



# CHINA GREENS THE ENERGY SUPPLY WITH HEAT AND POWER FROM THE SUN

Having ambitious objectives within climate and energy, China focuses on seven strategic industries to accelerate the green development – one being solar energy. Danish experiences can be of assistance to fully integrate solar heat and electricity into the Chinese energy portfolio.

### A RESOURCE HOLDING LARGE POTENTIALS

Developing a fossil free energy production and advancing the green and sustainable development is of growing interest in China. Accordingly, China has extended their focus on deploying renewable energy sources including solar energy. China applies a technological focus on the development and installation of solar electricity and solar heating systems. Together, solar electricity, also called photovoltaics (PV), and solar heat makes up the overall term “solar energy”.

During 2013 and 2014 (est.), China multiplied the share of energy generated from the sun. Solar is a promising renewable resource in China, and the newest research, which is among the results of the Sino-Danish collaboration in renewable energy, shows that the potential for solar energy is significant, as solar energy can be applied in almost every region in China.

#### SOLAR ENERGY IN CHINA IN BRIEF:

- China focuses on seven strategic industries to accelerate green development – one of these is solar energy, which is solar heat and solar electricity (Photovoltaics - PV in short).
- Studies show a large potential for solar energy in China, where solar is applicable in almost every Chinese region.
- The challenges for China concerning solar is integration of solar electricity in the power grid, solar heat in the district heating grid and to reduce the overall costs to generate solar energy.

The Chinese development of individual solar heating systems for rooftops etc. has been fast and today these solar heating systems are competitive with other sources of heating and are generally widespread. Conversely larger solar heating installations are not yet applied. Within PV it is so far mostly solar power plants that have been established, while smaller PV facilities on rooftops or integrated into buildings are only on the rise, but facing difficulties on the existing building mass. In addition there is also uncertainty about the rules for grid connection of these small facilities. Solar heating systems and PV's are put up in areas with large roof areas, e.g. industrial areas, economic development zones and larger public facilities. This is in the favour of the local inhabitants who can use the generated solar electricity and heat and benefit from cleaner air.

### SUPPORT TO THE DOMESTIC MARKET

Until now, China has exported the majority of its production of PV's abroad. But following the global financial crisis, the export has decreased. Consequently, China seeks to facilitate the domestic market that until 2013 only was 5-10 pct. of the produced PV's; a more than ten times increase is expected up until 2015. Concurrent with the domestic effort, Chinese industry is active in acquiring international manufacturing companies. Hence China will dominate a larger part of the market for PV and heat in the years to come as also indicated in the IEA Solar Energy Road Map of 2014.

# SOLAR ENERGY IN CHINA



## A FOCUS WITH CHALLENGES

Although China has an extensive focus on solar energy, the costs to generate electricity and heat from the sun are still so high that it often pays better to produce conventional energy. Therefore China focuses on reducing the cost of solar energy and on clarifying the conditions for the utilisation of solar energy in China as well as a price mechanism to enhance the development of renewable energy. The emphasis is on strategic planning and political initiatives to improve the conditions for green development in China including the utilisation of solar energy.

The generation of electricity from PV fluctuates depending on the sun's radiation and at night there is naturally no generation. A large-scale penetration of PV thus makes demands on the design of the overall power grid, so the electricity can be utilised as it is produced or can be stored while other facilities can balance production/demand when solar electricity is not available – a 'smart grid' development will be necessary. China is aware of the challenges of integrating wind, PV and other intermittent sources of electricity into the grid. Moreover there will be a need for expanding the transmission grid to transfer PV electricity from areas where it is produced most economically to load centres, as well as the need to coordinate PV and solar thermal utilisation in urban areas with limited space available.

## THE DANISH EXPERIENCES

To be able to utilise solar energy as much as possible to meet the overall energy demand of buildings Denmark focuses on a coherent strategy including expansion of low energy building where solar energy is able to cover the energy consumption, integration of solar systems into the building stock as well as solar district heating with or without seasonal storage. Also production, transmission, distribution and the management of the consumption is merged in a holistic approach to the Danish energy field. As a part of the Danish Energy Strategy 2050, aiming for conversion of the Danish energy supply to 100 pct. fossil free resources by 2050, the heat sector has to reach a fossil free heat supply by 2035. This leads to an increased

Danish focus on developing a sustainable heat generation e.g. by generation of solar heat. The experiences from this development form a strong basis for Danish export of solar heating technologies e.g. to China.

Also, Denmark has many positive experiences with integration of fluctuating amounts of electricity from fluctuating energy sources into the grid – the so-called smart grid. By incorporating more intelligence by means of technology in the power grid the Danish grid can handle a fluctuating production from renewable energy sources and simultaneously sustain the stability and security of supply.

## SINO-DANISH COOPERATION

As a part of the Sino-Danish cooperation on renewable energy a so-called roadmap on solar energy in China has been developed. The roadmap clarifies the long term potential for expansion of solar energy in China both concerning solar heat and solar electricity. Scenarios up to 2050 outline capacities of 2-3,000 GW of PV and 1,200-2,400 GW thermal meeting 18-40 pct. of the power demand and 15-32 pct. of the total primary energy demand. The resulting reduction in CO<sub>2</sub> emission will be 2.2-4.6 billion tons. Moreover it outlines promising courses of development of the Chinese solar energy industry both for the domestic and global markets with 12.5-19 million new jobs created.

Besides the solar energy road map there are specific cooperative projects between Danish and Chinese institutions and companies about demonstration facilities and testing of solar energy systems. Denmark has furthermore facilitated comments on the solar energy road map from the Solar Heating and Cooling (SHC) and PV Power Systems (PVPS) implementing agreements of the International Energy Agency (IAE).

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