

Are Dams Necessary in Patagonia? An Analysis of Chile's Energy Future

by

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-English Executive Summary-

HydroAisen is not necessary for Chile's energy portfolio through 2025. Instead of approving this massive hydroelectric power plant, Chile should focus on developing renewable energy projects and energy efficiency measures, which will easily help the country meet even the highest demand predictions.

In April 2008, the National Energy Commission (CNE) released its estimates of Chile's future energy supply and demand trends. However, since then the global economic recession has caused Chile's energy demand to contract, the CNE consequently readjusted the 2009 projected growth in electricity demand from 4.7% to 2.1%. Taking into account the reduced demand for electricity, the authors of this study generated a new demand prediction through 2025, which demonstrates that HydroAisen's output would be unnecessary since Chile has already approved enough future energy projects to supply over twice the amount of expected electrical consumption as early as 2014.

Additionally, if Chile creates substantive regulations supporting energy efficiency (EE) and renewable energy (RE) development, it can take advantage of its extraordinary solar and geothermal resources. Such measures would enable Chile to eliminate 40% of the coal-fired plants approved for future construction.

Several key findings regarding EE and RE development merit specific attention:

- The assertion that Chile must choose *only between* HydroAisen and coal plants for a secure energy future—both environmentally harmful options—is false. The best solution is to diversify Chile's energy portfolio with EE and RE projects.
- EE measures can feasibly contribute 3,041 MW and RE projects can add 4,383 MW of capacity to Chile's future grid by 2025. This total of 7,424 MW is more than two and a half times HydroAisen's potential capacity of 2,750 MW.
- EE measures can raise the percentage of approved and anticipated RE projects from 10% of Chile's total installed capacity to 25% by the year 2025.
- Chile has great amounts of geothermal and solar resources, which are among the highest quality in the world. This study's estimates of their potential development are rather conservative; technological advances and market opportunities will expand and accelerate their growth significantly.
- In a life-cycle cost analysis, EE and RE are more competitive than conventional energy plants.

Chile's electricity matrix is at a historic turning point. The global recession and consequent fall in energy demand have created a three-year window of opportunity during which Chile can fundamentally reorient its electricity system to be more technologically flexible, economically efficient and ecologically sustainable.

The first step to achieve this future is to halt the development of HydroAisen. At the same time, Chile must prioritize EE and RE within its energy policy, and adopt concrete means to create stable, long-term markets for these resources. There are various policies and programs that Chile needs to develop to meet this end. This report emphasizes four key recommendations:

- 1) Increase the Renewable Energy Standard via Public Law 20.257 from 10% to 25% by 2025.
- 2) Develop and implement a framework for integrated planning and resource development
- 3) Develop and implement a plan to modernize electricity transmission
- 4) Develop and implement a Minimum Energy Efficiency Standard (SEEM) as well as laws regulating general service lighting, industrial and large capacity motors, fluorescent ballasts, and commercial air conditioning systems.

In the 21st century, global emphasis will be on sustainable development, via reducing carbon footprints and promoting varied projects of lesser impacts in lieu of constructing mega-projects. Chile will need to change its energy policies, or the international markets will consider its products to be “environmentally harmful” and may easily establish restrictions against them.

Before analyzing the following charts which illustrate Chile's future energy development in detail, two important points must be addressed. First, it is useful to clarify the technical terms and units referring to *Energy Capacity* (MW) and *Energy Demand* (GWh). The former refers to an *instantaneous value*—the total existing supply of energy the grid can offer at any given time from its combined resources. The latter refers to the total consumption *over a period of time*. The situation is analogous to what happens in a home. At any moment, the house may use 2000 to 4000 Watts (or 2 to 4 kW), but over the course of a month the consumption typically is in the range of 150 to 250 kWh.

Secondly, Chile's electricity system is comprised of four separate grids: the Far North Interconnected System (SING), the Central Interconnected System (SIC), the Aysen Electrical System and the Magellanes Electrical System. This study only analyzes SIC, the grid that includes Regions III-X (including Santiago) and services over 92% of the population.

Figure 1: Installed capacity in SIC: present, approved and pending, 2009-2025

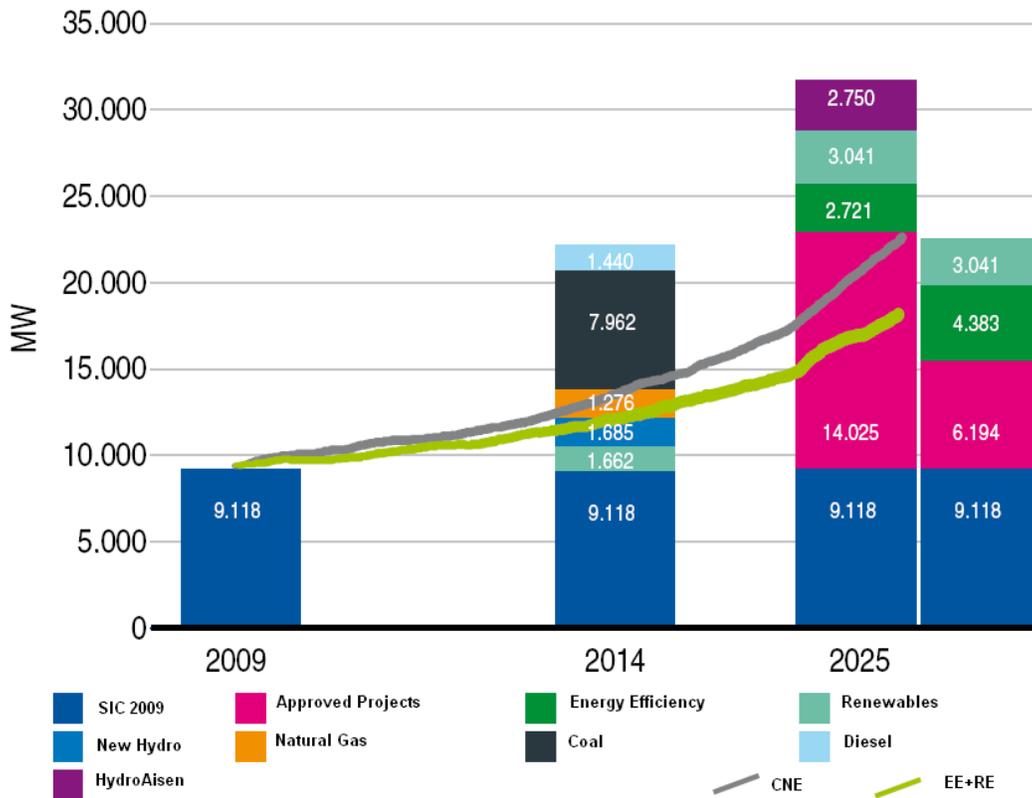


Figure 1 illustrates the projects already approved as well as those potentially installed in SIC through 2025. The grey line follows CNE’s “business as usual” demand trend estimated in April 2008; the green line represents the adjusted energy demand trend calculated by this study’s authors.

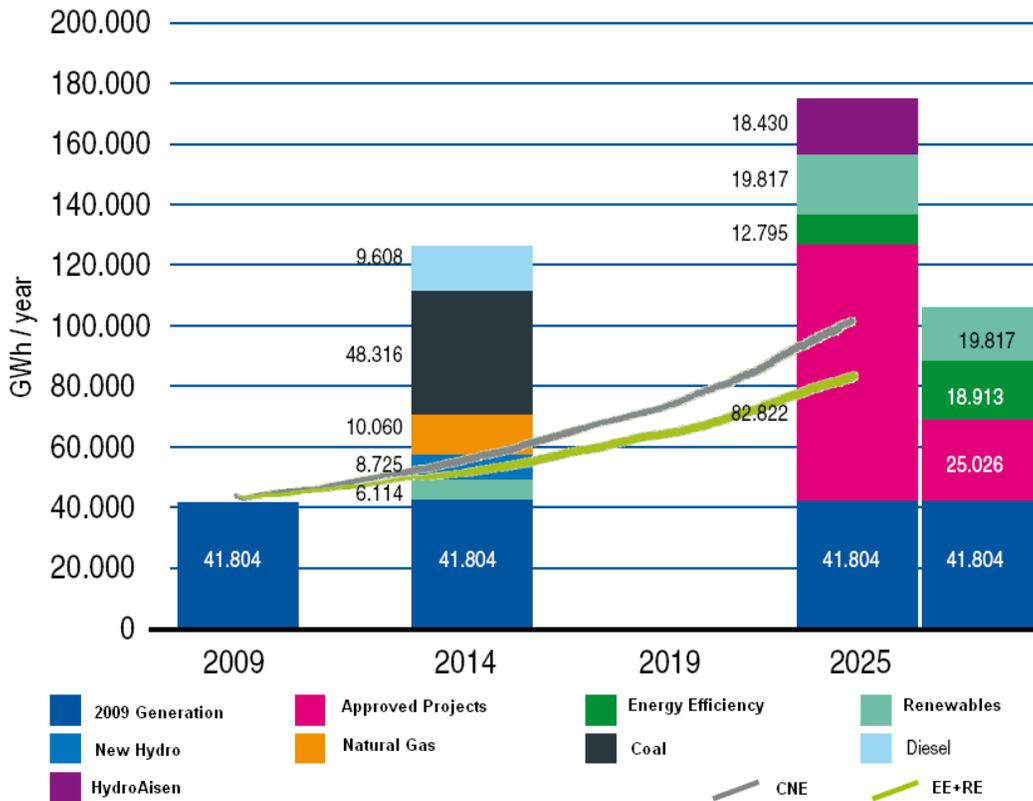
The first column represents SIC’s 2009 installed capacity of 9,118 MW. The second column is the projected situation for 2014, the sum of the existing capacity plus the projects already approved and pending approval by the National Environmental Commission (CONAMA). In 2014, the 23,143 MW total is already a clear oversupply of capacity, following either the “business as usual” or the adjusted trend line.

The third column represents the situation in 2025, when the sum of all present, approved and pending projects, plus EE measures, RE projects and HydroAisen would total 31,655 MW. The “business as usual” projection indicates that Chile will need 22,736 MW of energy by 2025; the adjusted trend line results in a demand of just 18,452 MW. According to this prediction, there would be 13,203 MW of surplus potential energy.

The fourth column illustrates the more “desirable” situation for 2025, the difference resulting from a change towards policies supporting EE and RE development. In this case, 40% of the fossil fuel-burning projects already approved by CONAMA can be eliminated from Chile’s energy matrix.

Figure 1 illustrates that with a coherent policy, Chile can comfortably meet its 2025 demand without HydroAisen and with only a fraction of the conventional projects. Energy efficiency can produce a savings in demand of 3,041 MW, and renewables can contribute 4,383 MW by 2025.

Figure 2: Electricity generation of SIC: present capacity and approved projects, 2009-2025



In Figure 2, an analysis of the same situation from the electrical generation perspective yields a similar table. The first column represents the existing electrical generation in 2009 of 41,804 GWh.

The second column shows that in 2014, the existing electrical supply plus the range of projects approved by CONAMA and pending approval would equal 124,627 GWh, roughly double either demand trend for that year. In 2014, Chile could also more than meet the projected demand trends for 2025.

In the third column continues to demonstrate this over-abundance of electricity. It is evident that the 19,817 GWh contributed by renewables could account for roughly half of the total increase in supply from 2014-2025.

The fourth column, which again represents the more “desirable” situation in 2025, shows that even with less than one third of the available conventional projects

replaced by EE and RE, and without HydroAisen, Chile still has sufficient energy to meet the more conservative demand estimate.

This study was conducted between November 2008 and March 2009. Although the panorama continues to change, developments since the completion of our research indicate that our hypotheses are correct. To cite a few new facts:

- On March 18, 2009, CNE published a new plan for energy works, which considers a delay of 9 to 14 months in the eventual launch of HydroAisen and also recognizes a much less dynamic energy scenario.
- Clear signals have already appeared that at least one or two concentrated solar power (CSP) plants of about 10 MW will be constructed in Chile within 5 years. Moreover, there is plain evidence that photovoltaic installations of varying amounts of kW will be a significant source of distributed generation in the coming years.
- On May 14, 2009, an agreement was announced between ENEL (Endesa's holding company) and SoWiTec (from Germany) to install new wind projects of up to 850 MW in Chile.

All these facts demonstrate that a very dynamic energy future will develop in Chile, and therefore reinforce the ultimate conclusion of this study: HydroAisen is not necessary to meet Chile's future energy needs.