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IMPLEMENTATION OF WIND ENERGY – ASPECT OF SUSTAINABILITY

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OVERVIEW

Beside water and biomass wind energy and photovoltaic are the most favourable renewable energy technologies worldwide. Especially wind energy will provide a major share of our future energy supply, and, due to the possibility of going off shore, it has an immense additional potential for power supply. At the end of the year 2009 the rated power of wind converters has been about 150 GW worldwide; the half of them was installed in Europe. During the last years, the potential of wind energy on shore, with the exception of repowering, has been nearly exhausted in some countries, e.g. Germany, so that future projects will have to go off shore. Due to the economics of scale this will require a fast development of wind converters of the 3-6 MW-class in good technical quality; moreover, grid expansion must have been accomplished by the time. On the other side the construction wind parks is material-intensively, so it needs a big amount of conventional energy as fossils to produce it. Thus raises the question, if the use of wind energy is sustainable under the aspect of cumulated energy and greenhouse gases reduction.

METHODS

To give an answer to the question the methodological approach of Life Cycle Assessment (LCA) will be used. LCA is an instrument to quantify all impacts of the entire energy supply chain. In this presentation only two indicators are considered: the cumulated energy as indicator for depleting of resources and cumulated carbon dioxide emissions as indicator for greenhouse gases. To obtain the cumulated energy demand for production, instance and of a wind park the whole facility has to be split up into its sub-components and their respective materials. For final evaluation of the energy systems Energy Yield Ratio as relationship of produced energy and total cumulated energy demand has been used to decide if market introduction of wind energy is sustainable enough or not.

RESULTS

The results of LCAs of on shore and off shore wind parks show that wind energy converters have a high Yield Ratio and low CO₂-emissions, even in comparison with other renewable energy systems like photovoltaic. Further, the study also shows that surveying the life cycle of a modern wind turbine, much more primary energy can be saved during the operational phase, than it is actually needed in construction phase.

CONCLUSIONS

Wind energy will be an important component of the future electricity system. It is absolutely necessary politics to advice in term of market introduction of renewable energies to do such kind of life cycle management investigations. The study results show that the sustainability is given by on and off shore wind energy.