



Renewable Power Integration in China

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How can China use more of the wind energy it produces? Xinyu Chen, a postdoctoral fellow in the Harvard China Project, presented his research on this question in the Energy Policy Seminar. Chen noted that China has been adding wind capacity at a rate that outpaces that of all other countries, and that ranks it first in the world in terms of wind capacity—China had 34% of the total wind capacity in the world in 2015.

However, using all of its wind energy is proving to be a challenge, Chen explained. China curtailed 16% of its total wind generation in 2011—an amount of unused electricity valued at \$1.6 billion dollars.

Curtailed levels are of particular concern because ambitious further growth in wind power is planned in China as part of efforts to reduce carbon emissions and improve air quality, Chen noted. Targets include a near-doubling of current capacity by 2020, and near quadrupling of capacity by 2030.

Curtailed wind power, Chen explained, results from the combination of a relatively inflexible generation mix in China (where the majority of electricity production comes from coal plants, which take up to ten hours to reach full production from a cold start) and the fact that areas with the greatest wind potential (and installed capacity) are not the same as the urbanized areas with greatest electricity demand. Furthermore, the widespread use of combined heat and power in areas of greatest wind production increases the rigidity of the system, since these units are “must run” during heating season, producing electricity even when plenty of wind electricity is available.

Complicating these challenges is China’s electricity dispatch system, Chen noted. Unlike electricity dispatch in the United States, dispatch in China is governed by annual and monthly plans, rather than markets, and permits very limited dispatch between provinces.

Chen went on to present the results of his research, which uses a model of China’s electricity system to examine three approaches to reducing the curtailment of wind power in China: a strategy of coordinated interregional transmission (increasing opportunities to export excess wind power), energy system integration between power and heating systems (using excess wind electricity to create storable heat), and interaction with a growing fleet of electric vehicles (choosing charging methods that maximize the ability to utilize electricity generated from wind).

All of the above approaches, Chen found, have the potential to reduce wind power curtailment to some extent, resulting in reduced carbon emissions and fuel cost savings. In the case of electric vehicles, Chen’s analysis found that the usefulness of electric vehicles for wind integration is considerably greater when slow charging, rather than fast charging, technology is used.

Chen spoke as part of the Kennedy School’s Energy Policy Seminar Series, which is jointly sponsored by the Energy Technology Innovation Policy research group of the Belfer Center and by the Consortium for Energy Policy Research of the Mossavar-Rahmani Center on Business and Government.

