Expanding Cross-Border Electricity Cooperation and Trade in South Asia

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Overview

South Asia has for some time confronted several challenges affecting electricity availability, reliability, and cost. Electricity supplies have not kept pace with demand growth, leading to long daily outages as well as frequent unplanned interruptions. These conditions impose hardships on households and businesses and discourage new business investment in the economy. On the other hand, several countries in the region are endowed with extensive hydropower resources, but most of that has not been exploited yet due to lack of access to export markets. While this creates a perfect setting for expanding regional electricity cooperation and trade, the region is lagging in terms of seizing this opportunity.

This paper assesses the potential regional-level cost savings for electricity provision from increased cross-border electricity cooperation and trade, and analyzes the policy and institutional adaptations needed to achieve such an increase in regional cooperation and trade within the sector. To our knowledge, this is the first study that quantifies the benefits of expanding regional electricity trading in South Asia.

Methods

We first use an intertemporal model that optimizes expansion of electricity generation and transmission interconnections systems to produce a least cost regional plan over 2015-2040. The model is calibrated to reflect generation and transmission investment and operating costs in South Asia, including for cross-border transmission among the grids in the region, as well as plausible projections of country-level electricity demand growth and fuel price changes over time. We compare the regional outcome to results of individual country investment and dispatch planning without expanded regional cooperation and trade to quantify the potential capital and operating cost savings with a regional approach. A number of sensitivity analyses establish the robustness of our key conclusions. We then utilize principles of electricity regulatory economics with stylized facts about the power sector in South Asia, along with findings about the impacts of regional coordination in other locations, to identify key institutional and policy steps needed to realize the benefits.

Results

In the regional outcome, renewables are a significantly larger share of total capacity additions, with larger additions to hydro capacity (especially in Nepal, but also in Bhutan and India), replacing a portion of costlier coal-fired capacity additions in the no-trade baseline (especially in India and Bangladesh). Transmission capacity by 2040 is more than 50% larger than in the baseline, while annual CO_2 emissions from electricity generation in the region are 8% lower. Cumulative cost savings with regional cooperation trade are almost $100 over the planning period; the present value of fuel savings exceeds the present value of additional capacity expenditures by more than 5:1.

To realize these benefits over time will require significant changes in regional electricity sector institutions and in domestic electricity sector policies. Our analysis of these factors indicates that cross-border institutional arrangements do not automatically require the immediate establishment of a single cross-national regulatory body, but can rely initially on increased coordination among the countries based on some specific common rules. Agreement for coordinating expansion of regional transmission capacity is key, as is a mechanism honoring cross-border contracts. Ultimately, however, reaping the full benefits of regional electricity cooperation and trade will require more fully integrated systems, and the establishment of competitive regional power markets. In turn, because decisions by domestic power sector regulators affect pricing, investment recovery and market entry and thus incentives to invest, strengthening domestic power sector performance through regulatory and institutional reforms also is key to improving regional inter-connection and power trade.

Conclusions

The potential direct payoff from increased cross-border regional cooperation and trade for electricity in South Asia is high, as is the potential for such an increase to help in addressing the many serious difficulties currently faced by the power sector in that region. Current efforts to encourage a more regional approach to the sector in investment planning and policy dialogues thus should be expanded. It is clear that the political economy complications of such efforts are significant, given historic and contemporary rivalries and disputes among countries in the region. Nevertheless, experience indicates that a successful effort could start with a relatively small number of countries and a focus on particular transactions (e.g. development of specific generation resources or transmission corridors), and then grow and deepen as benefits are demonstrated and as institutions and policies are strengthened.

References

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