China's Future Generation 2.0

Assessing the Maximum Potential for Renewable Power Sources in China to 2050

In November 2014, China took a bold, unprecedented step by committing to peak their overall GHG emissions by 2030. At the same time it made a pledge to increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030. Since 2014, China has reinforced its commitments to a safe climate future by progressively rolling out new climate policies to tackle China's domestic emissions.

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Beyond making these important commitments, China saw some very positive energy trends in 2014 and 2015. Throughout 2014, for example, China added about 35 GW of solar and wind energy generation capacity combined,[1] the most ever by a country in a single year. China also improved its energy intensity (energy use per unit of GDP) by at least 5%, which is more than twice as much as the global rate. These changes indicate the strong success of domestic energy efficiency programs.[2] The combined effect of these trends, as well as a drop in coal consumption in China for the first time since 2000, have caused China's energy-related CO_2 emissions to flatline or even to decrease.[3]

While these trends are very promising, China will need to accelerate its transition towards a clean energy economy. Further reforms in its power sector will help deliver emissions reductions, and achieve Chinese government's vision of an "Ecological Civilization," an economic pathway within environmental limits.

A new WWF report written by the Energy Transition Research Institute (Entri) models China's electric power future out to 2050. The power sector scenarios in this report are built using a refined and expanded version of China Grid 8760 Model, which simulates hour-by-hour power supply and demand from the present through 2050. Incorporating assumptions of only modest technology innovation, the report finds that:

- **Around 84% of China's electricity generation can be met by renewable sources by mid-century** if appropriate policies and measures are taken, including—and conditional upon—aggressive energy efficiency improvements.
- **China could meet or beat both of its commitments to peak its overall carbon emissions and have non-fossil fuels in primary energy use representing 20% by 2030** if the country

[11] REN 21, 2015; Global Status Report of Renewables, Paris 2015; http://www.ren21.net/status-of-renewables/global-status-report/ pages Figure 17, p. 59; Figure 23, p. 71

[12] IEA, 2015. Energy and Climate Change, Paris 2015. https://www.iea.org/publications/freepublications/publication/WEO2015SpecialReportonEnergyandClimateChange.pdf. Page 22

[13] Ibid. Figure 1.9, Page 30

pursues aggressive, low-carbon development scenarios for the power sector by, for example, peaking carbon emissions from the power sector by 2020.

- **Coal can be eliminated from the power mix by 2050** or even earlier, but this will require considerable political courage and enabling policies that would regulate and/or price carbon in the electricity sector at an appropriate level.
- **Over the period 2015-2050, the total costs for an electric power system run mainly with renewables would be less emissions-intensive and cheaper than a system dominated by coal.** *Future Generation 2.0* shows that a high-penetration renewables scenario would be about 14% cheaper and emit 3% fewer carbon emissions than what was projected in the first *Future Generation* report released in 2014.
- **Improved cost and emissions results** are primarily due to the China 8760 Model's inclusion of technologies that allow "demand dispatch"—a smart grid approach to efficiently manage electricity loads.

Policy Recommendations

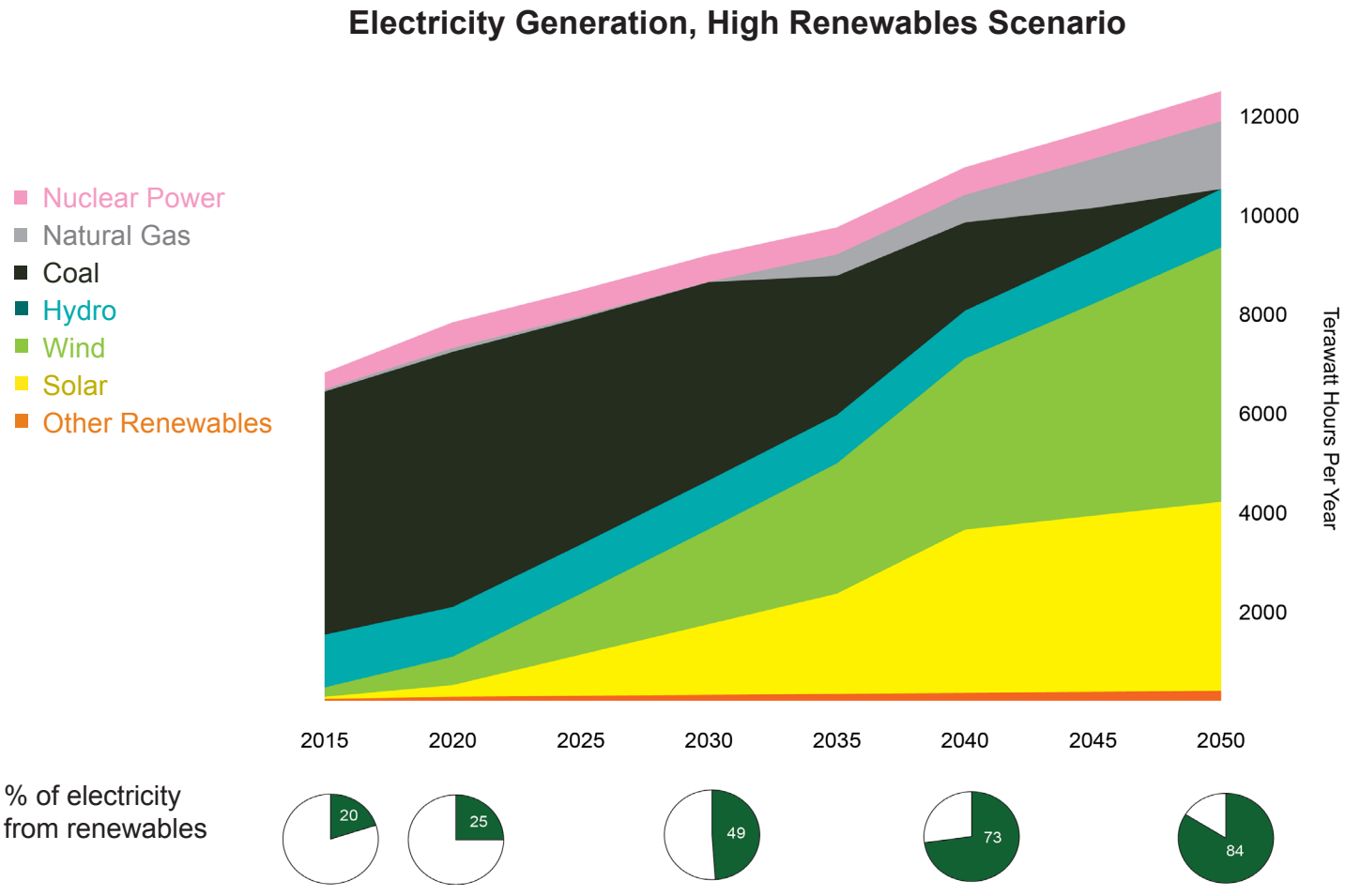
The recommendations from WWF and Entri's *Future Generation* report in 2014 concluded with several policy recommendations to achieve a pathway to a high-renewables energy model built on energy efficiency, carbon reduction investments, power pricing reforms, and data collection and transparency, all of which still are applicable today. *Future Generation 2.0* offers some new additional recommendations.

Appliance Efficiency Standards

Entri specifically recommends new stringent standards for air conditioners, water heaters, motors, and lighting, some to be enacted in 2017 and others to be achieved by 2030.

Abandon Plans for Coal Gasification

Officially, China plans to address some of its air pollution problems by producing synthetic natural gas from coal. This would shift some of the problems with coal from



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the densely populated east to the less-developed western provinces, but would also increase rather than reduce carbon emissions. Therefore, WWF recommends that China take extreme precaution with coal gasification by approaching it only as a last-resort technology and ensuring that proper economic cost-benefit and environmental impact assessments are performed for potential coal gasification facilities. Eschewing coal gasification would prevent unnecessary environmental degradation and avoid a long-term commitment to high-carbon, economically inefficient energy infrastructure. Furthermore, if coal gasification facilities were built and began operating but then closed as a result of environmental concerns, the loss of jobs would be a blow to the social fabric of certain western provinces.

Accelerating power sector reforms

Any delay in China's adoption of the policies and technologies that reduce demand for electricity would strengthen coal's grip on the power system. Entri notes with concern that:

- China's first electric sector reform document in over a decade contains no discussion of the need to separate the control of electricity distribution and transmission and pays little attention to optimizing the dispatch of electricity. Both of these reforms are essential for the rapid penetration of renewables in the power system.
- With little progress on using electricity prices for peak load management, vital reforms must be implemented across all sectors. Residential electricity consumers pay about half the real cost of their electricity, and this is a huge barrier to controlling electricity demand growth in buildings.

Including directives for these types of policy reforms in the 13th 5-year plan is an opportunity that should not be missed.

WWF believes that the "Chinese Dream" and an "Ecological Civilization" can only be achieved if China is powered by sustainable renewable energy. This report shows that such action is more feasible and in China's economic interests than ever before.

A full version of *China's Future Generation 2.0* can be downloaded at www.worldwildlife.org/ChinaEnergy, along with the first *Future Generation* report.

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