IEAGHG Information Paper 2017-IP41; Renewable Deployment not all Plain Sailing

Whilst the scale of renewable energy deployment has been making headlines in recent years, an analysis by I4CE Institute of Climate Economics in France suggests that bringing the deployed renewable electricity to the market is not as easy a proposition.

An article entitled 'Renewable energies in China: From a proactive political approach to bottlenecks in the field' is presented on their web site at: http://ideas4development.org/en/renewable-energies-china-curtailment/

I4CE indicate that the deployment of renewable energies is a challenge for all countries. It requires a major transformation in existing infrastructure and regulations, which needs to be carefully planned. They focus on China where they suggest that the deployment of renewable energies in China is driven by an ambitious political will. However, technical and regulatory constraints are numerous, encouraging in particular, the curtailment of renewable projects. A situation they also suggest has arisen in Germany.

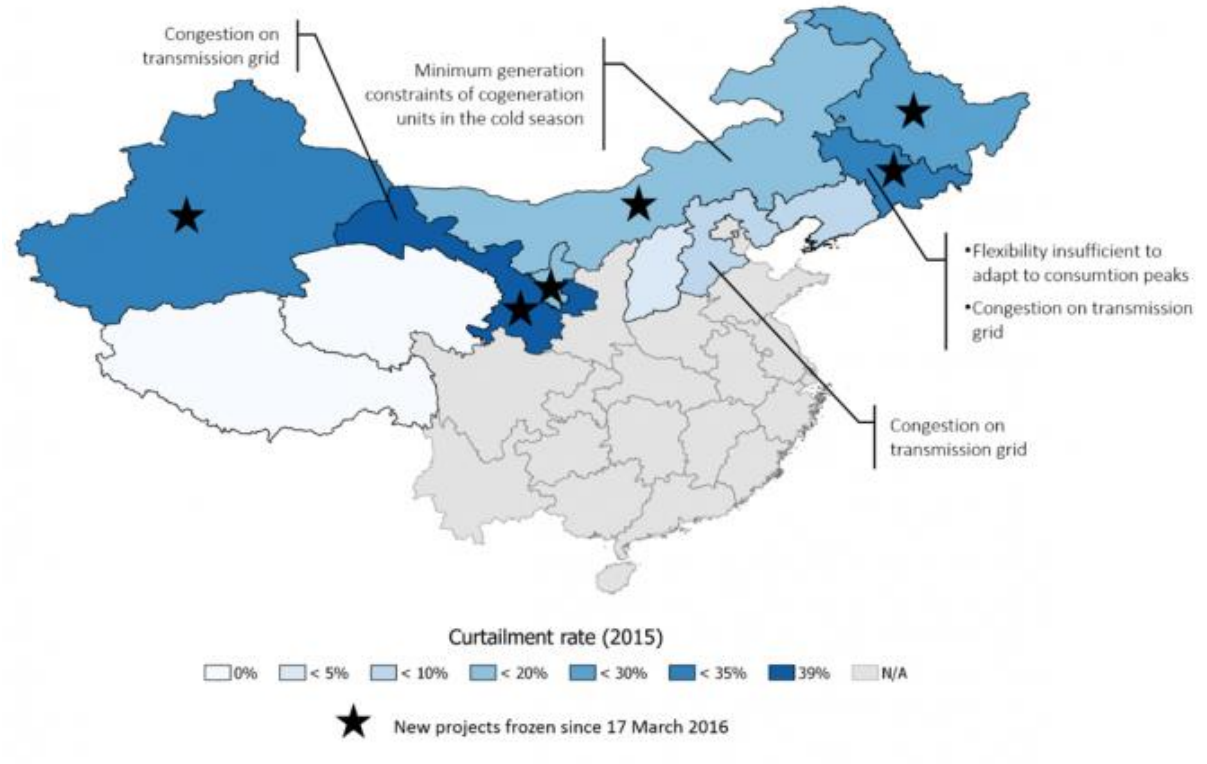
Chinese Renewable Deployment

In a decade, China has become the world leader in renewable energies. In 2015, the country invested USD 103bn to install an additional 30 GW of wind capacity and 15 GW of solar capacity on its territory. This trend stems from a structural development of its economy, but also from a strong political will to reduce its energy dependency and address the issue of air pollution, which causes 1.6 million premature deaths in the country every year.

The 13th Five-Year Plan, which was approved by the State Council in November 2016, confirmed this orientation by setting a target for the installed capacity of 110 GW for solar energy and 200 GW for wind energy by 2020. In addition, in January 2017, the National Energy Administration (NEA) announced that over USD 360bn would be invested for renewable energy projects by 2020, creating 13 million jobs.

However, according to I4CE, the day-to-day administrative management of projects sends out quite a different message: in March 2016, the same NEA asked the local authorities in six Chinese provinces to stop authorizing the construction of wind turbines on their territory. China is, in fact, finding it difficult to use all its renewable electricity: in 2015, 15 % of wind power and 9 % of solar power projects were consequently curtailed.

The figure on the following page, taken from the I4CE article, summarises the situation of wind energy by province in China curtailment rate and freeze on new projects in China.



Technical issues that are leading to project curtailment, I4CE suggest, include the geographical mismatch between the areas where renewable energy is generated and the areas where energy demand is high, and the insufficient development of power transmission infrastructure. As an example, most of the country's large wind farms are located in northern China in sparsely populated regions, while high-demand areas are located on the east and south coasts. Since 2009, the Government has been focusing on the construction of ultra-high-voltage transmission lines to transport the electricity, sometimes over thousands of kilometers. The regional transmission grids have not been sufficiently developed and currently cause most of the congestion problems.

I4CE suggest the issues are not purely technical, they suggest that the prevailing regulatory framework in China is also a major obstacle to the deployment of renewable energies in China. Firstly, grid operators pay the same price for electricity regardless of its source, and the curtailment of renewables is not penalized.] These operators thus have no incentive to opt for renewable energy to supply the grids. They thereby limit REN contribution to thresholds intentionally set low, to hedge against production variations and forecasting errors (especially for the weather), which can make renewable energy generation unpredictable.

Secondly, a number "cogeneration" power plants" in the Northern areas also provide an electricity, as a by-product of heat production. In winter, there is a high level of heat demand. The cogeneration power plants consequently produce a lot of heat and therefore a lot of electricity too. As a result, when electricity demand is low (during off-peak hours), the electricity produced by cogeneration covers virtually all this electricity demand. With no appropriate incentives this simpler and more stable cogeneration electricity is preferred to renewable electricity, even while coal power plants emit high levels of air pollution.

I4CE suggests the Chinese Government is now addressing these issues through a series of measures which the Government has been taking action on since 2015. The solutions proposed are as follows:

- Prioritize renewable energy access to the power grid
- Guarantee market opportunities for the sale of renewable electricity
- Introduce quotas for renewable electricity
- Reduce the role of coal by suspending the authorization to build new coal-fired power plants in 13 provinces.

Other measures are also under discussion, such as the development of mechanisms to meet demand, closer regional cooperation, and greater flexibility for cogeneration power plants.

The Case of Germany

I4CE suggest this issue of renewable energy project curtailment is being seen in Germany as well. Germany, which has over 40 year's experience in supporting renewable energies, also had to curtail its wind generation by 5.2 % of total generation (79.1 TWh) in 2015, i.e. three times more than in 2014. Albeit proactive, the country was overwhelmed by the rapidity of the deployment of these energies: only 40 % of the upgrading of the transmission grid launched in 2009 had been completed at the end of 2016 and it is not expected to be completed until the end of 2025. The outlook for congestion between the generation plants in the North Sea and consumption centres in the South of the country is such that in February the country limited new onshore wind capacity to 900 MW a year until "at least 2019".

In both Germany and China, power transmission infrastructure has had to be adapted to transport an increasingly variable and decentralized electricity production. However, experience from Germany also indicates that the regulatory situation has also required major changes in order to integrate new players with very different constraints.

Summary

The paper suggests that renewable power implementation is ahead of actual deployment in regions like china and that grid infrastructure reinforcement can slow the process of bringing the installed capacity to the market place. The need to add to the existing transmission infrastructure and make it suitable for variable electricity is a cost that sits under the radar and is certainly not reflected when LCOE comparisons are used to compare the prices of different low carbon technologies.

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12/07/2017