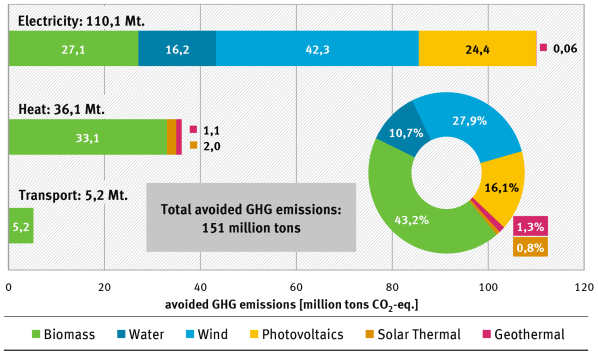
Latest Results

Calculations for the year 2014 show that the continous expansion of RES contributes substantially to achieving national climate goals in Germany.

In all energy sectors (electricity, heat and transport) fossil fuels are increasingly replaced by renewable energies thereby permanently avoiding energy related emissions of greenhouse gases (GHG) and air pollutants. In the year 2014 renewable energies accounted for approximately 13.5% of total final energy consumption and still show strong growth rates especially in the electricity sector where its share climbed to 27.4% of total (gross) electricity production.

Avoided greenhouse gas emissions through the use of renewable energy sources in Germany (2014):



Calculation show that RES deployment resulted in a net-avoidance of GHG-Emissions of about 151 Mt. CO_2-eq. in 2014. Out of 110.1 Mt. CO_2-eq. avoided within the electricity sector, a significant share (88.3 Mt. CO_2-eq.) were directly related to RES in the framework of the renewable energy law (EEG). The use of renewables in the heat and transport sector accounted for 36.2 Mt. and 5.2 Mt. CO_2-eq. respectively.

Besides accounting for GHGs, the „Emission Balance“ also looks into other emissions including acid forming substances and particulate matter related to the use of renewable energy sources - detailed results for these emissions are available in the full publication.

Publications

The result of our work is made available through the yearly updated UBA publication: “Emission Balance of Renewable Energy Sources“ (in German only). Besides detailed results for all investiged renewable energy source the publication contains a comprehensive methodology chapter.

Additionally, most important results are available through the brochure “Renewable Energy in Figures” published by BMWi (available in German and English).

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Emission Balance of Renewable Energy Sources in 2014

An Analysis undertaken by the German Environment Agency

Umwelt Bundesamt

Background

Since 2007, the German Environment Agency (UBA) has been compiling a regularly updated emission balance of renewable energy sources (RES) in Germany.

The work is undertaken on behalf of the Ministry for Economic Affairs and Energy (BMWi) within the framework of the working group on renewable energy statistics (AGEE-Stat). The analysis is based on the Directive 2009/28/EC of the European Parliament and of the European Council of 23 April 2009 (RED), which includes guidelines on the continuous monitoring of avoided GHG emissions through the use of renewable. To fulfil these requirements UBA developed a detailed methodology which is additionally underpinned by up-to-date research from a range of leading research institutions. The results of the analysis are published on a yearly basis and are publically available.

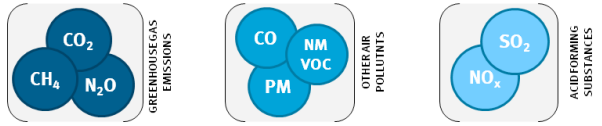
Some key aspects...

- **The calculation is not limited to GHG emissions but also includes some of the most important air pollutants like NO_x, SO_x or particulate matter (PM),in line with EU-Directive 2001/81/EC.**
- **Specific and regularly updated substitution factors for renewable power generation are used to derive emissions balances in the power sector.**
- **An analysis of substitution interlinkages and effects within the heat sector is applied, considering different consumption pattern (e.g. household, service, industry and agriculture)**
- **The balance of GHG emissions for biofuels is consistent with the RED, and includes differentiated assessments of various biomass feedstocks**

Types of emissions investigated

The emission balance includes all three relevant renewable energy sectors: electricity production (including solar PV, on- and off-shore wind power, hydropower, geothermal power and electricity generation from a number of biogenic ressources), heat production (from different types of biomass in households and industry, biogas, waste, solar thermal and geothermal sources), as well as transport (based on different biofuels).

The balance includes GHG-emissions (CO_2, CH_4 and N_2O), acid former (SO_2, NO_x) and ground-level ozone substances (CO, NMVOC), as well as particulate matter (PM).



Methodology

The emission balance aims to provide comprehensive results on the overall net-emissions avoided through the use of renewables. The work takes into account all emissions produced during the use of different RES. It includes all steps of the production and generation chain such as manufacturing, construction or maintenance of technical hardware (e.g. PV panels or wind turbines) or the cultivation, harvesting and transport of biomass. In a consecutive step, these life cycle emissions are compared with the avoided emissions of the substituted fossil fuels. The related calculations are carried out using technology specific substitution factors and result in overall net-emission balances for all investigated renewable energy sources.