

The Benefits of Expanding Cross-Border Electricity Cooperation and Trade in South Asia

By Michael Toman and Govinda Timilsina

The South Asia region is comprised of nations with (i) rapidly growing energy demand, (ii) significant seasonal complementarities in their energy demands (see Figure 1), and (iii) large but unevenly distributed primary energy electricity generation potential across countries and seasons. The region's national electricity systems face several challenges. Electricity supplies have not kept pace with demand and are frequently interrupted. At the same time, there is underutilization of available generation capacities due to fuel supply shortages and price controls. Electricity shortages not only impose hardships on households, but also hinder business activity and new investment in the economy. Electricity generation and transmission shortages also have stimulated use of energy-inefficient, costly and pollution-intensive power sources, including both aged and highly polluting coal-fired generation plants, and diesel generators operated both on the grid and by end-users. Government bailouts of electricity suppliers in serious financial distress put a serious weight on already-stressed government budgets.

Effectively addressing these challenges requires accelerating national-scale efforts to improve the technical efficiency of power systems, the economic efficiency of power markets, and the financial sustainability of electricity generators and distributors. Our research shows that further steps toward greater electricity sector inter-connection and power trade among South Asian countries can make important contributions to alleviating the many challenges noted above.

Table 1 provides a summary of key quantitative findings from the research.¹ Our analysis indicates that increased regional electricity integration and trade could generate, on average, cost savings on the order of about \$9 billion per year relative to the status quo, which has very limited cross-border trade and even less investment coordination. The present value of the net cost savings from expanded electricity cooperation and trade over 25 years (2015 – 2040) is almost \$100 billion (using a social discount rate of 5%). The present value of fuel and other operating cost savings exceeds the present value of the net increase in generation and interconnection investment costs to facilitate increased inter-connection and trade by more than 5-to-1.

These numbers are conservative in that we have focused only on the direct cost savings in the electricity sector, without attempting to assess the knock-on effects of lower electricity costs and more stable supplies for overall economic growth in the South Asia region. Nor have we attempted to calculate the potentially substantial economic and health benefits of reduced local air pollution. A larger and more integrated grid also can better absorb increases in intermittent renewable sources (solar and wind) without raising concerns about grid stability.

The net cost savings come primarily from large savings in fossil fuel costs

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See footnotes at end of text.

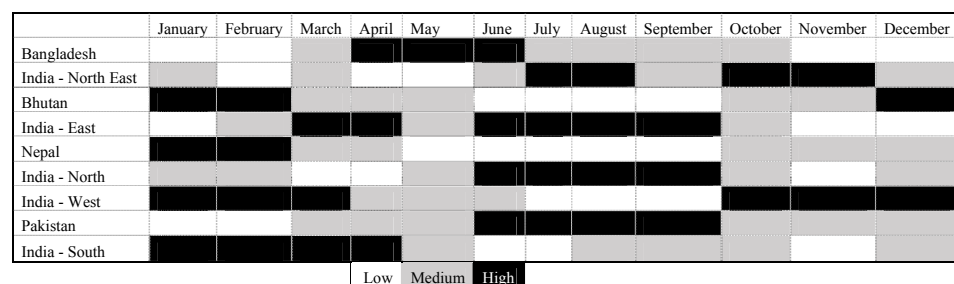


Figure 1: Seasonal complementarity in monthly electricity load profiles across South Asia

Source: Timilsina et al. (2015)

Total savings in electricity supply costs during the 2015-2040 period, relative to baseline	US\$222 billion (undiscounted) and US\$97 billion (discounted at 5%)
Changes in countries' total installed electricity generation capacities by 2040 relative to baseline (GW)	Afghanistan (+4), Bangladesh (-11), Bhutan (+9), India (-35), Nepal (+52), Pakistan (-13), Sri Lanka (-1); Net regional change = +5*
Changes in regional installed electricity generation capacities by 2040 for different technologies, relative to baseline (GW)	Hydro (+72), Coal (-54), Gas (-6), Wind (-7); Net regional change = +5*
Changes in cross border and inter-grid transmission capacities relative to baseline (GW)	Net increase in cross-border transmission capacity (+95) Inter-grid capacity in India (-37)
Reduction of regional power sector CO ₂ emissions, relative to baseline	8%

Table 1. Key Findings from Analysis of Gains from Increased South Asia Electricity Integration and Trade

* Total generation capacity changes only marginally relative to baseline since the demand trajectories are assumed to be the same with and without increased cooperation and trade.

due to expanded regional availability of hydroelectric power, as well as benefits from cross-border trading between higher-demand and lower-demand areas at different seasons in a year (and, to some extent, in different hours of the day). The ability to greatly expand regional hydroelectric capacity with an integrated regional scale market is a key gain from regional cooperation and trade, since high levels of hydroelectric development in Nepal and Bhutan in particular are not economic without access to power export markets. The table also shows that with expanded regional electricity cooperation and trade, there are major shifts in the types and locations of generation investments.

The region is expanding interconnections and increasing cross-border power flows.² However, progress is slow. An assessment of the experiences provided by several electricity cooperation initiatives, in developing and developed countries, provides a number of conclusions relevant to electricity cooperation in South Asia:³

- Effective cross-border institutional arrangements do not automatically require the establishment of a single cross-national regulatory body, but can rely on increased coordination among national regulatory mechanisms. The main challenge is the degree of willingness of sovereign countries to agree to common rules with working enforcement mechanisms. Agreements for expanding regional transmission capacity are key to the expansion of cross-border power cooperation and trade, as are mechanisms for ensuring that contracts for cross-border trade are honored. Trust building around regional electricity cooperation and trade is possible even among countries with a history of conflict. Cross-border power cooperation and trade can start with a small number of countries and discrete projects to expand interconnection. Such arrangements then may expand and deepen cooperation over time.
- While less formal regional cooperation arrangements can provide significant benefits, more fully integrated systems and the establishment of competitive regional power markets very effectively facilitate expansion of electricity cooperation and trade. In this context, the role of well-functioning regional institutions for effectively managing more integrated power systems – especially transmission – cannot be over-emphasized.
- Decisions by domestic power sector regulators affect pricing, investment recovery and market entry and thus incentives to invest, especially for expanding private sector participation. This implies that improvements in domestic power sector performance through regulatory and institutional reforms also contribute significantly to improving regional inter-connection and trade.

To increase cross-border electricity cooperation and trade in South Asia, an important first step can be to encourage specific cross-border power projects based on the specific circumstances involved, including projects involving private sector participation. The economics of specific projects will depend on availability and comparative costs of generation capacities, and the possibilities for joint benefits from expanded cross-border interconnection. Individual projects can be achieved with relatively simple rules for governing and operating the interconnections, and mechanisms for account settlement with respect to power transactions.

As bilateral trade increases, expanded participation by third parties also can grow. One such example is efforts to expand power trade between Nepal and Bangladesh with India as a transit country. Beyond that, market-based power trading can grow through participation by other countries' suppliers and purchasers in India's rapidly developing power exchanges, and eventually in the development of region-wide exchanges. This level of electricity cooperation can bring significant benefits in terms of incentives to produce and price power efficiently and flexibly. However, it would require additional efforts to harmonize access rules, develop protocols for grid management, and establish fair and non-discriminatory transmission charges. Deeper levels of regional electricity market integration also will require additional and harmonized reforms in national electricity markets.

Footnotes

¹ Timilsina et al (2015) reports on the analysis behind these numbers.

² Recent progress includes the completion of a 500 MW India-Bangladesh transmission line; significant progress on the construction of the first Nepal –India 400 kV transmission link (Dhalkebar-Muzzafarpur), and an agreement between Bangladesh and India for a 7,000 MW transmission line through Bangladesh that evacuates hydropower from North East India for Bangladesh and other parts of India.

³ See Oseni and Pollitt (2014) and Singh et al (2015).

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