Electricity generation & supply in ecoinvent v3

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Country specific LCI data for power generation & supply

- **no data in ecoinvent**
- **ecoinvent v2**
- **new in ecoinvent v3**
Electricity generation: country specific technologies
**Power supply**: country-specific market activities (electricity mix)

Domestic production mix + imports from markets from neighbour countries

Based on annual production volumes 2008 for all (v2.2 & new) countries
Global electricity generation in v2.2

Corresponding to production in year 2004

- 36.5% ecoinvent v2.2, country-specific
- 63.5% "rest-of-the-world" (not covered)
Global electricity generation in v3

Total worldwide in 2008: 20'261 TWh
Generation technologies: what’s new?

• Global activity unit process DS for all generation technologies
• Child DS in all relevant countries for most of the technologies
• Fossil fuels: no more „fuel, burned in,…“ DS, only „electricity production,…“
• Natural gas: CC & conventional generation datasets with & w/o CHP for new countries with country-specific efficiencies
• Hard coal & lignite: datasets for new countries with country-specific efficiencies and key emission factors (SO₂, NOₓ, PM)
• Oil: datasets for new countries with country-specific efficiencies
• Nuclear: datasets for new countries with country-specific efficiencies
• Wind power: onshore turbines <1MW, 1-3MW, >3MW
• PV: new roof-top & open ground systems used in all countries
• Geothermal: Enhanced geothermal system (based on plant in Basel)
• Hydro, wood, biogas and waste: based on v2.2 DS for new countries
Data sources

• Natural gas: IEA statistics; expert judgement
• Hard coal & lignite: IEA statistics; national pollutant inventories; personal information; IEA clean coal center power plants database*
• Oil: IEA statistics
• Nuclear: WNA reactor database*
• Wind power: manufacturer‘s information; wind turbine database*
• PV: ESU-services - manufacturer‘s information; IEA PVPS
• Geothermal: data from EGS plant in Basel
• Hydro, wood, biogas and waste: ecoinvent v2.2
  * contains data for all single plants operating

• Market activities: ESU-services - IEA statistics; country-specific information
New features in power generation activities

• Use of **parameters**:
  - efficiencies of thermal power plants
  - yield of solar modules & wind turbines

• **Parent – child** datasets for most country-specific generation activities

• Use of **tags** for technology classification

• Specification of **technology level**: „old“, „current“, „modern“

• Use of **activity links** for specific fuel supply (coal)
Electricity market activities: HV – MV – LV

• Market activity datasets for high (HV), medium (MV) and low (LV) voltage corresponding to „electricity supply mixes“

• Market activities include electricity imports from neighbour countries (via markets or activity links to specific generation technologies)

• Specified using the annual production volumes (2008) of generation technologies provided by IEA statistics and more country-specific information

• Updated also for v2.2 countries

• Transforming activities for transformation of HV to MV and MV to LV

• Main data source: Itten & Frischknecht (2012) „Life Cycle Inventories of Electricity Mixes & Grid“

Report and datasets: www.lc-inventories.ch

Results for GHG emissions of CH mixes:
Market activities (power mix): new countries (HV)

- Hard coal
- Industrial Gases
- Hydro, pumped storage
- Photovoltaic
- Wood
- Lignite
- Oil
- Nuclear, PWR
- Solar thermal
- Biogas
- Peat
- Hydro, reservoir
- Nuclear, BWR
- Wave and tidal energy
- Hydro, run-of-river
- Geothermal
- Wind
- Natural Gas
- Wood
- Imports
Conclusions & Outlook

• Availability of electricity generation technology & market datasets in new countries is an important step towards internationalisation
• Update of production volumes ensures up-to-date electricity mixes
• Use of new features increases user-friendliness and transparency

Potential for further improvement

• Update of generation technologies for “v2.2 countries”, e.g. China
• Update of fuel supply chains, also considering country-specific trade information
• Extension in terms of individual generation technologies, e.g. wave power
• Regular update of annual production volumes