
FRAUNHOFER INSTITUTE FOR SOLAR ENERGY SYSTEMS ISE

Power generation from renewable energy in Germany – assessment of 2015



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www.ise.fraunhofer.de

www.energy-charts.de

Power generation from renewable energy in Germany – assessment of 2015

11 January 2016, last updated on: 13 January 2016

The **first version** from 11 January 2016 takes into account the monthly power generation data published on 11 January 2016 by the German Statistical Office (Destatis) up to and including October 2015. The data for November and December were extrapolated from adjusted hourly values from the EEX power exchange in Leipzig. The tolerance range is greater for extrapolated values.

The data at Energy Charts is updated by the hour:

www.energy-charts.de

Power generation in the year 2015

Renewable energy

In 2015, roughly 37 TWh of electricity from **photovoltaic arrays** was fed into the grid. Production thus rose year-over-year by 2 TWh or 4.8%. The slight increase compared to previous years is due to the small installation rate of only 1.4 GW. The target of the government was 2.5 GW. At the end of 2015, 39.6 GW PV were installed. Solar power production peaked at 27.3 GW on 21 April 2015 at 1:15 PM. In July 2015, the monthly electricity production of PV systems was for the first time higher than that of nuclear power plants. On 02 August 2015 PV plants contributed approximately 44% to electricity production.

In the year 2015, 86 TWh were generated from **wind**, 29 TWh more, hence 50% increase compared to 2014. Monthly production of wind power peaked in December and was even higher than production of lignite (brown coal). Hourly production peaked at 35.6 GW on 21 December 2015. The completion of new **offshore wind farms** increased production in the North Sea fivefold from 1.3 TWh to 7.1 TWh. The incremental rollout of a new wind farm in the Baltic also increased power production there fourfold from 0.2 TWh to 0.8 TWh.

Taken together, **solar and wind power generators** produced 122 TWh in 2015, enough to put them in second place after lignite but ahead of hard coal and nuclear.

Roughly 56 TWh of electricity was generated from **biomass**, 24% more compared to last year with 45 TWh. Approximately 20 TWh came from **hydropower**, a level roughly unchanged year-over-year .

In total, **renewable energy sources** – solar, wind, hydropower, and biomass – produced approximately 190 TWh of electricity in 2015, 30 TWh more than in 2014, equivalent to a 20% increase. Renewables thus made up around 35% of public net power supply. The share in gross power supply – including power plants in the processing sector, the mining sector, quarries, and excavation – is around 32.5%.

1 TWh = 1 terawatt-hour = 1,000 gigawatts-hours (GWh) = 1 million megawatt-hours (MWh) = 1 billion kilowatt-hours (kWh)

Power generation in the year 2015

Non-renewable generation

The net power production from **nuclear plants** came in at around 87 TWh, 5.1% below the 92 TWh in the previous year. The reason for the decline is the shutdown of the reactor Grafenrheinfeld in Bavaria on 27 June 2015.

Lignite power plants generated 139 TWh net, some 1.3 TWh (1%) less than in 2014. They were forced to curtail production in particular at times of peak wind power generation during wind storms. Lignite power stations are still very inflexible in their response to high feed of renewable energies.

Net production from **hard coal** plants was posted at 104 TWh, 3.8 TWh (3.5%) lower than in 2014.

Gas power plants generated some 30 TWh, 1 TWh (3.8%) below the level of the previous year. The downward trend in power production from gas turbines since 2008 thus continues. In addition to power plants for public power supply, there are also power generation facilities in the mining and manufacturing sector for self supply. These units produced additional 20 TWh.

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Power generation in the year 2015

Export surplus

In 2015, the **export surplus** reached some 48 TWh, a level even higher than the record years of 2012, 2013, and 2014. Specifically, the level is 14 TWh (40%) above the record in 2014. The largest share of exports went to the Netherlands, and the Dutch passed on some of this electricity to Belgium and the UK. Austria came in second, and it also passed along some of the electricity to Switzerland. In third place, Poland passed on some of the electricity from eastern Germany to southern Germany via the Czech Republic.

Germany imported electricity from France, mainly in order to pass it on to neighboring countries.

In **power trading** so far only numbers from January to October 2015 are available. During this period, 29.7 TWh were imported to a value of 1.27 billion euros. The export amounted to 67.4 TWh and a value of 2.88 billion euros. In balance, the resulting export surplus was 37.6 TWh and revenues worth 1.6 billion euros. Imported electricity cost an average of 42.58 Euro/MWh compared to 42.69 Euro/MWh for exports.

The average **day-ahead price** of electricity has fallen to 31.2 Euro / MWh and is adjusted for inflation at approximately the same level as of 2003.

The average **market value** for PV was at 96% and for wind 85% of the average market price of electricity.

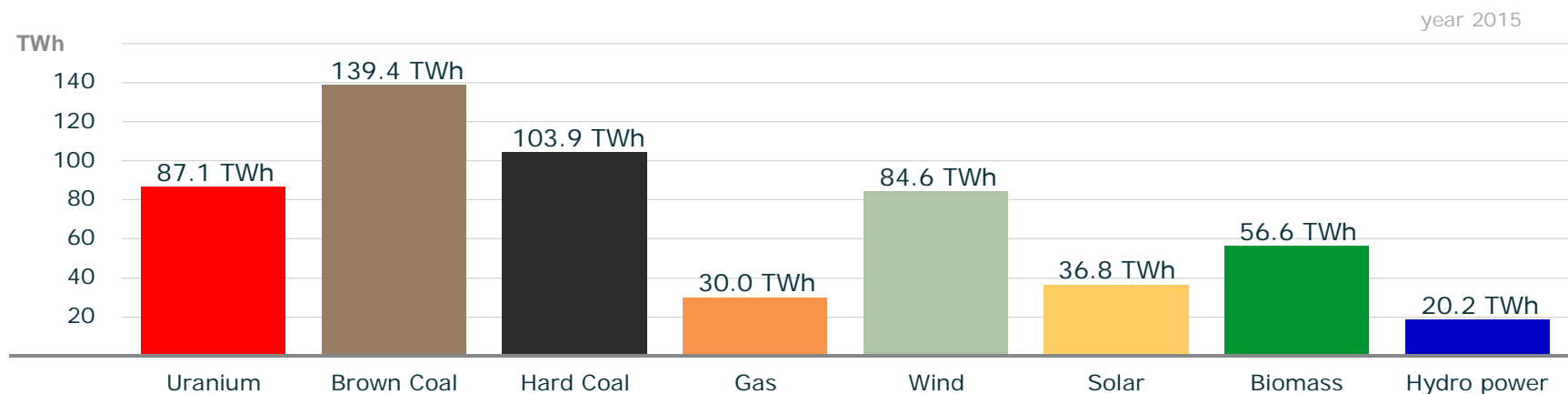
For additional information and graphics, visit: www.energy-charts.de

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Net power generation for the public grid

Year 2015

Electricity production in 2015



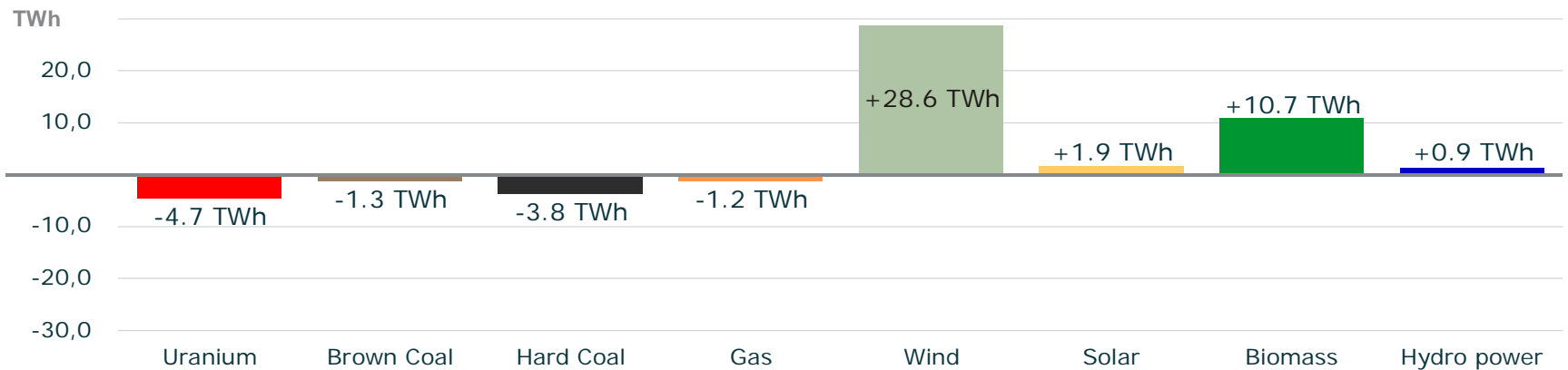
The graph shows net power generation from power plants for the public power supply. Electricity from power plants in the processing sector, mining, quarries, and excavation is not included.

Graphic: B. Burger, Fraunhofer ISE; data: DESTATIS and the EEX power exchange in Leipzig, with adjustments

Absolute change in net power generation

Year 2015 compared to year 2014

Change in electricity production: 2015 versus 2014

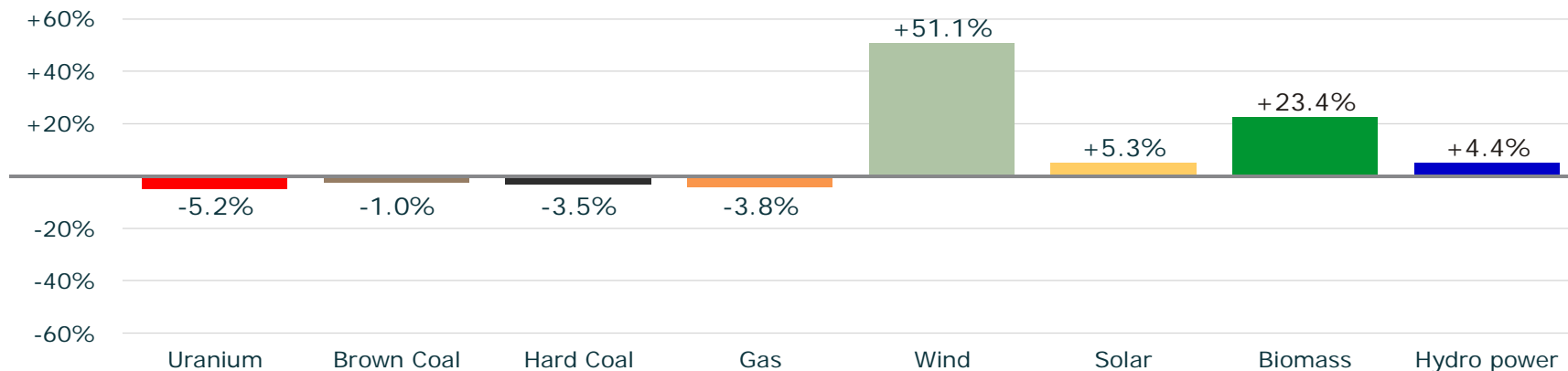


Graphic: B. Burger, Fraunhofer ISE; data: DESTATIS and the EEX power exchange in Leipzig, with adjustments

Relative change in net power generation

Year 2015 compared to year 2014

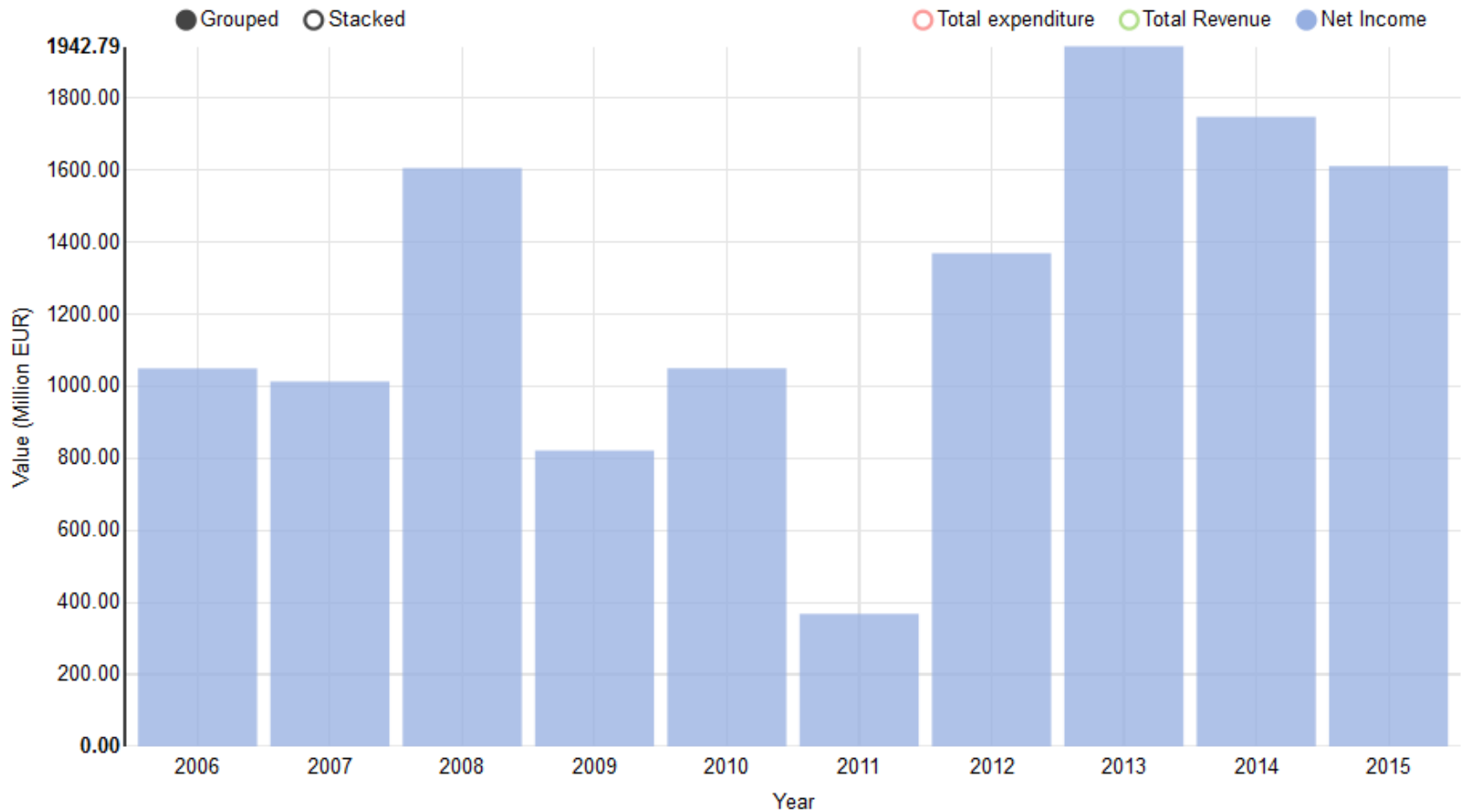
Relative change in net power generation in 2015 compared to 2014



Graphic: B. Burger, Fraunhofer ISE; data: DESTATIS and the EEX power exchange in Leipzig, with adjustments

Power trading in millions of euros

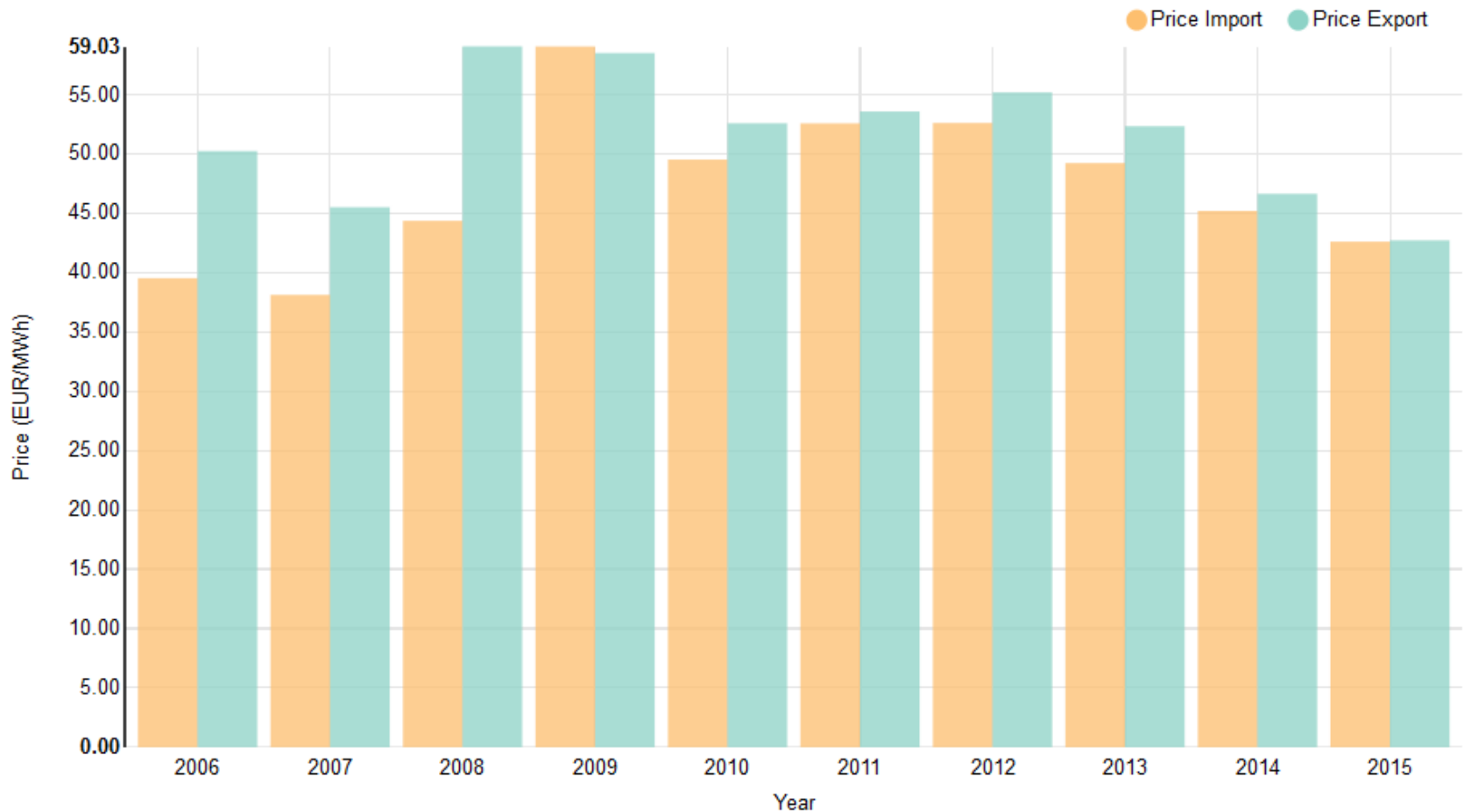
Year 2006 - 2015



Data of 2015 only from January to October; source: <https://www.energy-charts.de/trade.htm>

German power trading

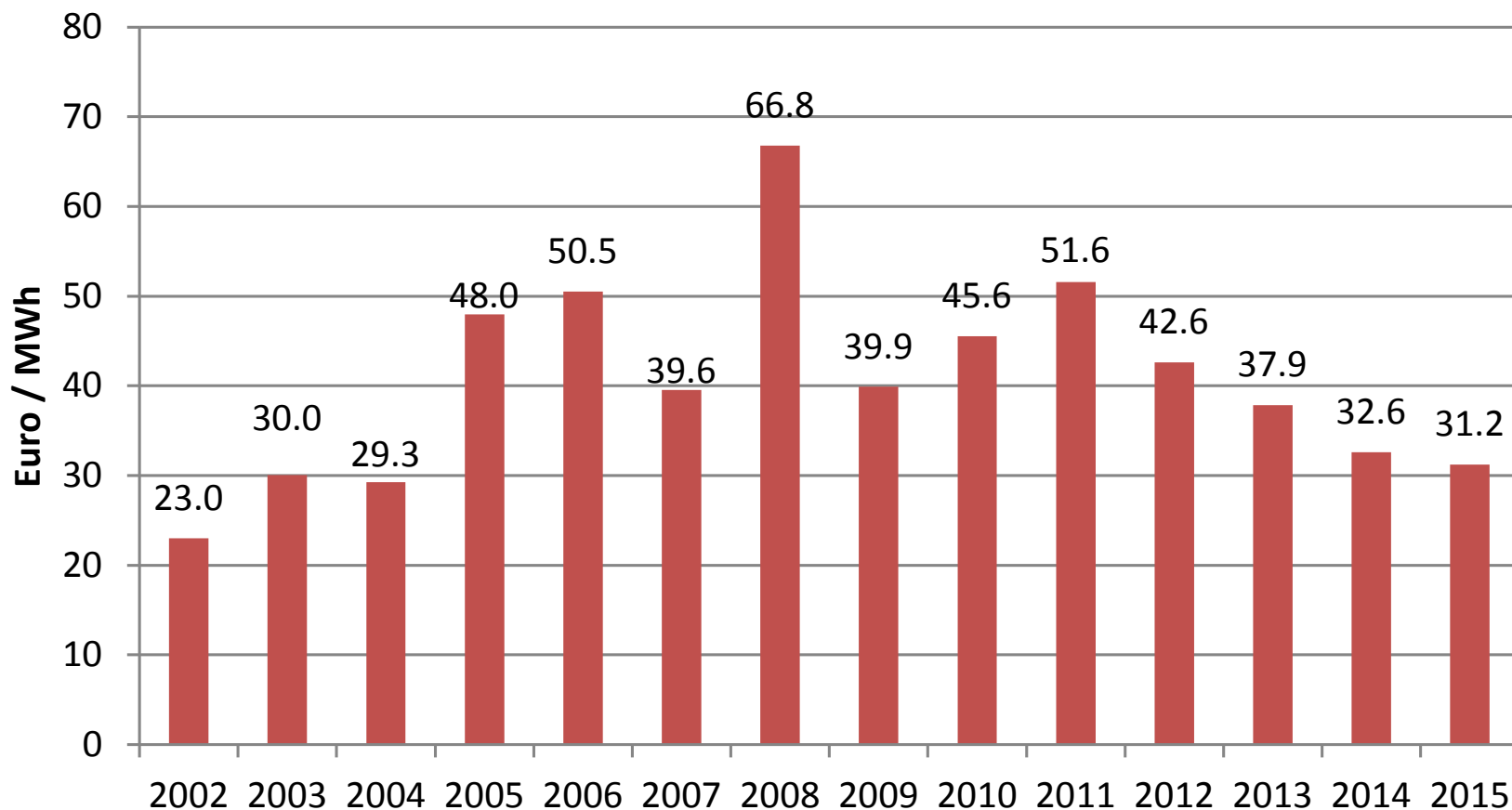
Volume weighted average prices in Euro/MWh



Data of 2015 only from January to October; source: <https://www.energy-charts.de/trade.htm>

EPEX day ahead spot price

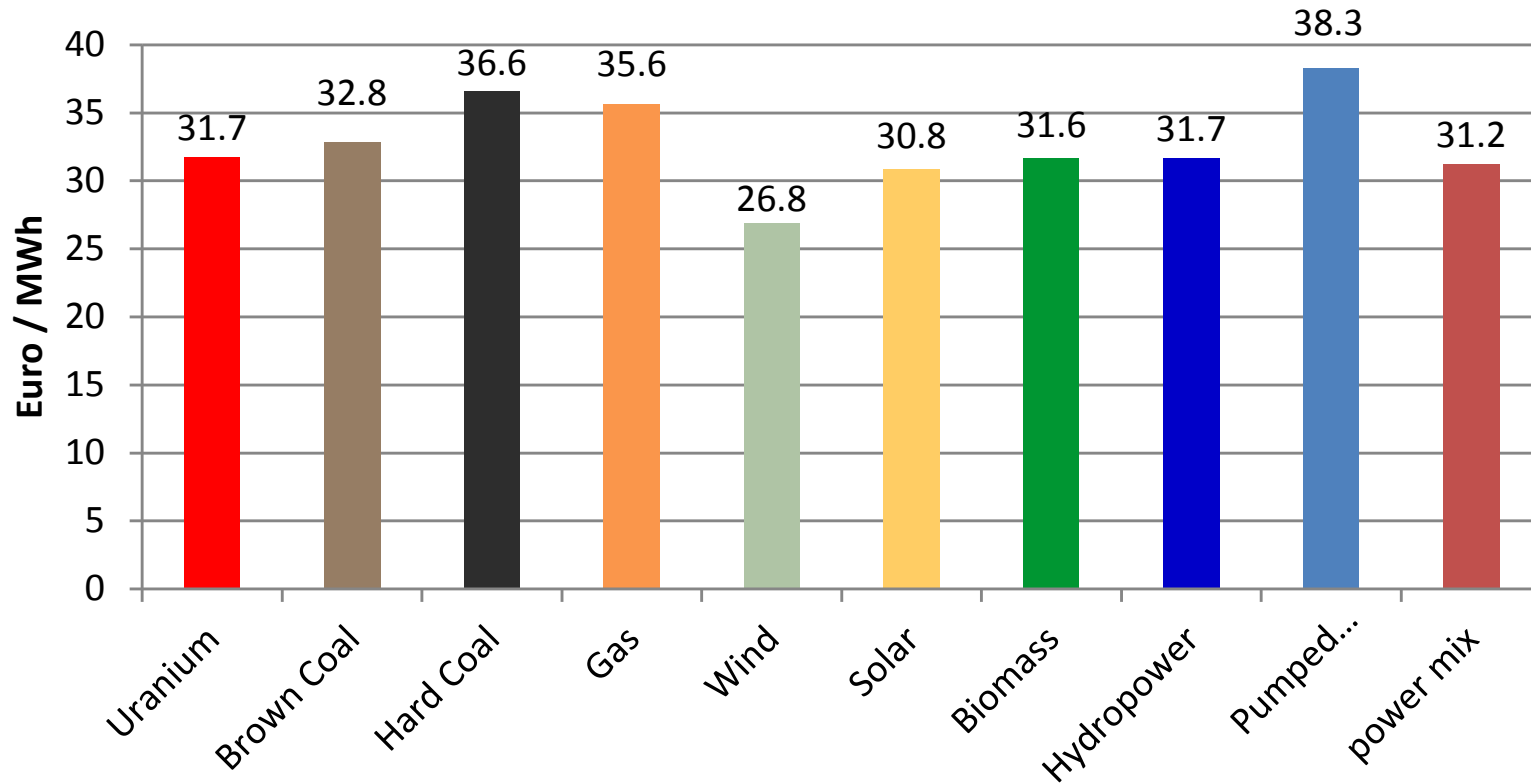
Weighted by volume, inflation-adjusted, for prices from November 2015



Graphic: B. Burger, Fraunhofer ISE; data: EPEX

Day-ahead market values, weighted by volume

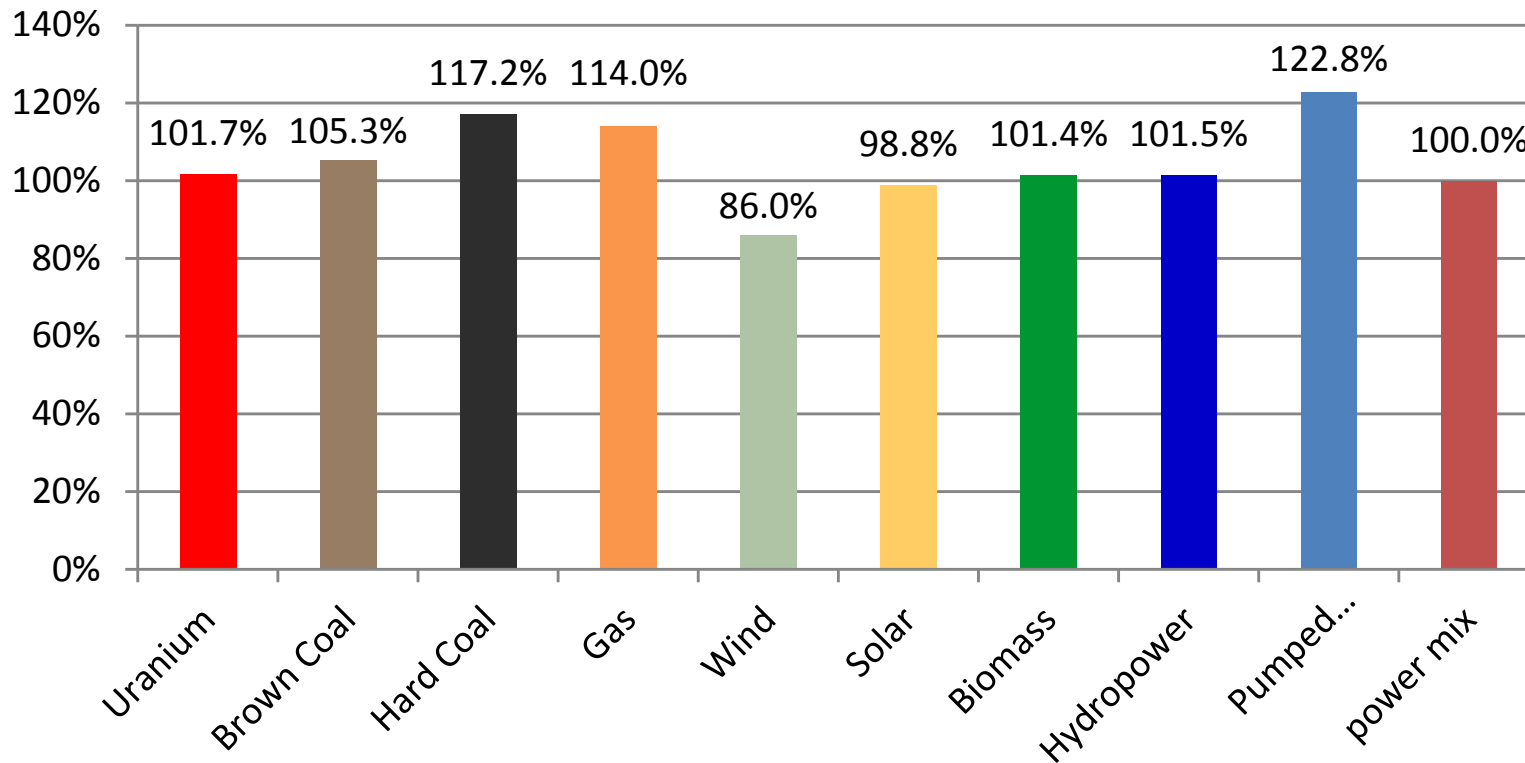
Year 2015



Graphic: B. Burger, Fraunhofer ISE; data: EPEX

Relative day-ahead market values, weighted by volume

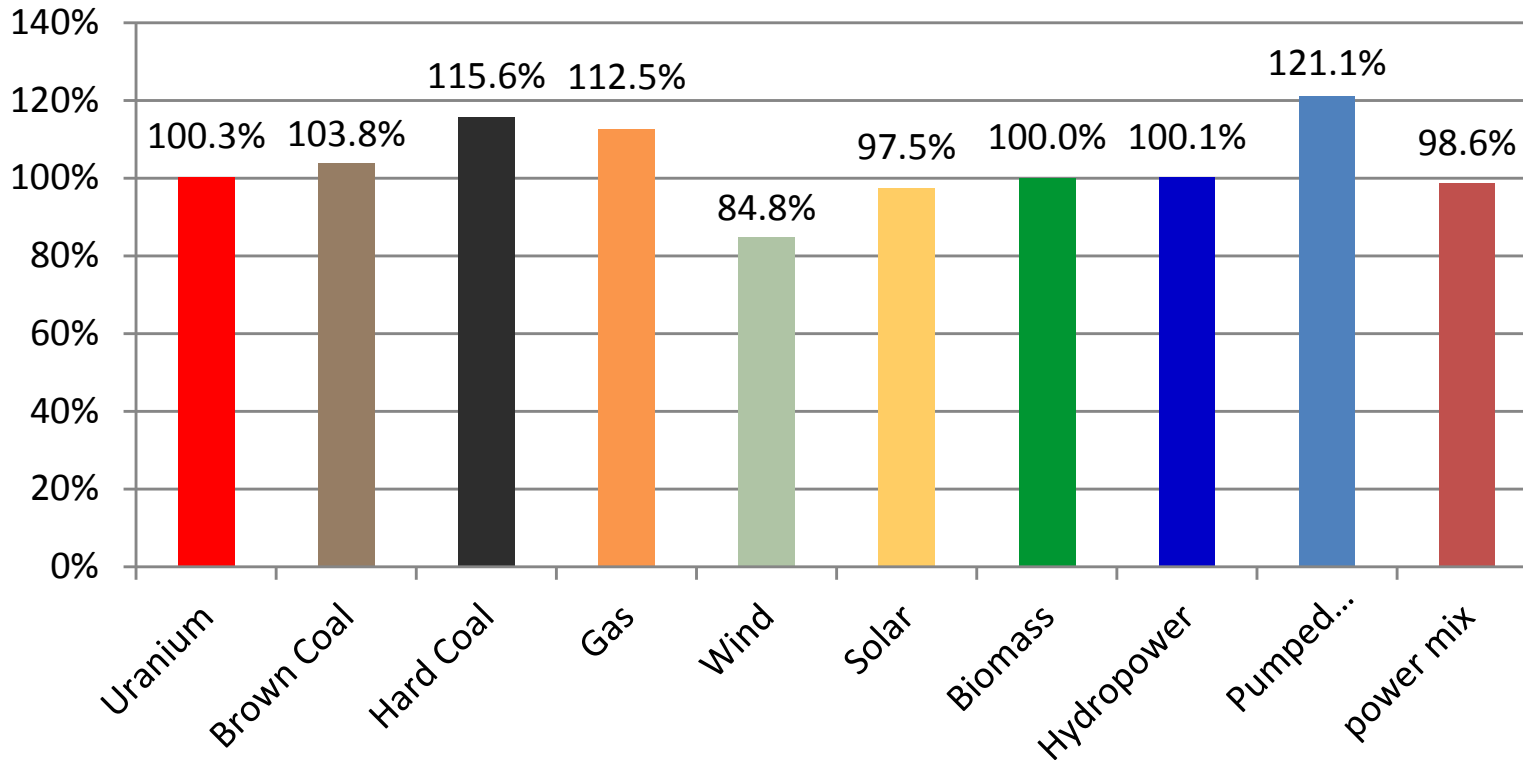
Year 2015



Graphic: B. Burger, Fraunhofer ISE; data: EPEX

Market value factors

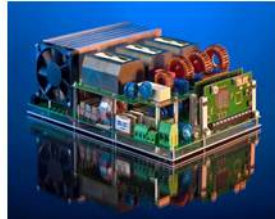
Year 2015



Graphic: B. Burger, Fraunhofer ISE; data: EPEX

Thank you for your Attention!

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