ENVISIONING A SUSTAINABLE CHILE:
FIVE FINDINGS ABOUT THE FUTURE OF THE CHILEAN ELECTRICITY AND ENERGY SYSTEM

We employ SWITCH – a long term capacity expansion model developed in the Renewable and Appropriate Energy Laboratory at the University of California, Berkeley – to analyze different scenarios for the Chilean electricity grid's evolution from 2011-2031. In doing so, we recognized five important and relevant conclusions about the future of the Chilean electric grid:

1. Under a Business-as-usual (BAU) scenario, Chile would become the largest per capita polluter in Latin America and would rank above most European countries, severely affecting its global competitiveness, increasing its risk profile, and failing to meet its international commitment of 20 percent greenhouse gas reductions by 2020. Critically, Chile would generate 47 percent of its energy from imported coal by 2030, an even riskier situation than natural gas imports from Argentina in the late 1990's with its known consequences.

2. If Chile installed no coal plants from 2014 on, system costs would only go up by 3 percent and carbon dioxide emissions would be halved compared to BAU. Natural gas and non-conventional renewable energy evenly split the gap left by coal plants, compared to BAU, but 70 percent to 100 percent additional incremental liquefied natural gas (LNG) capacity will be required by 2030 compared to existing expansion plans at the two main systems, SING and SIC.

3. Chile can install up to 25 times its 2013 intermittent renewable capacity with existing flexible capacity provided by natural gas plants, which translates to a 7:1 ratio between intermittent resources – wind and solar – and "backup" capacity. Hydropower's hourly dispatch is adjusted to fit to short term intermittency. A system's flexibility viewpoint is critical to correctly assess the relationship between intermittent capacity and reliability.

4. Integration costs for high penetration of intermittent renewables triple if transmission expansion is hampered. Restrictions on expanding the transmission system create a wealth transfer towards generators—particularly fossil fuel based ones—that compensates the lack of transmission expansion with larger deployment and more fuel and operational costs.

5. Geothermal energy is the most cost-effective resource and its timing of deployment is sensible to lowering finance rates through schemes that bound exploration risks. Deploying geothermal energy sooner may save between $1 and $11 billion in the 20 year analysis period. Wind power should become the largest source of non-conventional renewable energy in Chile by 2030 with over 7 to 8.5 GW. Utility scale solar power could reach between 1.7 and 3.6 GW by 2030 depending on module cost and finance rate reductions; distributed PV could play a more important role, but we currently lack the data to simulate it properly with SWITCH.

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