

ELECTRICITY MARKETS IN A CARBON-CONSTRAINED WORLD: REFORMING SCHEDULING PRACTICES IN CHINA AND INDIA

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Overview

While a standard reform model for introducing electricity sector competition exists, implementation in many countries lags due to persistent legacy central planning institutions, lack of sufficient regulatory institutions or other supporting institutions, and political intervention in price-setting and other decisions. These can distort not only achievement of satisfactorily competitive outcomes, but also the ability for the market to efficiently integrate the temporal and geographic variability of renewable energy. While much discussion on the potential insufficiencies of current market structure to accommodate increasing penetrations of renewables focuses on introducing additional market products in the presence of a reasonably well-operating energy market, this does not necessarily reflect the needs of a large class of countries for which a short-term energy market is still under-developed.

This work focuses on the scheduling practices in two major countries with both ambitious renewable energy targets and transitioning electricity sector regulation and markets: China and India. First, I will review the latest work on experiences of standard electricity reform models in transitioning economies, highlighting where current methods may not fully capture the heterogeneity of scheduling practices. Next, I will describe in detail the current operation practices at the subnational level in these two countries. Third, I will introduce ongoing reforms to institute markets, their impact to date on renewable energy integration, and their potential evolution in the future. Finally, I will seek to broaden to an even larger class of countries where basic electricity market institutions are not in place.

Methods

The research relies on interviews conducted in China and India (2016, 2017) with government planners and regulators, grid operators, and market participants, as well as extensive literature reviews.

Results

In both countries, a detailed tracing of scheduling and operations (annual to hourly) at the primary load balancing jurisdiction (province in China, state in India) demonstrate a range of practices that deviate from those in more established markets. These practices have distinct historical legacies arising from the different approaches adopted by the two countries to transition away from a primarily centrally planned economy toward the introduction of markets.

Both countries share certain barriers to an efficient dispatch that effectively integrates renewable energy, such as large shares of physical generation commitments (whether through long-term contracts or government planning processes) that constrain system dispatch. Trading barriers between states or provinces are further cemented through the balkanization of scheduling and operations at the subnational level, which prevent effective geographic balancing of renewable intermittency.

Some merit order principles exist in both contexts and are, in general, increasing in importance as a result of more recent reforms. However, these fall short of short-term location-based signals. Instead, some of these efforts may in fact advantage dispatchable capacity such as coal, by creating markets on horizons longer than accurate renewable energy forecasts are available.

Conclusions

A majority of countries target substantial increases in renewable energy to reach Paris Agreement and other public policy goals. However, many that have undergone restructuring do not currently have sufficiently competitive and flexible markets to accommodate high levels of renewable integration. China and India, as the two most important countries for future greenhouse gas emissions growth, deserve particular attention, and this research demonstrates that current practices do not appear up to the task. By identifying which institutions (such

as scheduling processes) are the largest barriers, this approach can generate better policy recommendations for second-best policy and regulation.

References

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