Scenarios
Experiences from Denmark support China’s renewable energy expansion

The Scenario work is a key element in the Sino-Danish collaboration between CNREC and the Danish Energy Agency. The Danish Energy Agency contributes with an extensive know-how from the Danish work with scenario analysis to generate scenarios for China.

Danish and China collaborate on renewable energy issues in the joint cooperation between China National Renewable Energy Centre (CNREC) and the Danish Energy Agency. The key issue in the cooperation is the scenarios that make it possible to shed light on challenges and solutions by an extensive Chinese renewable energy expansion.

Sino-Danish cooperation
China has a growing interest in using a larger share of renewable energy to meet the country’s future energy demands. Consequently China is focusing on increasing the use of renewable energy by massively investing in renewable energy facilities and by developing renewable energy technologies. The intense focus on renewable energy however produces certain challenges concerning the integration of increasing amounts of renewable energy in the Chinese energy system.

Through the cooperation between the Danish Energy Agency and CNREC, Denmark assists China with the renewable energy expansion. A key element in the cooperation is the work with scenarios aiming to define scenarios for the use of large shares of renewable energy in China approaching 2050. On the basis of many years’ experiences converting the energy supply system to renewable energy, Denmark can contribute with know-how and methodology concerning analysis and solutions regarding the conversion to renewable energy.

China wishes to expand its energy supply massively with non-fossil fuels which is renewable energy and nuclear power. The aim is 15 pct. in 2020. Moreover China’s objective is to reduce the energy consumption per GDP unit with 16 pct. from 2011 to 2015. However scenarios show that the Chinese energy consumption will continue to increase despite improved energy efficiency and that China up to 2035 will be responsible for approximately half the global carbon emission increment unless a considerable effort is made to reverse the picture.

Making scenarios
Together CNREC and the Danish Energy Agency have launched a scenario study which will show an estimate of how much renewable energy it is possible to fit into the Chinese energy system and how the renewable energy expansion can be accomplice as cost-effective and appropriate as possible. The reporting on the study’s first phase was given in the summer of 2013. The study report has not yet been published.

The Danish Energy Agency contributes to the project with an extensive know-how related to scenario analysis, not least the experiences from the making of the Climate Commission’s report “Green Energy” from September 2010 and the Danish Government’s initiative “Our Future Energy” from November 2011.

A number of computer models have been developed to define the scenarios. The models calculate the development in energy consumption for transport, industry and buildings. On the provincial level the optimal expansion of the electricity and district heating system is calculated including the localization of new renewable energy facilities as well as the development of the transmission grid until 2050.

The distribution by energy sources of China’s gross energy consumption in 2010.

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Approaching 2020 China will expand the use of non-fossil energy with 15 pct. However, scenarios show that China’s energy consumption will continue to increase despite improved energy efficiency. In this context roadmaps and scenario analyses regarding the use of renewable energy are important measures to meet future challenges from the conversion to use more non-fossil energy. Denmark can contribute to the process with know-how and methods to generate long-term roadmaps and scenarios.

Some key point from the from the results are:

- As a part of the scenario work China’s renewable energy resources have been mapped and the analysis shows large renewable energy resources in China.
- The Chinese energy supply can technically be based on a large share of renewable energy at approximately 50 pct. in 2050 against 9 pct. in 2010. But a large share of renewable energy in the supply demands a more flexible management of the production and transmission system than today.
- The renewable resources that will be able to contribute most to a conversion to green energy are wind and water power. Water power is the economically most attractive, but the resource is limited and long-term wind is the most important renewable energy resource and in the scenarios as much as 2,800 GW wind capacity is included in 2050.
- Calculations moreover show that the additional costs for investment in production capacity, transmission grids, operational costs and fuels are approximately 9 pct. in the most ambitious renewable energy scenario.
- The value increment in the renewable energy sector in 2050 will be able to make up as much as 3 pct. of the GDP and employ at least 5 million if the ambitious renewable energy expansion plans are carried through.

**The effect on the carbon emission level**

The effect of making scenarios comes in so far as China decides to expand with renewable energy based on the calculated renewable energy scenario. Such an expansion can however have an immense influence on the carbon emission. The calculations indicate that the carbon emissions in the most ambitious scenarios could decrease drastically. Compared to the carbon emissions in the reference scenario there will be approximately 4,000 million tonnes carbon emission reduction in the most ambitious renewable energy scenario in 2050. This corresponds to the total European carbon emission in 2011.

**The technology catalogue as input**

One of the most important inputs for the scenario analysis is data from a new Chinese technology catalogue. The catalogue is built up using the same principle as the Danish technology catalogue and contains descriptions of data for renewable energy technologies including wind turbines, solar heat, solar cells, biomass etc. The data in the catalogue includes information about technique, economy and environment. The Danish Energy Agency has contributed to the development and quality control of the catalogue with expert advice.

Visit CNREC’s website:  
http://www.cnrec.org.cn/english/

Visit the Danish Energy Agency’s website:  

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