E-02 | kWh |
| Electricity, high voltage {NO} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 3.61E-03 | kWh |
| Electricity, high voltage {PL} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 1.33E-01 | kWh |
| Electricity, high voltage {RO} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 2.65E-03 | kWh |
| Electricity, high voltage {SE} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 1.46E-01 | kWh |
| Electricity, high voltage {SI} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 1.59E-03 | kWh |
| Electricity, high voltage {SK} heat and power co-generation, wood chips, 6667 kW, state-of-the-art 2014 | 1.01E-02 | kWh |

Table 9

Dataset concerning European electricity production by hydro.

| OUTPUT - Product | | |
|--|----------|-----|
| Electricity, high voltage {EURO} electricity production, hydropower | 1.000 | kWh |
| INPUT - Electricity/heat | | |
| Electricity, high voltage {AT} electricity production, hydro, pumped storage | 7.18E-03 | kWh |
| Electricity, high voltage {AT} electricity production, hydro, reservoir, alpine region | 2.02E-02 | kWh |
| Electricity, high voltage {AT} electricity production, hydro, run-of-river | 6.06E-02 | kWh |
| Electricity, high voltage {BA} electricity production, hydro, pumped storage | 9.00E-06 | kWh |
| Electricity, high voltage {BA} electricity production, hydro, reservoir, alpine region | 2.72E-03 | kWh |
| Electricity, high voltage {BA} electricity production, hydro, run-of-river | 5.05E-03 | kWh |
| Electricity, high voltage {BE} electricity production, hydro, pumped storage | 2.40E-03 | kWh |
| Electricity, high voltage {BE} electricity production, hydro, run-of-river | 6.58E-04 | kWh |
| Electricity, high voltage {BG} electricity production, hydro, pumped storage | 1.39E-03 | kWh |
| Electricity, high voltage {BG} electricity production, hydro, run-of-river | 5.95E-03 | kWh |
| Electricity, high voltage {CH} electricity production, hydro, reservoir, alpine region | 2.03E-02 | kWh |
| Electricity, high voltage {CH} electricity production, hydro, run-of-river | 1.93E-02 | kWh |
| Electricity, high voltage {CZ} electricity production, hydro, pumped storage | 1.35E-03 | kWh |
| Electricity, high voltage {CZ} electricity production, hydro, reservoir, non-alpine region | 9.81E-04 | kWh |
| Electricity, high voltage {CZ} electricity production, hydro, run-of-river | 2.94E-03 | kWh |
| Electricity, high voltage {DE} electricity production, hydro, pumped storage | 1.23E-02 | kWh |
| Electricity, high voltage {DE} electricity production, hydro, reservoir, non-alpine region | 6.25E-03 | kWh |
| Electricity, high voltage {DE} electricity production, hydro, run-of-river | 3.28E-02 | kWh |
| Electricity, high voltage {EE} electricity production, hydro, run-of-river | 7.70E-05 | kWh |
| Electricity, high voltage {FI} electricity production, hydro, reservoir, non-alpine region | 2.33E-02 | kWh |
| Electricity, high voltage {FI} electricity production, hydro, run-of-river | 7.77E-03 | kWh |
| Electricity, high voltage {FR} electricity production, hydro, pumped storage | 9.00E-03 | kWh |
| Electricity, high voltage {FR} electricity production, hydro, reservoir, alpine region | 1.82E-02 | kWh |
| Electricity, high voltage {FR} electricity production, hydro, run-of-river | 9.10E-02 | kWh |
| Electricity, high voltage {GB} electricity production, hydro, pumped storage | 5.47E-03 | kWh |
| Electricity, high voltage {GB} electricity production, hydro, run-of-river | 9.75E-03 | kWh |
| Electricity, high voltage {GR} electricity production, hydro, pumped storage | 3.47E-04 | kWh |
| Electricity, high voltage {GR} electricity production, hydro, run-of-river | 8.12E-03 | kWh |
| Electricity, high voltage {HR} electricity production, hydro, pumped storage | 2.97E-04 | kWh |
| Electricity, high voltage {HR} electricity production, hydro, reservoir, alpine region | 8.38E-03 | kWh |
| Electricity, high voltage {HR} electricity production, hydro, run-of-river | 1.71E-04 | kWh |
| Electricity, high voltage {HU} electricity production, hydro, run-of-river | 3.93E-04 | kWh |
| Electricity, high voltage {IE} electricity production, hydro, pumped storage | 3.91E-04 | kWh |
| Electricity, high voltage {IE} electricity production, hydro, run-of-river | 1.48E-03 | kWh |
| Electricity, high voltage {IS} electricity production, hydro, reservoir, non-alpine region | 4.92E-02 | kWh |
| Electricity, high voltage {IT} electricity production, hydro, pumped storage | 3.65E-03 | kWh |
| Electricity, high voltage {IT} electricity production, hydro, reservoir, alpine region | 4.94E-02 | kWh |
| Electricity, high voltage {IT} electricity production, hydro, run-of-river | 2.78E-02 | kWh |
| Electricity, high voltage {LT} electricity production, hydro, pumped storage | 9.53E-04 | kWh |
| Electricity, high voltage {LT} electricity production, hydro, run-of-river | 7.80E-04 | kWh |
| Electricity, high voltage {LU} electricity production, hydro, pumped storage | 1.96E-03 | kWh |
| Electricity, high voltage {LU} electricity production, hydro, run-of-river | 1.79E-04 | kWh |
| Electricity, high voltage {LV} electricity production, hydro, run-of-river | 6.84E-03 | kWh |
| Electricity, high voltage {MK} electricity production, hydro, reservoir, alpine region | 1.57E-03 | kWh |
| Electricity, high voltage {MK} electricity production, hydro, run-of-river | 3.46E-04 | kWh |
| Electricity, high voltage {NL} electricity production, hydro, run-of-river | 1.92E-04 | kWh |
| Electricity, high voltage {NO} electricity production, hydro, pumped storage | 1.98E-03 | kWh |
| Electricity, high voltage {NO} electricity production, hydro, reservoir, alpine region | 2.62E-01 | kWh |
| Electricity, high voltage {PL} electricity production, hydro, pumped storage | 7.89E-04 | kWh |
| Electricity, high voltage {PL} electricity production, hydro, run-of-river | 3.76E-03 | kWh |
| Electricity, high voltage {RO} electricity production, hydro, pumped storage | 5.05E-04 | kWh |
| Electricity, high voltage {RO} electricity production, hydro, run-of-river | 2.23E-02 | kWh |
| Electricity, high voltage {RS} electricity production, hydro, pumped storage | 2.29E-03 | kWh |
| Electricity, high voltage {RS} electricity production, hydro, reservoir, alpine region | 2.56E-03 | kWh |
| Electricity, high voltage {RS} electricity production, hydro, run-of-river | 1.34E-02 | kWh |
| Electricity, high voltage {SE} electricity production, hydro, pumped storage | 2.32E-04 | kWh |
| Electricity, high voltage {SE} electricity production, hydro, reservoir, non-alpine region | 2.91E-02 | kWh |
| Electricity, high voltage {SE} electricity production, hydro, run-of-river | 1.16E-01 | kWh |
| Electricity, high voltage {SI} electricity production, hydro, pumped storage | 3.47E-04 | kWh |
| Electricity, high voltage {SI} electricity production, hydro, run-of-river | 7.18E-03 | kWh |
| Electricity, high voltage {SK} electricity production, hydro, pumped storage | 6.20E-04 | kWh |
| Electricity, high voltage {SK} electricity production, hydro, reservoir, non-alpine region | 1.89E-03 | kWh |
| Electricity, high voltage {SK} electricity production, hydro, run-of-river | 5.67E-03 | kWh |

Table 10

Dataset concerning European electricity production by wind.

OUTPUT - Product

| | | |
|---|----------|-----|
| Electricity, high voltage {EURO} electricity production, wind | 1.000 | kWh |
| INPUT - Electricity/heat | | |
| Electricity, high voltage {AT} electricity production, wind, <1 MW turbine, onshore | 6.06E-04 | kWh |
| Electricity, high voltage {AT} electricity production, wind, >3 MW turbine, onshore | 5.95E-04 | kWh |
| Electricity, high voltage {AT} electricity production, wind, 1–3 MW turbine, onshore | 1.68E-02 | kWh |
| Electricity, high voltage {BE} electricity production, wind, <1 MW turbine, onshore | 2.87E-04 | kWh |
| Electricity, high voltage {BE} electricity production, wind, >3 MW turbine, onshore | 1.25E-03 | kWh |
| Electricity, high voltage {BE} electricity production, wind, 1–3 MW turbine, offshore | 7.96E-03 | kWh |
| Electricity, high voltage {BE} electricity production, wind, 1–3 MW turbine, onshore | 1.06E-02 | kWh |
| Electricity, high voltage {BG} electricity production, wind, <1 MW turbine, onshore | 1.48E-03 | kWh |
| Electricity, high voltage {BG} electricity production, wind, >3 MW turbine, onshore | 1.87E-03 | kWh |
| Electricity, high voltage {BG} electricity production, wind, 1–3 MW turbine, onshore | 5.56E-03 | kWh |
| Electricity, high voltage {CH} electricity production, wind, <1 MW turbine, onshore | 5.00E-07 | kWh |
| Electricity, high voltage {CH} electricity production, wind, 1–3 MW turbine, onshore | 5.00E-06 | kWh |
| Electricity, high voltage {CZ} electricity production, wind, <1 MW turbine, onshore | 3.29E-04 | kWh |
| Electricity, high voltage {CZ} electricity production, wind, 1–3 MW turbine, onshore | 2.70E-03 | kWh |
| Electricity, high voltage {DE} electricity production, wind, <1 MW turbine, onshore | 5.06E-02 | kWh |
| Electricity, high voltage {DE} electricity production, wind, >3 MW turbine, onshore | 3.04E-02 | kWh |
| Electricity, high voltage {DE} electricity production, wind, 1–3 MW turbine, offshore | 1.06E-02 | kWh |
| Electricity, high voltage {DE} electricity production, wind, 1–3 MW turbine, onshore | 2.78E-01 | kWh |
| Electricity, high voltage {EE} electricity production, wind, <1 MW turbine, onshore | 8.50E-05 | kWh |
| Electricity, high voltage {EE} electricity production, wind, >3 MW turbine, onshore | 1.26E-04 | kWh |
| Electricity, high voltage {EE} electricity production, wind, 1–3 MW turbine, onshore | 2.95E-03 | kWh |
| Electricity, high voltage {FI} electricity production, wind, <1 MW turbine, onshore | 2.03E-04 | kWh |
| Electricity, high voltage {FI} electricity production, wind, >3 MW turbine, onshore | 1.64E-03 | kWh |
| Electricity, high voltage {FI} electricity production, wind, 1–3 MW turbine, offshore | 1.21E-04 | kWh |
| Electricity, high voltage {FI} electricity production, wind, 1–3 MW turbine, onshore | 1.63E-03 | kWh |
| Electricity, high voltage {FR} electricity production, wind, <1 MW turbine, onshore | 6.54E-03 | kWh |
| Electricity, high voltage {FR} electricity production, wind, >3 MW turbine, onshore | 4.20E-04 | kWh |
| Electricity, high voltage {FR} electricity production, wind, 1–3 MW turbine, offshore | 6.50E-05 | kWh |
| Electricity, high voltage {FR} electricity production, wind, 1–3 MW turbine, onshore | 1.02E-01 | kWh |
| Electricity, high voltage {GB} electricity production, wind, <1 MW turbine, onshore | 9.76E-03 | kWh |
| Electricity, high voltage {GB} electricity production, wind, >3 MW turbine, onshore | 5.68E-03 | kWh |
| Electricity, high voltage {GB} electricity production, wind, 1–3 MW turbine, offshore | 4.65E-02 | kWh |
| Electricity, high voltage {GB} electricity production, wind, 1–3 MW turbine, onshore | 8.09E-02 | kWh |
| Electricity, high voltage {GR} electricity production, wind, <1 MW turbine, onshore | 8.94E-03 | kWh |
| Electricity, high voltage {GR} electricity production, wind, >3 MW turbine, onshore | 3.94E-03 | kWh |
| Electricity, high voltage {GR} electricity production, wind, 1–3 MW turbine, onshore | 1.52E-02 | kWh |
| Electricity, high voltage {HR} electricity production, wind, <1 MW turbine, onshore | 3.46E-04 | kWh |
| Electricity, high voltage {HR} electricity production, wind, 1–3 MW turbine, onshore | 2.05E-03 | kWh |
| Electricity, high voltage {HU} electricity production, wind, <1 MW turbine, onshore | 1.05E-04 | kWh |
| Electricity, high voltage {HU} electricity production, wind, >3 MW turbine, onshore | 2.09E-04 | kWh |
| Electricity, high voltage {HU} electricity production, wind, 1–3 MW turbine, onshore | 5.30E-03 | kWh |
| Electricity, high voltage {IE} electricity production, wind, <1 MW turbine, onshore | 5.39E-03 | kWh |
| Electricity, high voltage {IE} electricity production, wind, >3 MW turbine, onshore | 9.49E-04 | kWh |
| Electricity, high voltage {IE} electricity production, wind, 1–3 MW turbine, offshore | 3.30E-04 | kWh |
| Electricity, high voltage {IE} electricity production, wind, 1–3 MW turbine, onshore | 2.26E-02 | kWh |
| Electricity, high voltage {IT} electricity production, wind, <1 MW turbine, onshore | 2.74E-02 | kWh |
| Electricity, high voltage {IT} electricity production, wind, >3 MW turbine, onshore | 8.38E-03 | kWh |
| Electricity, high voltage {IT} electricity production, wind, 1–3 MW turbine, onshore | 6.20E-02 | kWh |
| Electricity, high voltage {LT} electricity production, wind, <1 MW turbine, onshore | 2.04E-04 | kWh |
| Electricity, high voltage {LT} electricity production, wind, >3 MW turbine, onshore | 2.04E-04 | kWh |
| Electricity, high voltage {LT} electricity production, wind, 1–3 MW turbine, onshore | 3.55E-03 | kWh |
| Electricity, high voltage {LU} electricity production, wind, <1 MW turbine, onshore | 1.10E-04 | kWh |
| Electricity, high voltage {LU} electricity production, wind, 1–3 MW turbine, onshore | 4.37E-04 | kWh |
| Electricity, high voltage {LV} electricity production, wind, <1 MW turbine, onshore | 4.40E-04 | kWh |
| Electricity, high voltage {LV} electricity production, wind, 1–3 MW turbine, onshore | 3.91E-04 | kWh |
| Electricity, high voltage {NL} electricity production, wind, <1 MW turbine, onshore | 9.61E-03 | kWh |
| Electricity, high voltage {NL} electricity production, wind, >3 MW turbine, onshore | 6.08E-03 | kWh |
| Electricity, high voltage {NL} electricity production, wind, 1–3 MW turbine, offshore | 2.83E-03 | kWh |
| Electricity, high voltage {NL} electricity production, wind, 1–3 MW turbine, onshore | 1.78E-02 | kWh |

(continued on next page)

Table 10 (continued)

| | | |
|--|----------|-----|
| Electricity, high voltage {NO} electricity production, wind, <1 MW turbine, onshore | 2.26E-04 | kWh |
| Electricity, high voltage {NO} electricity production, wind, >3 MW turbine, onshore | 3.72E-04 | kWh |
| Electricity, high voltage {NO} electricity production, wind, 1–3 MW turbine, offshore | 2.70E-05 | kWh |
| Electricity, high voltage {NO} electricity production, wind, 1–3 MW turbine, onshore | 1.07E-02 | kWh |
| Electricity, high voltage {PL} electricity production, wind, <1 MW turbine, onshore | 1.28E-03 | kWh |
| Electricity, high voltage {PL} electricity production, wind, >3 MW turbine, onshore | 4.44E-04 | kWh |
| Electricity, high voltage {PL} electricity production, wind, 1–3 MW turbine, onshore | 3.29E-02 | kWh |
| Electricity, high voltage {RO} electricity production, wind, <1 MW turbine, onshore | 5.02E-04 | kWh |
| Electricity, high voltage {RO} electricity production, wind, >3 MW turbine, onshore | 4.12E-03 | kWh |
| Electricity, high voltage {RO} electricity production, wind, 1–3 MW turbine, onshore | 1.46E-02 | kWh |
| Electricity, high voltage {SE} electricity production, wind, <1 MW turbine, onshore | 7.34E-03 | kWh |
| Electricity, high voltage {SE} electricity production, wind, >3 MW turbine, onshore | 2.46E-04 | kWh |
| Electricity, high voltage {SE} electricity production, wind, 1–3 MW turbine, offshore | 2.10E-03 | kWh |
| Electricity, high voltage {SE} electricity production, wind, 1–3 MW turbine, onshore | 4.26E-02 | kWh |
| Electricity, high voltage {SK} electricity production, wind, <1 MW turbine, onshore | 4.40E-05 | kWh |

Table 11

Dataset concerning European electricity production by others (geothermal and biogas).

| | | |
|--|----------|-----|
| OUTPUT - Product | | |
| Electricity, high voltage {EURO} electricity production, other | 1.000 | kWh |
| INPUT - Electricity/heat | | |
| Electricity, high voltage {AT} electricity production, deep geothermal | 1.00E-05 | kWh |
| Electricity, high voltage {CH} electricity production, deep geothermal | 7.00E-06 | kWh |
| Electricity, high voltage {DE} electricity production, deep geothermal | 2.87E-04 | kWh |
| Electricity, high voltage {IS} electricity production, deep geothermal | 4.78E-02 | kWh |
| Electricity, high voltage {IT} electricity production, deep geothermal | 5.13E-02 | kWh |
| Electricity, high voltage {AT} heat and power co-generation, biogas, gas engine | 6.10E-03 | kWh |
| Electricity, high voltage {BE} heat and power co-generation, biogas, gas engine | 7.77E-03 | kWh |
| Electricity, high voltage {CH} heat and power co-generation, biogas, gas engine | 2.49E-03 | kWh |
| Electricity, high voltage {CZ} heat and power co-generation, biogas, gas engine | 1.40E-02 | kWh |
| Electricity, high voltage {DE} heat and power co-generation, biogas, gas engine | 2.64E-01 | kWh |
| Electricity, high voltage {EE} heat and power co-generation, biogas, gas engine | 1.53E-04 | kWh |
| Electricity, high voltage {FI} heat and power co-generation, biogas, gas engine | 1.33E-03 | kWh |
| Electricity, high voltage {FR} heat and power co-generation, biogas, gas engine | 1.23E-02 | kWh |
| Electricity, high voltage {GB} heat and power co-generation, biogas, gas engine | 5.62E-02 | kWh |
| Electricity, high voltage {GR} heat and power co-generation, biogas, gas engine | 1.95E-03 | kWh |
| Electricity, high voltage {HR} heat and power co-generation, biogas, gas engine | 5.74E-04 | kWh |
| Electricity, high voltage {HU} heat and power co-generation, biogas, gas engine | 2.02E-03 | kWh |
| Electricity, high voltage {IE} heat and power co-generation, biogas, gas engine | 1.90E-03 | kWh |
| Electricity, high voltage {IT} heat and power co-generation, biogas, gas engine | 7.40E-02 | kWh |
| Electricity, high voltage {LT} heat and power co-generation, biogas, gas engine | 3.83E-04 | kWh |
| Electricity, high voltage {LU} heat and power co-generation, biogas, gas engine | 5.55E-04 | kWh |
| Electricity, high voltage {LV} heat and power co-generation, biogas, gas engine | 2.10E-03 | kWh |
| Electricity, high voltage {NL} heat and power co-generation, biogas, gas engine | 9.64E-03 | kWh |
| Electricity, high voltage {NO} heat and power co-generation, biogas, gas engine | 1.05E-04 | kWh |
| Electricity, high voltage {PL} heat and power co-generation, biogas, gas engine | 5.40E-03 | kWh |
| Electricity, high voltage {RO} heat and power co-generation, biogas, gas engine | 1.91E-04 | kWh |
| Electricity, high voltage {RS} heat and power co-generation, biogas, gas engine | 5.70E-05 | kWh |
| Electricity, high voltage {SE} heat and power co-generation, biogas, gas engine | 1.91E-04 | kWh |
| Electricity, high voltage {SI} heat and power co-generation, biogas, gas engine | 1.46E-03 | kWh |
| Electricity, high voltage {SK} heat and power co-generation, biogas, gas engine | 1.82E-03 | kWh |

Table 12

Medium voltage European electricity mix (assumption: network electricity losses = about 3%).

| | | |
|---|-------|-----|
| OUTPUT - Product | | |
| Electricity, medium voltage {EURO} electricity production mix | 1.000 | kWh |
| INPUT - Electricity/heat | | |
| Electricity, high voltage {EURO} electricity production, hard coal | 1.030 | kWh |

Table 13

European electricity mix (high voltage) in 2050 according to BAU scenario.

| | | |
|---|-------|-----|
| OUTPUT - Product | | |
| Electricity 2050-BAU, high voltage {EURO} electricity production mix | 1.000 | kWh |
| INPUT – Electricity/heat | | |
| Electricity, high voltage {EURO} electricity production, hard coal | 0.264 | kWh |
| Electricity, high voltage {EURO} electricity production, lignite | 0.097 | kWh |
| Electricity, high voltage {EURO} electricity production, oil | 0.006 | kWh |
| Electricity, high voltage {EURO} electricity production, natural gas | 0.186 | kWh |
| Electricity, high voltage {EURO} electricity production, nuclear | 0.220 | kWh |
| Electricity, high voltage {EURO} electricity production, biomass | 0.036 | kWh |
| Electricity, high voltage {EURO} electricity production, hydropower | 0.143 | kWh |
| Electricity, high voltage {EURO} electricity production, wind | 0.046 | kWh |
| Electricity, high voltage {EURO} electricity production, other | 0.034 | kWh |

Table 14

European electricity mix (medium voltage) in 2050 according to BAU scenario. Assumption: network electricity losses = about 1.5% (considering a technological improvement of the network in next decades).

| | | |
|--|-------|-----|
| OUTPUT - Product | | |
| Electricity BAU, medium voltage {EURO} electricity production mix | 1.000 | kWh |
| INPUT – Electricity/heat | | |
| Electricity BAU, high voltage {EURO} electricity production mix | 1.015 | kWh |

Table 15

European electricity mix (high voltage) in 2050 according to REAL scenario.

| | | |
|---|-------|-----|
| OUTPUT - Product | | |
| Electricity REAL, high voltage {EURO} electricity production mix | 1.000 | kWh |
| INPUT – Electricity/heat | | |
| Electricity, high voltage {EURO} electricity production, hard coal | 0.059 | kWh |
| Electricity, high voltage {EURO} electricity production, oil | 0.002 | kWh |
| Electricity, high voltage {EURO} electricity production, natural gas | 0.415 | kWh |
| Electricity, high voltage {EURO} electricity production, nuclear | 0.244 | kWh |
| Electricity, high voltage {EURO} electricity production, biomass | 0.033 | kWh |
| Electricity, high voltage {EURO} electricity production, hydropower | 0.151 | kWh |
| Electricity, high voltage {EURO} electricity production, wind | 0.070 | kWh |
| Electricity, high voltage {EURO} electricity production, other | 0.026 | kWh |

Table 16

European electricity mix (medium voltage) in 2050 according to REAL scenario. Assumption: network electricity losses = about 1.5% (considering a technological improvement of the network in next decades).

| | | |
|---|-------|-----|
| OUTPUT - Product | | |
| Electricity REAL, medium voltage {EURO} electricity production mix | 1.000 | kWh |
| INPUT – Electricity/heat | | |
| Electricity REAL, high voltage {EURO} electricity production mix | 1.015 | kWh |

Table 17

European electricity mix (high voltage) in 2050 according to OPT scenario.

| | | |
|---|-------|-----|
| OUTPUT - Product | | |
| Electricity OPT, high voltage {EURO} electricity production mix | 1.000 | kWh |
| INPUT – Electricity/heat | | |
| Electricity, high voltage {EURO} electricity production, hard coal | 0.029 | kWh |
| Electricity, high voltage {EURO} electricity production, oil | 0.005 | kWh |
| Electricity, high voltage {EURO} electricity production, natural gas | 0.005 | kWh |
| Electricity, high voltage {EURO} electricity production, nuclear | 0.169 | kWh |
| Electricity, high voltage {EURO} electricity production, biomass | 0.158 | kWh |
| Electricity, high voltage {EURO} electricity production, hydropower | 0.242 | kWh |
| Electricity, high voltage {EURO} electricity production, wind | 0.323 | kWh |
| Electricity, high voltage {EURO} electricity production, other | 0.079 | kWh |

Table 18

European electricity mix (medium voltage) in 2050 according to OPT scenario. Assumption: network electricity losses = about 1.5% (considering a technological improvement of the network in next decades).

| | | |
|---|-------|-----|
| OUTPUT - Product | | |
| Electricity OPT, medium voltage {EURO} electricity production mix | 1.000 | kWh |
| INPUT – Electricity/heat | | |
| Electricity OPT, high voltage {EURO} electricity production mix | 1.015 | kWh |

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

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