# PHASING OUT FOSSILS BY WIND
# - WHAT EFFECTS ON $CO_2$ AND ECOBALANCE? -

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## (1) Overview

Beside water and biomass wind energy and photovoltaic are the most favourable renewable energy technologies worldwide. There is an enforced market introduction from on shore and also off shore wind facilities worldwide. Also Uruguay is introducing new wind converters. The construction of wind parks is material-intensively, it needs a big amount of conventional energy as fossils to produce it. With the energy consumption connected are emissions of green house gases and other relevant chemicals.

The cost situation of wind use is very known. But is the use of wind energy sustainable under the aspect of cumulated energy and environment?
That is the problem the presentation is dealing with. The results of the presentation will give help for the environmental discussion in respect to renewable energies.

This presentation will present and discuss the methodological approach of cumulated energy balances and ecobalance and the results of wind energy converters. For calculating the yearly energy output two locations of wind converters have been selected: near coastal and offshore. A wind energy converter of 1.5 MW, as produced in Germany, has been chosen to be considered. Beside that a park of multi megawatt wind turbines in the ocean, 30 miles far away from the cost is considered.

## (2) Methods

To give an answer to the question the methodological approach of Life Cycle Assessment will be used. Life Cycle Assessment is an instrument to quantify all impacts of the entire energy supply chain.

In this presentation only the cumulated energy as indicator for depleting of resources and cumulated carbon dioxide emissions will be detailed considered. To obtain the cumulated energy demand for production, for instance, of a wind converter, the whole facility has to be split up into components, sub-components and their respective materials. Using this material balance with specific data for materials, energy resources and emissions it is possible to calculate the cumulated energy demand.

For final evaluation of the energy systems Energy Yield Ratio as relationship of produced energy (valued as primary energy) and total Cumulated Energy Demand and $CO_2$ emissions has been used to decide if market introduction of wind energy is sustainable enough or not

## (3) Results

The results of this study show e. g. that -surveying the life cycle of a modern wind turbine-, much more primary energy can be harvested during the operational phase, than it is actually needed in the constructing phase. The Energy Payback Time for the 1.5 MW wind turbines is about 4 months while the Energy Payback Time for the 5 MW offshore designs is approx. 8-9 months.

## (4) Conclusions

To advise politics in term of market introduction of renewable energies it is absolutely necessary to do such kind of life cycle management investigations. For wind energy systems the balance of energy and the ecoblance is very well.

## References


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## Biographical notes of Prof. Hermann-Josef WAGNER:

**H.-J. Wagner** is Professor for Energy Systems and Energy Economics at the Ruhr-University of Bochum, Germany. He holds a Diploma degree and a Doctorate in Energy Engineering from Technical University in Aachen, Germany. He works as a scientist for the Research Centre Juelich, for the German Parliament and for the Technical University Berlin and the Universities Duisburg and Essen. His relevant experiences are on the fields on energy systems analysis, renewable energies like solar and wind energy and life cycle analysis. He published about 200 articles in international and national journals and books. He is editor of the book series “Energy and Sustainability”.

He is member in International Association of Energy Economics (IAEE) and in German Association of Engineers (VDI) where he held the chairmanship of the division of Energy and Environment (GEU) with about 22.000 members. He was also admitted as member by the German Academy of Sciences Leopoldina and worked as an academy consulter for energy politics.

Prof. H.-J. Wagner is member of the IAEE since 27 years. He was also member of the board of the German association of IAEE – GEE al lot of years.

The German President decorated him for his engagement with the Order of Merit of the Federal Republic of Germany in the year 2010.

Privately: Hermann-Josef. Wagner was born 1950; he is married and is the father of a daughter and a son.