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A Critique on Germany's Renewable Energy Strategy

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Introduction

A shift of the global energy system from fossil energy carriers and nuclear power to renewable resources is unavoidable over the long term. The limited availability of conventional energy resources such as coal, oil, natural gas and uranium and the damage to environment caused by their use would ensure this shift. The depletion of fossil resources and the disposal of toxic wastes from fossil energy production to the biosphere and atmosphere is already a global challenge. The increased carbon dioxide emissions caused by ever increasing use of fossil fuels is a main contributor to the human - induced climate change.

The modern society is on the verge of a paradigm shift from the economic growth and associated industrial and social development, fuelled by fossil-nuclear energy over the last two centuries to a future based on renewable energy with significantly reduced greenhouse gas emissions.

The German Path toward Renewable Energies

Germany's attempts to transform a highly industrialized country's energy system from conventional to renewable energies have attracted worldwide attention. The German energy strategy, the so called German "energie wende" ("energy shift"), comprises the phasing out of nuclear power generation and the substitution of fossil energy through renewable energies.

Wind, solar and biomass will contribute significantly to the future energy resource portfolio. Far reaching legislation has been enacted, especially in the electric power market (e.g. the renewable energy act "EEG", the combined cycle legislation "KWK Gesetz", European emission trading legislation), supplemented by rules to reduce electric power consumption, integrating renewable energies in the current energy system, and energy efficiency in buildings and construction (thermal insulation, efficient heating systems etc.).

Owing to public pressure following the nuclear accident in Fukushima, several older nuclear power plants were taken off the grid immediately in 2011 and the production period was limited to 2020 for the remaining ones. While excess capacities ensured smooth servicing of electric power demand till now, reserve capacities is being drastically reduced, resulting in a heated debate on power supply security, at least regionally.

In addition, there are only limited transmission lines connecting the regions where renewable energy production capacities are being installed in a big way and the primary consumption centres. E.g. major wind power generation capacities are located and projected in Northern Germany whereas numerous large industrial consumers are in Southern Germany. Removal of several nuclear power stations from the grid in Southern Germany has resulted in a short term need for high voltage transmission lines to wind power generation locations in Northern Germany.

The need for additional North-South transmission lines will be reinforced by the scheduled additions of off-shore wind power parks that are to go on stream in the near future. Currently three additional North-South transmission lines are being planned that shall be built as modern direct current high voltage systems.

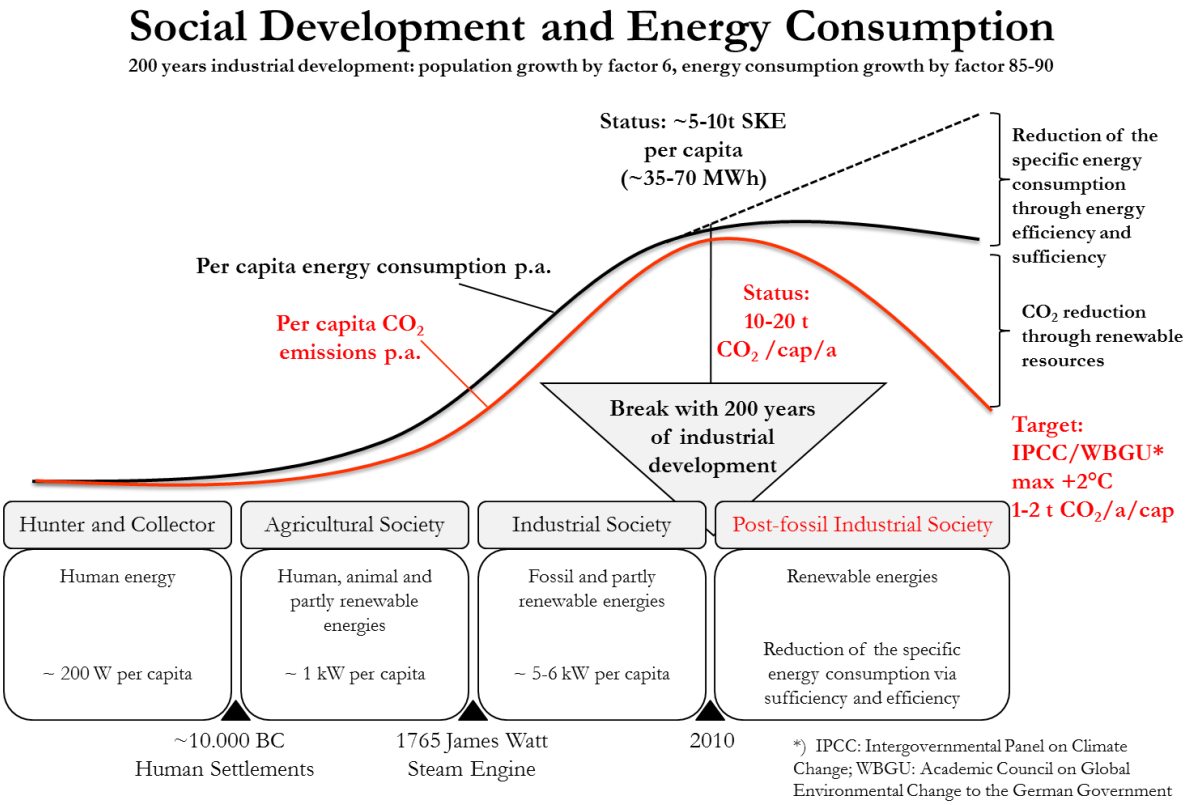

Figure 1. Energy and Society

The extended use of renewables has led to a paradigm change in the German electric power system:

- In the existing system electricity is mainly being delivered from central power plants to the consumers. In the future, electric power will also be delivered by small decentralized producers and even residential customers on a larger scale.
- In the conventional power system, actual consumption could be matched with regulating production capacities. With increasing decentralized, renewable power production capacities with its higher fluctuation, electric storage capacities will become necessary to match electric power production and demand in order to safeguard grid stability. Demand side management needs to function as a core instrument to integrate wind and solar power into the electricity system.

Challenges

The energy shift should have been directed more carefully. The political stake holders such as the national and state ministries lack decision making transparency and clear responsibilities. The concept for transition should have been commonly agreed upon between industry and political decision makers (regional autarchy considerations, expected total cost, consumer prices etc.). Adequate dissemination of information to the public is becoming more and more crucial for convincing local communities to accept construction of new transmission line and large storage system.

While capacity additions for renewable electricity production are on track (30% by 2020, currently ~50 GWp wind and solar power installed) there are major lags in reducing total consumption and integrating renewable energies into the central grid system. Critical situations arise where too large volumes of renewable electricity enter the grid and transmission lines as well as storage capacities fall short. Transmission line additions lag several years behind, resulting in wind power generators having to be taken off line. At peak times in 2012, German renewable energy even was exported free of charge to safeguard overall grid functionality.

Cost for renewable power has decreased while overall electricity prices still rose due to cross subsidization under the EEG regime. With the growing share of renewable power, the operation times of conventional power plants decrease, affecting their economic viability.

Apart from large storage units, small batteries (vehicles; residential households) may be integrated in the central grid system to reduce peak load situations and to increase decentralized – but controllable - electric power capacities. Energy efficiency efforts and energy saving (especially in the residential and commercial buildings as well as in the transport sector) require intensive efforts to complete the energy shift.

Outlook

The German energy shift is more than the mere substitution of fossil fuel and nuclear derived energy by renewable energies. It implies decoupling wealth and economic growth from resource consumption by drastically increasing efficiency and deploying new technologies. Therefore both the public as a whole and the individuals have to identify themselves with this effort. The energy shift is a vital mosaic for a future oriented society, breaking with two centuries of industrial development on the basis of cheaply and abundantly available fossil energy resources.

A sound policy framework is necessary for safeguarding the transition. The current EEG has been criticized for causing significant consumer price increases even while renewable energy production costs are declining. Residential customers have reached “grid parity”, i.e. equality of grid electricity prices and the cost of decentralized power production. An updated EEG seems necessary, not favouring selected technologies, but considering falling costs of renewable energy production and decreasing operation times of conventional back up capacities.

Necessary regulatory issues should not address energy supply only but should comprise the overall use of resources including production, consumption patterns, growth and wealth, as well as quality of life. While energy saving and efficiency constitute core issues of the energy turnaround; they significantly lag behind policy targets set for 2020.

Instead of one-way, use and throw, and end of pipe concepts, new approaches such as closed loop cycles, sustainable design, recycling and reparability, long life duration of products, and similar

innovative efforts have to become integral parts of our economic system. Ecological services utilized have to have a cost component; e.g. the use of the environment (biosphere, atmosphere) should not be free of charge. The current social maxims of consumption as a status symbol, monetary wealth and ownership need to be replaced by values such as sufficiency, subsidiarity, moderation and cooperation.

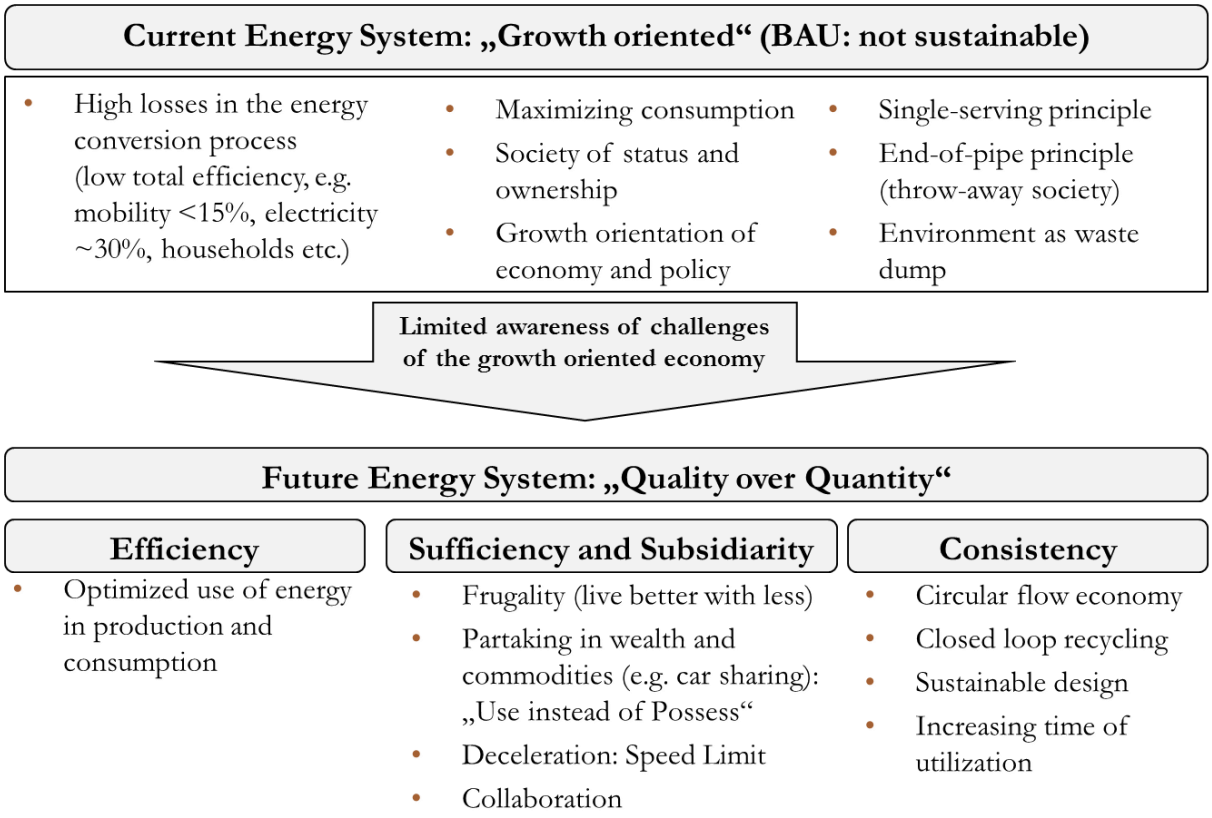

Figure 2. The Energy System – Today and Tomorrow
Remark: BAU: Business as Usual

The complexity of the overall system is challenging; it has to be analyzed in its various technical, social, and economic dimensions while still considering its overall coherence. The effort is, however, worthwhile and even necessary considering that on 22/08/2012 we had the so-called "Earth Overshoot Day"[1] after which we are living at the expense of future generations. According to the organization Global Footprint Network, worldwide consumption of resources exceeded natural reproducibility and carbon dioxide sequestration after 8 months already, with this date arriving earlier each year.

[1] *http://www.footprintnetwork.org/de/index.php/gfn/page/earth_overshoot_day/*