Energy storage for demand response republic of china

Energy storage for demand response republic of china

,?,?:,?,,?,,?,...

Thank you for visiting nature . You are using a browser version with limited support for CSS. To obtain the best experience, we recommend you use a more up to date browser (or turn off compatibility mode in Internet Explorer). In the meantime, to ensure continued support, we are displaying the site without styles and JavaScript.

The costs for solar photovoltaics, wind, and battery storage have dropped markedly since 2010, however, many recent studies and reports around the world have not adequately captured such dramatic decrease. Those costs are projected to decline further in the near future, bringing new prospects for the widespread penetration of renewables and extensive power-sector decarbonization that previous policy discussions did not fully consider. Here we show if cost trends for renewables continue, 62% of China''s electricity could come from non-fossil sources by 2030 at a cost that is 11% lower than achieved through a business-as-usual approach. Further, China''s power sector could cut half of its 2015 carbon emissions at a cost about 6% lower compared to business-as-usual conditions.

China''s electricity system accounts for about half of the country''s energy-related carbon dioxide (CO2) emissions, which represent about 14% of total global energy-related CO2 emissions1. Decarbonizing China''s electrical system therefore is essential to the decarbonization of energy systems not only in China but also globally. Further, given electricity''s increasing role in China''s energy use, a low-carbon electrical system is key to reducing CO2 emissions from other economic sectors such as transport, industry, and buildings.

Under the Paris Agreement, China committed to peak its CO2 emissions and to supply 20% of its energy demand using non-fossil sources by 2030. Such targets, however, are unlikely to limit the worldwide temperature increase to 2 or 1.5 degrees above pre-industrial levels2. Various studies have outlined strategies for China to attain a high degree of non-emitting generation by 20503,4,5,6. Many recent studies and reports around the world have not adequately captured the dramatic decrease in costs of renewable energy and storage, however. For example, the World Energy Outlook produced by the International Energy Agency and the International Energy Outlook developed by the U.S. Energy Information Administration have under-estimated the development of renewables7,8,9.

We focus on the following questions in this study: how would China''s power system change given the rapid decrease in costs of renewables and storage under more stringent CO2 emissions targets? What are the costs to achieve those changes in China''s power system? How would those changes affect China''s regional pattern of power development and transmission? By addressing those questions, this paper is the first effort to reveal the implications of cost decrease on power systems and new perspectives on clean power transition that are not visioned in the existing literature.

We updated the SWITCH-China model14 and developed four scenarios for 2030 to simulate and understand the effects of the rapid decrease in renewable energy costs. The scenarios are: First, business as usual scenario (BAU), which assumes the continuation of current policies and moderate cost decreases in future renewable costs. Second, low-cost renewables scenario (R), which assumes the rapid decrease in costs for renewables and storage will continue. Third, carbon constraints scenario (C50), which has a carbon cap of 50% lower than the 2015 level in 2030 on top of the R scenario. Fourth, deep carbon constraints scenario (C80), which further constrain the carbon emissions from the power sector to be 80% lower than the 2015 level by 2030.

Our modeling analysis shows if cost trends for renewables continue, 62% of China''s electricity could come from non-fossil sources by 2030 at a cost that is 11% lower than achieved through a business-as-usual approach. Further, China''s power sector could cut half of its 2015 carbon emissions at a cost about 6% lower compared to business-as-usual conditions. An 80% reduction in 2015 carbon emissions is technically feasible as early as 2030, but requires about a 21% higher cost than the business-as-usual approach, for a $21/tCO2 cost of conserved carbon.

As expected, rapid decreases in the costs of renewable energy sources lead to the larger installation of wind and solar capacity. By 2030, the low-cost renewables (R) scenario, compared with the BAU scenario, would lead to an increase in wind capacity from 660 to 850 GW and in solar capacity from 350 to 1260 GW. The need for power sector generators to incorporate flexibility in utilizing resources would result in increasing storage capacity from 34 to 290 GW to support the integration of variable renewable resources. The need for natural gas capacity would decrease from 300 to 170 GW, replaced by increasing renewable capacities and storage capacities. Coal capacity would diminish from 750 to 700 GW (Fig. 1), about a 7% reduction.

The scale of the bar chart are the installed capacity by technologies, and the data labels show the share of each technology in total capacity. Source data are provided as a Source Data file.

Under the carbon constraints (C50) scenario, coal capacity would decrease further to 520 GW by 2030, almost a 1/3 reduction compared with the BAU scenario. The deep carbon constraints (C80) scenario would phase out coal further to about 200 GW, only 4% of total capacity. The decrease in coal use would be offset primarily by renewables: 1920 GW of solar and 2000 GW of wind.

Under R scenario, coal-based generation would decrease from 4900 TWh in the BAU scenario to 3000 TWh by 2030, a 30% reduction. Wind and solar production could provide 39% of electricity need, with battery storage and natural gas supplementing the increasing wind and solar supplies. The total share of non-fossil generation could reach 62% in 2030. The C50 scenario would cause coal generation to decline further to 2400 TWh (less than half the amount generated under the BAU scenario), while the share of non-fossil generation would increase to 77% in 2030. The C80 scenario would reduce coal generation to about 960 TWh, or to about 10% of total power generation, while the share of non-fossil generation would approach 90% in 2030 (Fig. 2).

Energy storage for demand response republic of china

Contact us for free full report

Web: https://www.kary.com.pl/contact-us/
Email: energystorage2000@gmail.com
WhatsApp: 8613816583346