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Decarbonizing China's power system with wind power: the past and the future

Executive Summary

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Wind power in China has experienced significant growth since the beginning of this century. Total installed capacity has increased almost 300 fold – from 346 MW in 2000 to 91,413 MW in 2013. This rapid development has had two major drivers:

- First, the excellent wind power resource in China, especially in the north of the country, and the increasing competitiveness of wind generation worldwide.
- Second, favourable government policies such as: mandatory targets for major power generators in relation to renewable energy; the decentralization of plant approval rights; and feed-in tariffs for wind generation.

Along with the development of domestic wind turbine manufacturing capacity, these factors have stimulated the growth of wind power over the past 10 years or so. However, this rapid development has itself created new challenges. In particular, wind power has not been fully integrated into the electricity system as a whole, as the growth of wind generation capacity has not been matched by a corresponding growth in transmission capacity. This has resulted in a substantial requirement to curtail excess wind power, leading to the loss of a significant proportion (approximately 20 per cent) of potential wind output. To help with this problem, a number of transmission routes are planned, in order to link the wind farms in the interior to load centres on the coast. Nevertheless, it remains unclear whether the proposed expansion of the transmission system is adequate to accommodate the future growth of wind.

It is also unclear whether the existing pricing systems for electricity itself, and for electricity transmission, reflect the real costs involved. The rapid growth of wind generation has led to a growing deficit in China's renewable energy fund; this in turn is leading to uncertainty over payments to wind farm developers and turbine manufacturers. It can be argued that current pricing mechanisms do not give appropriate signals to encourage the integration of wind power into the electricity system as a whole – a problem which can only get worse as wind power expands further.

This paper highlights two options that could help the future development of wind power and its efficient integration into the electricity system: a more coordinated approach to the application of government policy in this area and the development of more market-based price signals in the power sector. Together these could provide a more coherent path towards the overall development of the power system and help secure the optimum contribution from wind power.