Addendum to the article

Sustainability-guided promotion of renewable electricity generation

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Renewable energy technologies considered (14 in total)

A. Hydro power technologies

Small Hydro – small-scale run-of-river hydro power plant, (probably *) without GHG emissions

100 kW, 5,000 annual operating hours; lifetime 50 years; 100% degree of utilisation, land requirement 100 m^2.

Small Hydro, Reactivated – small-scale run-of-river hydro power plant, without GHG emissions

10 kW; 5,000 annual operating hours; lifetime 50 years; 100% degree of utilisation, land requirement 10 m^2.

Small Hydro, Refurbished – small-scale run-of-river hydro power plant, without GHG emissions

10 kW; 5,000 annual operating hours; lifetime 50 years; 100% degree of utilisation, land requirement 10 m^2.

Large Hydro – large-scale run-of-river hydro power plant, without GHG emissions

50 MW; 5,000 annual operating hours; lifetime 50 years; 100% degree of utilisation, land requirement 10,000 m^2.

B. Wind power technologies

Small Wind – small-scale wind power plant, park with 10 turbines á 100 kW, excl. cables and transformer stations

1 MW; 2,000 annual operating hours; lifetime 20 years; 100% degree of utilisation; 33% capacity factor, land requirement 2,000 m^2.

Medium Wind – medium-scale wind power plant, park with 10 turbines á 500 kW, excl. cables and transformer stations

5 MW; 2,000 annual operating hours; lifetime 20 years; 100% degree of utilisation; 33% capacity factor, land requirement 10,000 m^2.

Large Wind – large-scale wind power plant, park with 10 turbines á 1 MW, excl. cables and transformer stations

10 MW; 2,000 annual operating hours; lifetime 20 years; degree of utilisation 100%; 33% capacity factor, land requirement 20,000 m^2.

C. Wood-based technologies

Small Wood Gas GT – small-scale wood-gas-fired gas turbine power plant

10 MW; 6,000 annual operating hours; lifetime 15 years; degree of utilisation 28%; land requirement 200 m^2.

Small Wood Gas GT/ST – small-scale wood-gas-fired gas and steam turbine power plant

50 MW; 6,000 annual operating hours; lifetime 15 years; degree of utilisation 45%; land requirement 2,500 m^2.

Small Wood ST – small-scale wood-chips-fired steam turbine power plant

2 MW; 5,000 annual operating hours; lifetime 20 years; degree of utilisation 15%; zero (* probably negligible) land requirement.

Large Wood Chips ST – large-scale wood-chips-fired steam turbine power plant

20 MW; 5,000 annual operating hours; lifetime 20 years; degree of utilisation 22.5%; zero (* probably: negligible) land requirement.

D. Photovoltaic technologies

PV Mono – mono-crystalline photovoltaic module

50 W_p; irradiation 1,000 kWh/m^2/yr (favourable location); 990 annual operating hours; lifetime 30 years; degree of utilisation 11.56%; land requirement 0.43 m^2; system incl. aluminium frame and elevation according to the German industrial standard DIN.

PV Multi – multi-crystalline photovoltaic module

50 W_p; irradiation 1,000 kWh/m^2/yr (favourable location); 990 annual operating hours; lifetime 30 years; degree of utilisation 9.66%; land requirement 0.52 m^2; system incl. aluminium frame according to the German industrial standard DIN.

PV Amorph – amorphous photovoltaic module

50 W_p; irradiation 1,000 kWh/m^2/yr (favourable location); 990 annual operating hours; lifetime 30 years; degree of utilisation 6%; land requirement 0.84 m^2; system incl. alumiinum frame according to the German industrial standard DIN.

Source: GEMIS 4.13*

Notes: Typical values for Germany. * no further information provided (land requirements only refer to the site area, and do not include the impact range on surrounding land)

*Further information on GEMIS:

Fritsche, U. R. and Schmidt, K., 2003. GEMIS Manual, Öko-Institut e.V. (Institute for Applied Ecology), Darmstadt, April.

http://www.oeko-institut.de/gemis_engl.htm

http://www.oeko.de/service/gemis/en/index.htm