

11 Energy

11.1 Scenarios

Those models that do not account for varying societal conditions (population, GDP, etc.) should keep these fixed at year 2005 levels throughout the simulations (**2005soc** scenario in Group 1 and Group 2). However, the “present-day” representation of the installed renewable power generation should reflect 2015 conditions, since the installed power in 2005 was still very restricted and scattered. Models that only account for the weather-induced changes in power generation, without representing population or GDP effects, should name these scenarios **2015soc**. However, as soon as other socio-economic drivers are considered and fixed at 2005 levels, the scenarios should be called “2005soc”, even though they represent a mixture of both conditions. Those models that do not account for varying societal conditions only need to run the first pre-industrial period of Experiment I (1661-1860, see option 2 of Experiment I below). The models focusing on the simulation of future projections (e.g. some IAMs) need to run experiment variations associated only with the periods post-2006. Group 3 runs are only relevant for models that are able to represent future changes in societal conditions.

| Climate & CO ₂ scenarios | |
|--------------------------------------|--|
| picontrol | Pre-industrial climate and 286ppm CO ₂ concentration. The climate data for the entire period (1661-2299) are unique – no (or little) recycling of data has taken place. |
| historical | Historical climate and CO ₂ concentration. |
| rcp26 | Future climate and CO ₂ concentration from RCP2.6 |
| rcp60 | Future climate and CO ₂ concentration from RCP6.0 |
| Human influence & land-use scenarios | |
| 1860soc | Pre-industrial society |
| histsoc | Varying society |
| 2005soc | Representation of fixed year 2005 society |
| 2015soc | Representation of fixed year 2015 society |
| rcp26soc | Varying society according to SSP2+RCP2.6 |
| rcp60soc | Varying society according to SSP2+RCP6.0 |
| 2100rcp26soc | Representation of fixed year 2100 society according to the last year of rcp26soc. |

Table 27 ISIMIP2b scenarios for energy sector simulations.

| Experiment | | Input | Pre-industrial 1661-1860 | Historical 1861-2005 | Future 2006-2099 | Extended future 2100-2299 |
|-------------|--|---------------------------|------------------------------|------------------------------|---------------------|------------------------------|
| I | no climate change, pre-industrial CO ₂ | Climate & CO ₂ | picontrol | picontrol | picontrol | picontrol |
| | varying society up to 2005, then fixed at 2005 levels thereafter | Human & LU | Option 1: 1860soc | Option 1: histsoc | 2005soc | 2005soc |
| | | | Option 2*: 2005soc | Option 2*: 2005soc | | |
| Ib | no climate change, pre-industrial CO ₂ | Climate & CO ₂ | picontrol | picontrol | picontrol | picontrol |
| | varying society up to 2015, then fixed at 2015 levels thereafter | Human & LU | Option 1: 1860soc | Option 1: histsoc | 2015soc | 2015soc |
| | | | Option 2*: 2015soc | Option 2*: 2015soc | | |
| II | RCP2.6 climate & CO ₂ | Climate& CO ₂ | Experiment I | historical | rcp26 | rcp26 |
| | varying society up to 2005, then fixed at 2005 levels thereafter | LU etc. | | Option 1: histsoc | 2005soc | 2005soc |
| | | | | Option 2*: 2005soc | | |
| Iib | RCP2.6 climate & CO ₂ | Climate & CO ₂ | Experiment Ia | historical | rcp26 | rcp26 |
| | varying society up to 2015, then fixed at 2015 levels thereafter | Human & LU | | Option 1: histsoc | 2015soc | 2015soc |
| | | | | Option 2*: 2015soc | | |
| III | RCP6.0 climate & CO ₂ | Climate & CO ₂ | Experiment I | Experiment II | rcp60 | not simulated |
| | varying society up to 2005, then fixed at 2005 levels thereafter | LU etc. | | | 2005soc | |
| IIIb | RCP6.0 climate & CO ₂ | Climate & CO ₂ | Experiment Ia | Experiment IIa | rcp60 | not simulated |

| | | | | | | |
|------------|--|--------------------------|--------------|---------------|-----------|---------------|
| | varying society up to 2015, then fixed at 2015 levels thereafter | Human & LU | | | 2015soc | |
| IV | no climate change, pre-industrial CO ₂ | Climate& CO ₂ | Experiment I | Experiment I | picontrol | picontrol |
| | varying society up to 2100 (SSP2+RCP2.6), then fixed at 2100 levels thereafter | LU etc. | | | rcp26soc | 2100rcp26soc |
| V | no climate change, pre-industrial CO ₂ | Climate | Experiment I | Experiment II | picontrol | not simulated |
| | varying society up to 2100 (SSP2+RCP6.0), then fixed at 2100 levels thereafter | LU etc. | | | rcp60soc | |
| VI | RCP6.0 climate & CO ₂ | Climate | Experiment I | Experiment II | rcp26 | rcp26 |
| | varying society up to 2100 (SSP2+RCP2.6), then fixed at 2100 levels thereafter | LU etc. | | | rcp26soc | 2100rcp26soc |
| VII | RCP6.0 climate & CO ₂ | Climate | Experiment I | Experiment II | rcp60 | |
| | varying society up (SSP2+RCP6.0) | LU etc. | | | rcp26soc | |

11.2 Output data

Table 28 Variables to be reported by energy models

| Variable | Variable name | Unit | Comments |
|---------------------------|---------------|--------------|----------|
| Energy Demand | | | |
| Total energy demand | ed_tot | EJ/time step | |
| Energy demand residential | ed_res | EJ/time step | |
| Energy demand industry | ed_ind | EJ/time step | |

| | | | |
|----------------------------|------------|--------------|--|
| Energy demand transport | ed_trans | EJ/time step | |
| Energy Supply | | | |
| Solar power | p_sol | EJ/time step | |
| Wind power | p_wind | EJ/time step | |
| Gross hydropower | p_hydgross | EJ/time step | |
| Actual hydropower | p_hydact | EJ/time step | |
| Thermoelectric power total | p_therm | EJ/time step | Including nuclear, biomass, fossil-fueled power plants |
| Biomass production | prod_biom | EJ/time step | |
| Total energy extraction | extr_tot | EJ/time step | Sum of coal/shale/gas extraction |
| Economics | | | |
| Primary energy costs | | US\$2005/GJ | |
| Final energy costs | | US\$2005/GJ | Sum of average cost of electricity of all power plant technologies |
| Solar power costs | | US\$2005/GJ | |
| Wind power costs | | US\$2005/GJ | |
| Hydropower costs | | US\$2005/GJ | |
| Thermoelectric power costs | | US\$2005/GJ | Sum of average cost of electricity of coal/gas/nuclear/biomass-fueled plants |
| Adaptation costs | | US\$2005/GJ | |
| Electricity prices | | US\$2005/GJ | |