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Swiss Competence Center on Supply for Electricity
Annual Conference 2015

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Review of Global Energy Scenarios

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1. Background

The deployment of energy technologies can be at a different pace in the world regions. To identify key long-term trends, energy system scenarios are developed.

The **Paul Scherrer Institut (PSI)** and the **World Energy Council (WEC)** established a modelling partnership to develop such global energy scenarios: The ***WEC-PSI JAZZ*** scenario is market- and energy access-oriented, with focusing on economic growth. The ***WEC-PSI SYMPHONY*** scenario is more state-driven and regulation-oriented, with a focus on achieving environmental sustainability and energy security within international cooperation.

2. Approach

Besides the *WEC-PSI* collaboration, there exist various other energy system models and published scenarios with the goal of exploring the future of the global energy system (►Table).

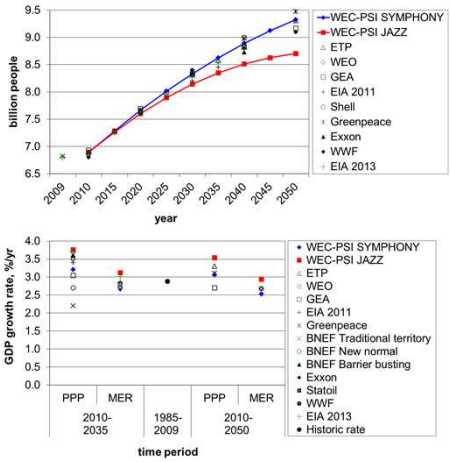
For the Global Observatory (Task 4.2), which monitors technology characterization and development, the scenario studies were reviewed and compared. The comparison was regarding the roles of specific technologies (e.g. CCS) and key driving factors (e.g. population, Gross Domestic Product (GDP)).

Organisation / Report	Year
Bloomberg New Energy Finance (BNEF)	2013
Exxon	2013
Shell	2013
EIA	2012
Greenpeace	2012
IEA/OECD Energy Technology Perspectives (ETP)	2012
IEA/OECD World Energy Outlook (WEO)	2012
IIASA Global Energy Assessment (GEA)	2012
Statoil	2012
WWF	2011

http://www.psi.ch/eem/wec-comparison

3. Scenario comparison

(a) Population & GDP

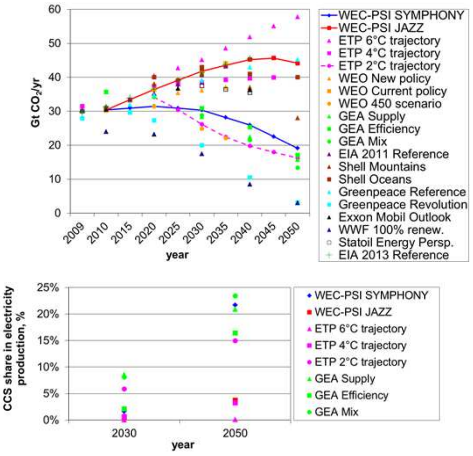


◄ Most scenarios assume 9 to 10 billion people in 2050. *WEC-PSI JAZZ* has a lower population growth up to 2050. This is related to the faster rate of economic development (see also GDP figures).

► *WEC-PSI SYMPHONY* nearly reaches the *ETP 2°C trajectory* for CO_2 (- - -). *WWF 100% renewables* and *Greenpeace Revolution* scenarios have very low CO_2 emissions.

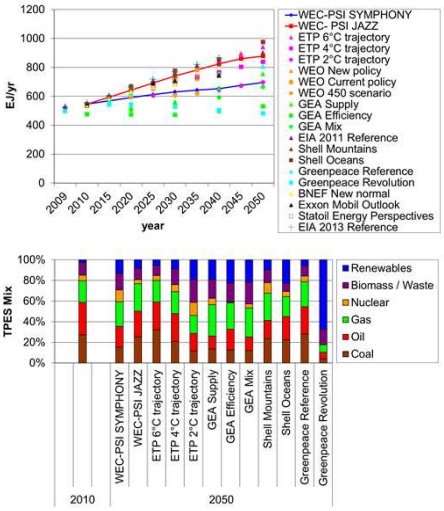
◄ The assumed GDP growth rates are in the range of average historic rates; no severe economic disruptions are expected.

(b) CO_2 Emissions & CCS



► CCS is deployed more in 2050 than in 2030. *WEC-PSI SYMPHONY* includes strong governmental support for CCS along with high CO_2 prices and – thus – high CCS shares.

(c) Total Primary Energy Supply



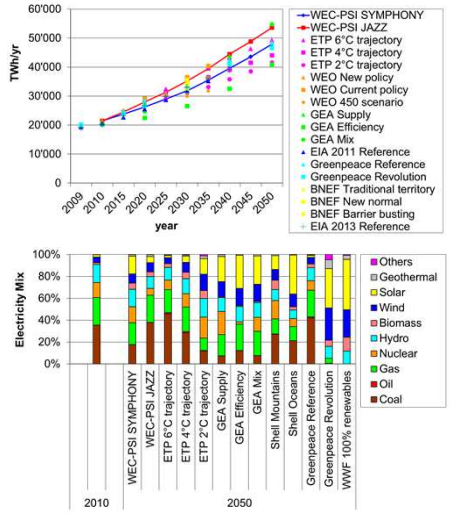
◄ The Total Primary Energy Supply (TPES) is expected to increase in almost all scenarios. The *WEC-PSI* scenarios are in the medium range of the other studies.

► Electricity production increases more than TPES in all scenarios. *WEC-PSI SYMPHONY* has more electricity per TPES than *WEC-PSI JAZZ* due to its cost-effective decarbonisation of the energy sector.

◄ In *ETP 2°C trajectory*, *GEA Supply* and *GEA Mix* as well as *Greenpeace Revolution* more renewables are deployed due to the more ambitious and in some cases "normative" climate change goals.

► *WEC-PSI SYMPHONY* has less coal than *WEC-PSI JAZZ* due to additional climate change mitigation action. In *WEC-PSI JAZZ* the gas share is substantial due to shale gas.

(d) Electricity Production



Further information

- Panos E., Turton H., Densing M., Volkart K. (2015). **Powering the growth of Sub-Saharan Africa: The Jazz and Symphony scenarios of World Energy Council**. *Energy for Sustainable Development*, Vol. 26, pp. 14-33.
- Frei C., Turton H., Densing M., Panos E., Volkart K. (2013). **World Energy Scenarios – Composing energy futures to 2050**. World Energy Council, London, UK.
- Laboratory for Energy Systems Analysis (2013). **Energiespiegel No. 22**. Paul Scherrer Insititut, Villigen PSI, Switzerland.