

Regional Electricity Trade in Latin America Without Expanding Generation Capacities

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Regional or cross-border electricity trade entails several economic and environmental benefits, including optimal use of electricity generation resources across the borders; hourly cross-border electricity trade utilizing differing load curves between the countries; sharing peak load and reserve margins, enhancing the system reliability; facilitating clean energy trade to reduce emissions of greenhouse gases (GHGs) and local air pollutants and finally reducing the cost of electricity supply. Limited regional electricity trade has been exercised in Latin America (LAC region), multilaterally in Central America (SIEPAC) and multilaterally or bilaterally in other parts, such as Brazil-Uruguay-Argentina. However, the volume of cross-border electricity trade in the region accounts for less than 5% of the total regional generation. Several countries in the region have excess capacities; their load profiles differ significantly, indicating cross-border electricity trade opportunities without adding new capacities for electricity generation. This study estimates the gains from sub-regional and regional electricity trade in Latin America utilizing existing generation capacities (e.g., day-ahead, intra-day, and balancing services).

The study uses the World Bank's electricity planning model (EPM) to simulate hourly electricity generation and trading potential at the sub-regional and regional levels. It develops three scenarios – Baseline, Sub-Regional trade and Regional trade. Under the baseline scenario, each country dispatches its power plants following the merit-order rule and meets its demand in 2020. It also accounts for existing cross-border electricity trading facilities. The Sub-regional trade scenario assumes unconstrained cross-border electricity between the countries within three sub-regions: Andean sub-region (Bolivia, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela), Central sub-region (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama) and Mercosur sub-region (Argentina, Brazil, Chile, Paraguay and Uruguay). The regional trade scenario considers unconstrained electricity trade across all countries in the LAC region. We collected hourly load data in 2020 (8784 hours) for 20 LAC countries to develop hourly load profiles. Other data used are fuel and electricity prices, peak loads, generation capacities by technology type (10 types of technologies) and existing cross-border interconnection capacities.

The study finds that the existing volume of electricity trade (baseline scenario) in LAC is approximately 4% of the regional generation. It would increase to 13% and 29% under the sub-regional and regional scenarios, respectively. The Andean region realizes the highest increase in electricity trade volume; the traded volume of electricity in this sub-region accounts for 0.2% and 33% of the total sub-regional generation in the baseline and sub-regional scenario, respectively. The ratio of traded electricity to total generation would almost double from the baseline scenario to the sub-regional scenario in the Central and Mercosur sub-regions. In terms of trade value, the region as a whole would gain US\$1.5 billion annually under the sub-regional scenario and almost US\$2 billion under the full regional scenario. More than half of this gain would be realized by the Andean sub-region under both scenarios. About one-third of the total regional gains would go to the Mercosur sub-region. The Central region would gain 12% and 15% of the total regional gains under the sub-regional and full regional scenarios. Note that these are short-term benefits by utilizing existing capacities in different countries. The size of the total benefits would be larger in the long run.

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This study estimates the potential savings on electricity supply costs if 20 Latin American countries allowed unrestricted trade of electricity between the borders without expanding their current electricity generation capacity. The study shows that the volume of cross-border electricity trade would increase by 13 and 29 percent under the subregional and regional scenarios, respectively. The region would gain US\$1.5 billion annually under the subregional scenario and almost US\$2 billion under the full regional scenario. More than half of this gain would be realized by the Andean subregion under both scenarios. These are short-term benefits without expanding the current electricity generation capacities. In the future, when countries add more generation capacity to meet their increasing demand, the potential benefits of electricity trade would be higher.