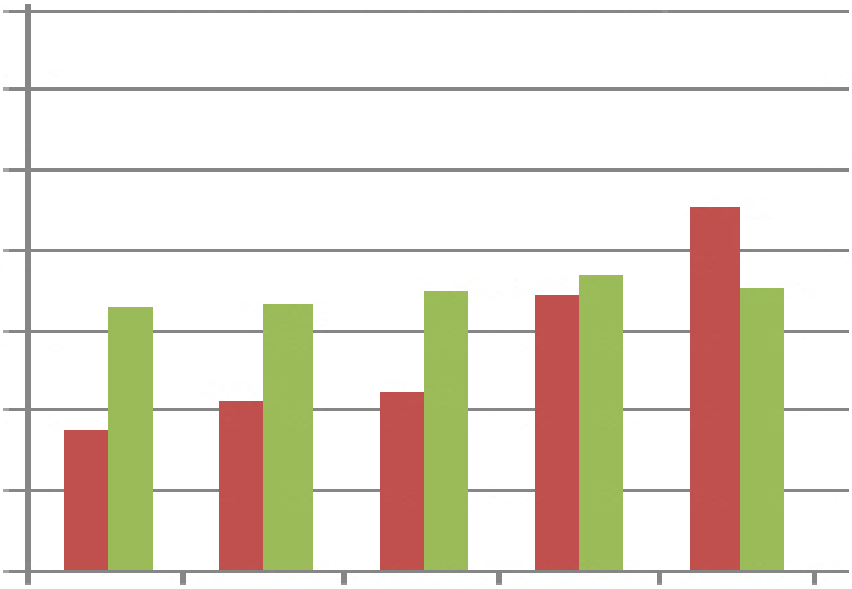


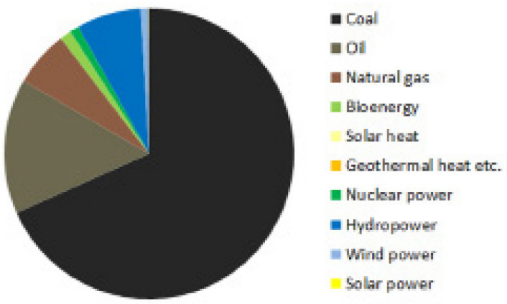
DANISH EXPERTISE SUPPORTS CHINA'S RENEWABLE ENERGY EXPANSION

Denmark and China collaborate on renewable energy issues in a joint cooperation between the Danish Energy Agency and China National Renewable Energy Centre. The key issues in the cooperation are the scenarios that make it possible to shed light on the challenges and solutions of an extensive Chinese renewable energy expansion.

EXPANSION CALLS FOR SCENARIO OUTLOOKS

China's rapid economic growth has sparked an interest in using larger proportions of renewable energy to meet the country's future energy demands. Consequently, China is focusing on expanding 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, presents certain challenges concerning the integration of renewable energy into the Chinese energy system.

In cooperation with China National Renewable Energy Centre (CNREC), the Danish Energy Agency will assist China in their expansion with renewable energy. A key element is developing scenarios that analyse possible roads for deploying large proportions of renewable energy in China approaching 2050. As a result of the many years of converting the energy supply system to renewable energy, Denmark has gained expertise in methodology to analyse and pre-empt possible scenarios, when converting energy systems to renewable energy. These outlooks form the basis for coherent and long-term energy planning.



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

China wishes to expand its energy supply massively with non-fossil fuels i.e. renewable energy and nuclear power. The aim is that non-fossil fuels will make up 15 pct. of the total energy consumption 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. It is likely China will be responsible for roughly half the global carbon emission increment by 2035, unless a considerable effort is made to reverse the picture. Scenarios lay out alternate paths for China to follow.

MAKING SCENARIOS

CNREC and the Danish Energy Agency have launched a joint 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 accomplished as cost-effectively and appropriately as possible. 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.

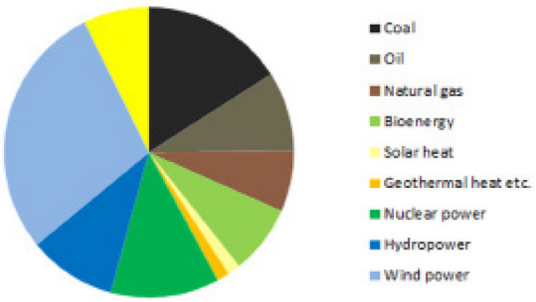
The result of the study is three scenarios showing possible paths for the future Chinese energy development: A Reference Scenario, illustrating the development if the 12th 5-year plans

SCENARIO STUDIES

(2011-2015) ambitions are followed, a RE Max Scenario, illustrating the most ambitious renewable energy development, and an Optimisation Scenario, balancing economic and regulatory measures. The scenarios concentrate on the development of the supply side and supply side policy measures.

The Danish Energy Agency contributes to the project with an extensive know-how related to scenario analyses, not least from the experiences gained in the making of the Climate Commission's report "Green Energy" (2010) and the Danish Government's initiative "Our Future Energy" (2011).
A number of computer models have been developed to define the scenarios. The models calculate the development in the Chinese 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 EFFECT ON THE CARBON EMISSION LEVEL
Scenarios show possible methods for introducing more renewable energy into the system. The effect on the carbon emission level, if China decides to invest in renewable energy, is based on one of the calculated renewable energy scenarios. A Chinese expansion would have an immense effect on carbon emissions. Calculations indicate that the carbon emissions in the most ambitious renewable energy scenarios could facilitate a 4,000 million tonnes carbon emission reduction by 2050, compared to the carbon emissions in the reference scenario. This reduction corresponds to the European carbon emission of 2011.



The distribution by energy sources of China's gross energy consumption in 2050 if the country follows the RE MAX scenario.

THE TECHNOLOGY CATALOGUE AS INPUT
One of the most important inputs for the scenario analyses is data from the new Chinese Technology Catalogue. The catalogue is based upon the same principles 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 new Chinese Technology 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.

SOME KEY POINTS FROM THE RESULTS ARE:

- The adoption of a more flexible management of the Chinese production and transmission system could mean an increase of the renewable energy share to roughly 50 pct. by 2050, from the 9 pct. in 2010.
- Long-term, wind power is the most important renewable energy resource in China and scenarios indicate that in 2050 wind power could generate roughly 2,800 GW at full capacity.
- Calculations show that the additional costs for investment in production capacity, transmission grids, operational costs and fuels are only approximately 9 pct., even in the most ambitious renewable energy scenario.
- The value increment in the renewable energy sector is expected to make up as much as 3 pct. of the GDP in 2050 and employ at least 5 million, if the ambitious renewable energy expansion plans are carried through.

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