



Ministerio de
Energía

Gobierno de Chile

Renewable Energy in Chile:

“Where do we stand and where we are headed”

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Ministry of Energy
May 2016



1. What are the current governmental policies in the energy sector?

2. Market Overview and Attractiveness: Investment needs for Chile in the coming years.



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2. Market Overview and Attractiveness: Investment needs for Chile in the coming years.

In May 2014, in order to revive and strengthen the energy industry in Chile, the government proposed a long term horizon centered on what is known as the Energy Agenda...

AGENDA DE ENERGÍA
DESAFÍO PAÍS, PROGRESO PARA TODOS

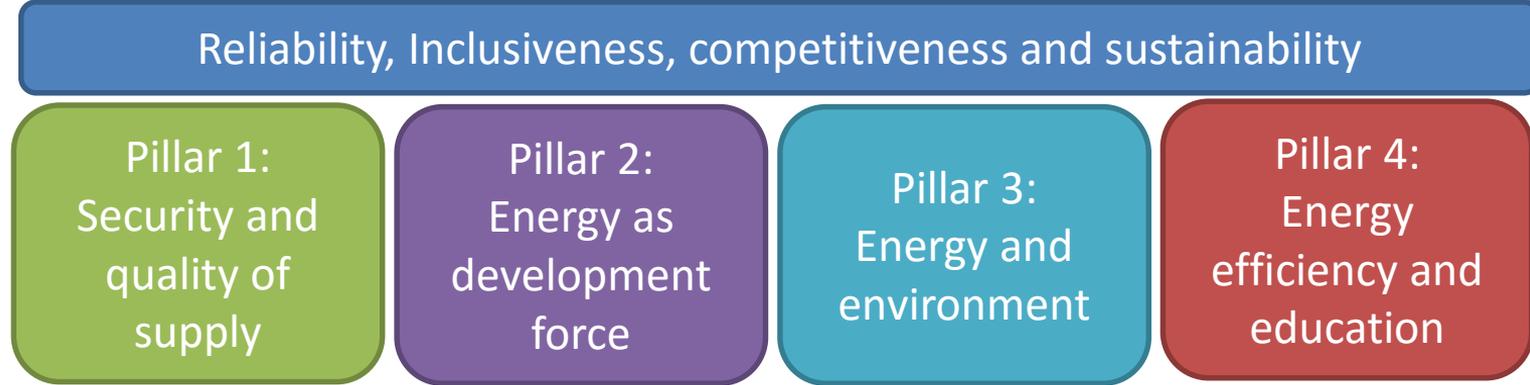
7 Pillars of the Energy Agenda

1. A new role for the state
2. Reduction of energy prices, with higher competition, efficiency and diversification of the energy market
3. Development of our own energy resources
4. Connectivity for the energy development
5. An efficient sector managing consumption
6. Boost for investment in energy infrastructure
7. Citizen involvement and territorial regulation



Energy 2050: Long Term Energy Policy

Pillars



Long Term Goals

- 2035: 60% of electric generation from RE.
- 2050: 70% of electric generation from RE.

First South American country to implement a carbon tax for large power plants. Voluntary target of cutting GHG emissions 30% from 2007 levels by 2030, up to 45% if there is any international cooperation.

Other Policies we are currently working on:

- PPA Tender for regulated customers (2015-2016).
- Main transmission system reinforcement (2015-2018).
- Ministry of National Assets` Tender for wind projects.
- Transmission Law (2016).
- Energy Efficiency Law (2016).
- Communities Engagement Standards.
- 100 Small Hydro Power Plants by 2018 (2014-2018).
- Basin Study.
- Solar Energy Promotion:
 - PV Self-Supply Strategy.
 - Utility-Scale PV Market and CSP.

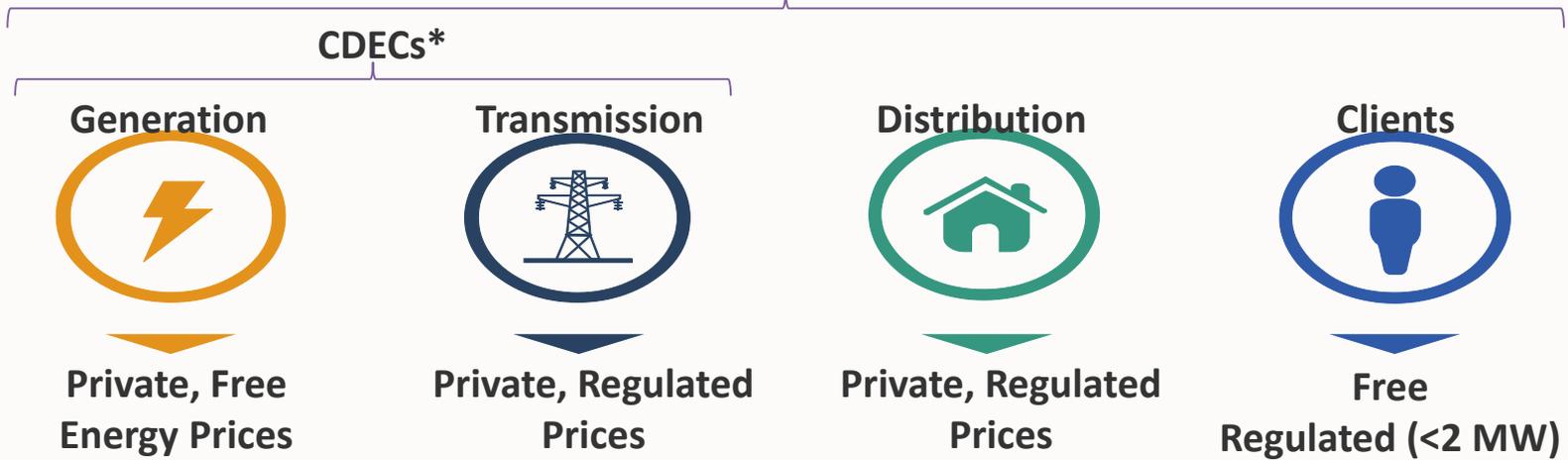


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Key Industry Players

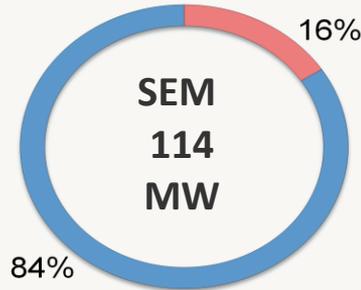
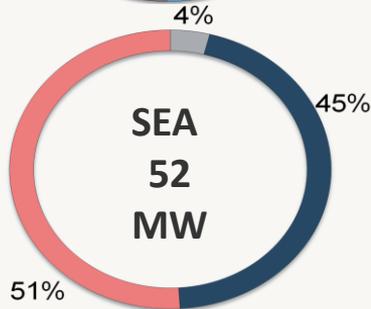
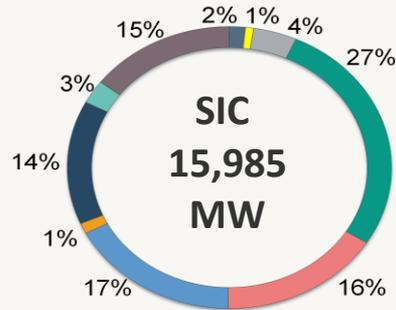
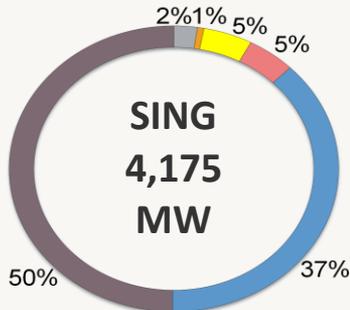
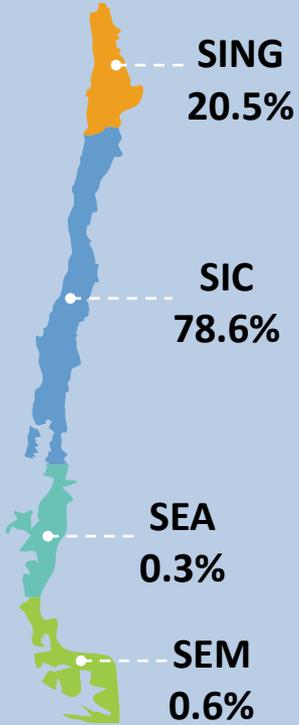
Ministry of Energy – National Energy Commission – Electricity & Fuels Superintendence



Transmission and distribution markets are regulated, but generation is a wholesale market.

*CDEC: Dispatching Center

Current Installed Electricity Capacity – 20,337 MW

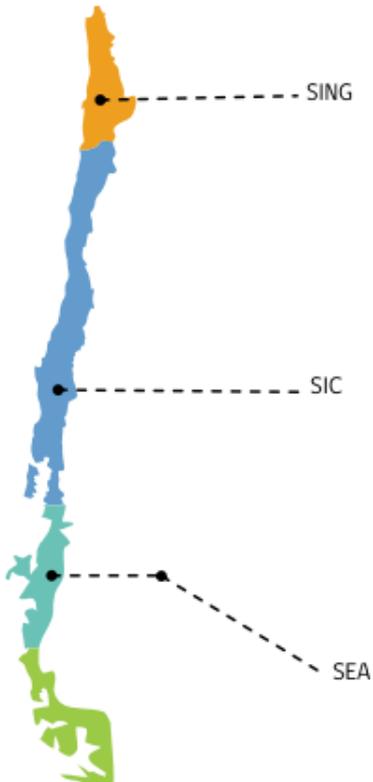


- Others
- Wind
- Diesel
- Coal
- Biomass
- Natural Gas
- Solar photovoltaic
- Hydroelectric (run – of – river)
- Hydroelectric (reservoir)
- Mini hydroelectric

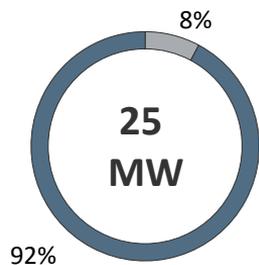
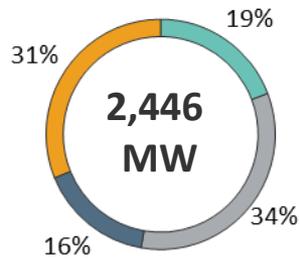
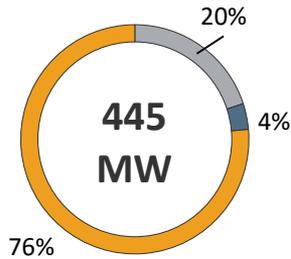
Source: NEC

Note: Total capacity is 20,195 MW. However, it is important to consider 2 extra systems: IPC (6 MW) and "Los Lagos" (4 MW)

Current status of NCRE*

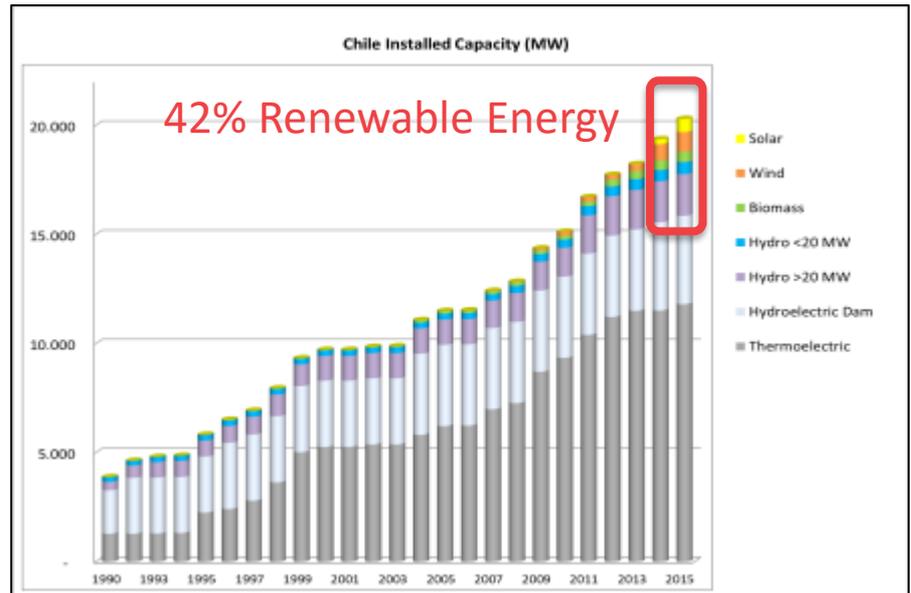


Fuente: CDEC-SIC / CDEC-SING y CNE



-  Wind
-  Bioenergy
-  Solar PV
-  Small Hydro

As of April 2016, 2,916 MW installed of NCRE, which accounts for 14% of total installed capacity

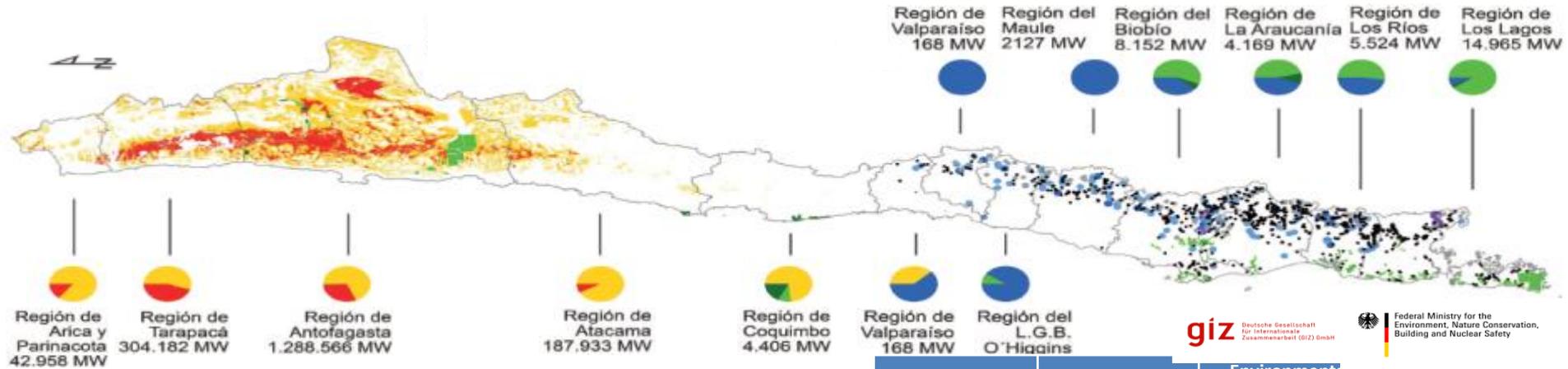


*NCRE: Non Conventional Renewable Energy concept includes Small Hydro (less than 20 MW).

Investment opportunities in Renewables

Renewable potential by technology

Chile has enormous potential, more than 1,865,000 MW of wind, solar and hydro energy, and probably 2,000 or more MW geothermal power and 2,000 MW of biomass...that is about 100 times Chile's total installed capacity.

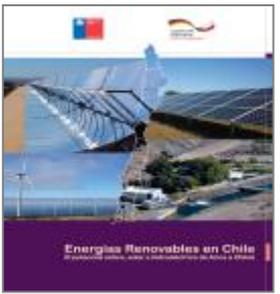


giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
 Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety



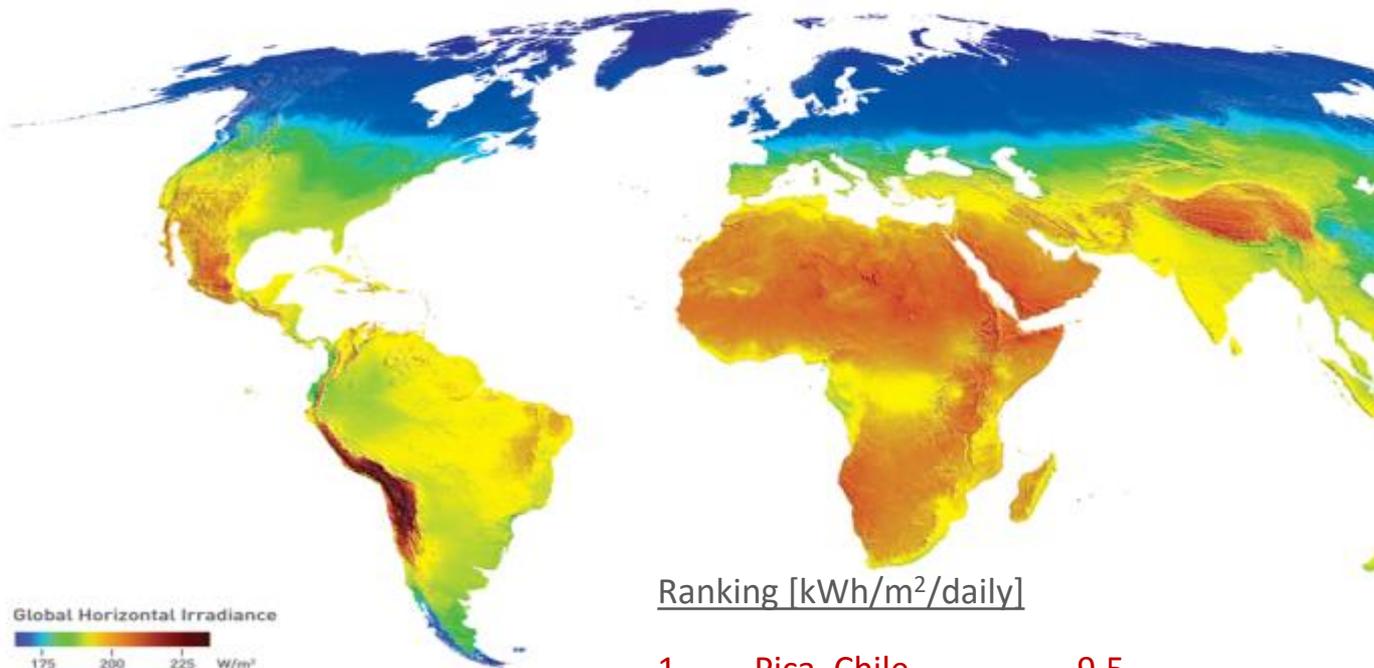
Available RE potential without overlap.

Technology	Potential [MW]	Environmental Assessment Approved [MW]	Under Evaluation [MW]
Mini-hydro	7,951	337	215
Wind	37,477	5,513	1,960
Hydraulic	4,521	1,352	611
Solar-PV	1,263,407	8,173	4,792
Solar -CSP	548.478	760	370
Geothermal	16,000	120	0
Total	1,840,394	10,478	7,948





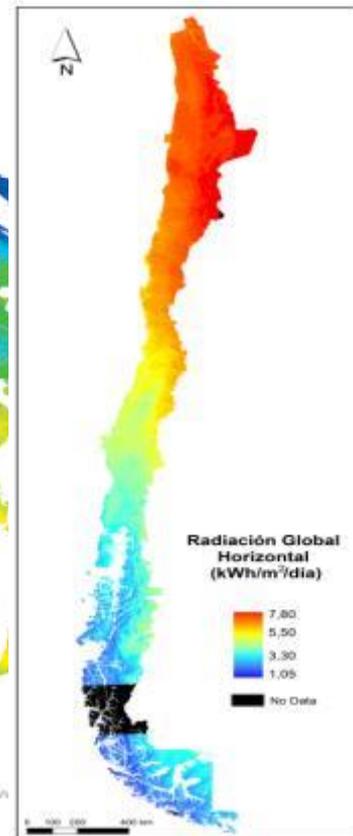
Global Mean Solar Irradiance



We have exceptional solar radiation conditions.

Ranking [kWh/m²/daily]

1. **Pica, Chile** 9.5
2. Calama, Chile 7.4
3. Al-Fashir, Sudan 6.7
4. Crucero, Chile 7.1
5. Guanajuato, Mex 6.7

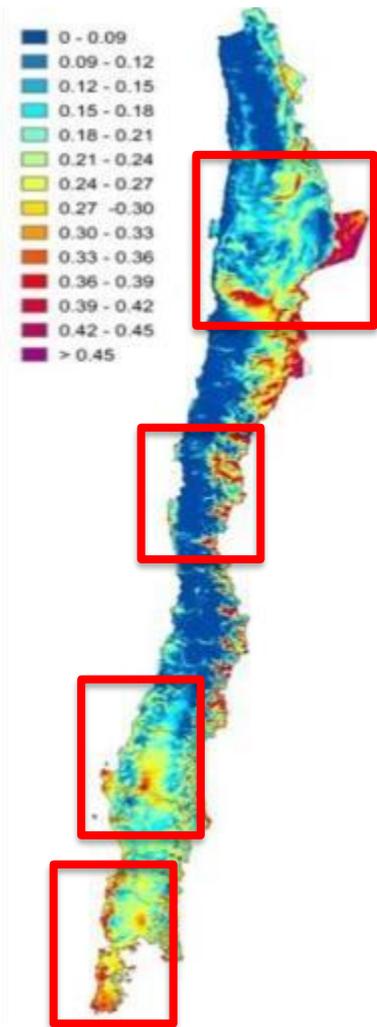
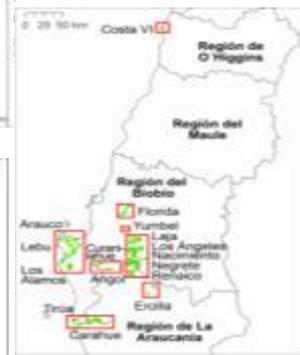
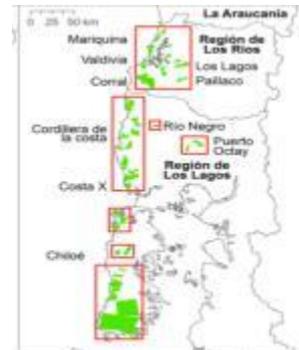


Source: Minenergia

Major areas with wind potential in SING-SIC

Areas with greater capacity to 50 MW and capacity factor >30%

At least 8 different wind regimes.



State-owned land tender for NCRE projects

Next wind Tender: Second one in Taltal

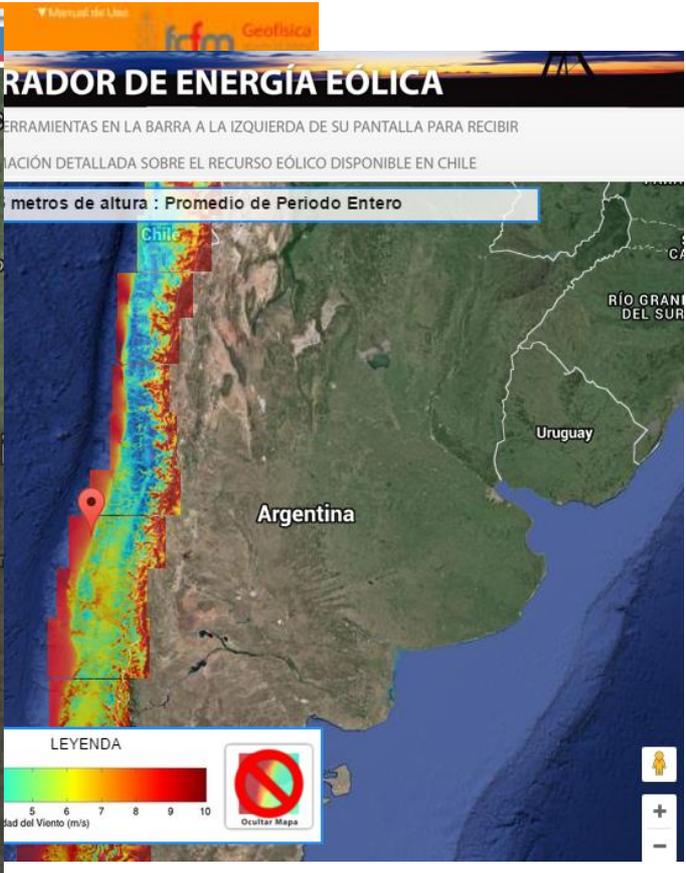
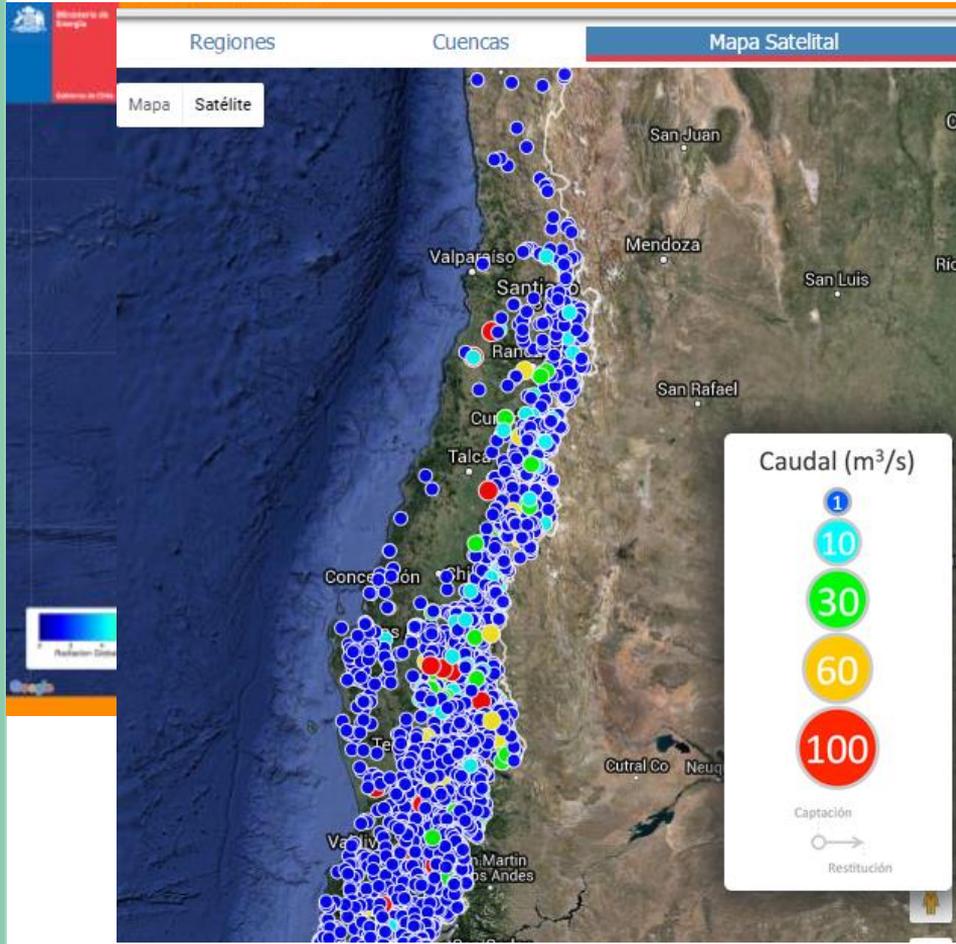


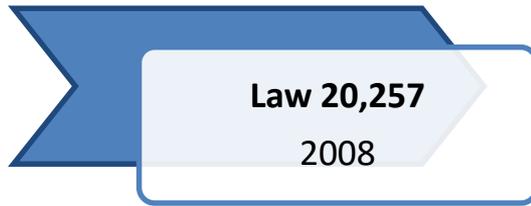
- First Semester 2016
- 7.967 ha
- Max. 400 MW
- Minimum value of the land
- Land-use Concession: 30 years

Other Information:

- Wind projects since 2014: Factor Capacity 0,3
- Wind Energy Explorer, 1 km resolution. On line
- Measurement campaign since 2009.

RENEWABLES ENERGY TOOLS





As of January 1st, 2010, generators must accredit that in the course of the calendar year, 5% of the energy supplied came from non-conventional renewable sources or mini-hydro. As of the year 2015, it will increase by 0.5 percentage points annually, until reaching 10% in the year 2024. This percentage must then be maintained in the future.

Sets the obligation of 5% for the years 2010 - 2013, increasing by 2 percentage points annually beginning in the year 2014 through the year 2019; and increasing by 3 percentage points in 2020, until reaching 20% in the year 2020.

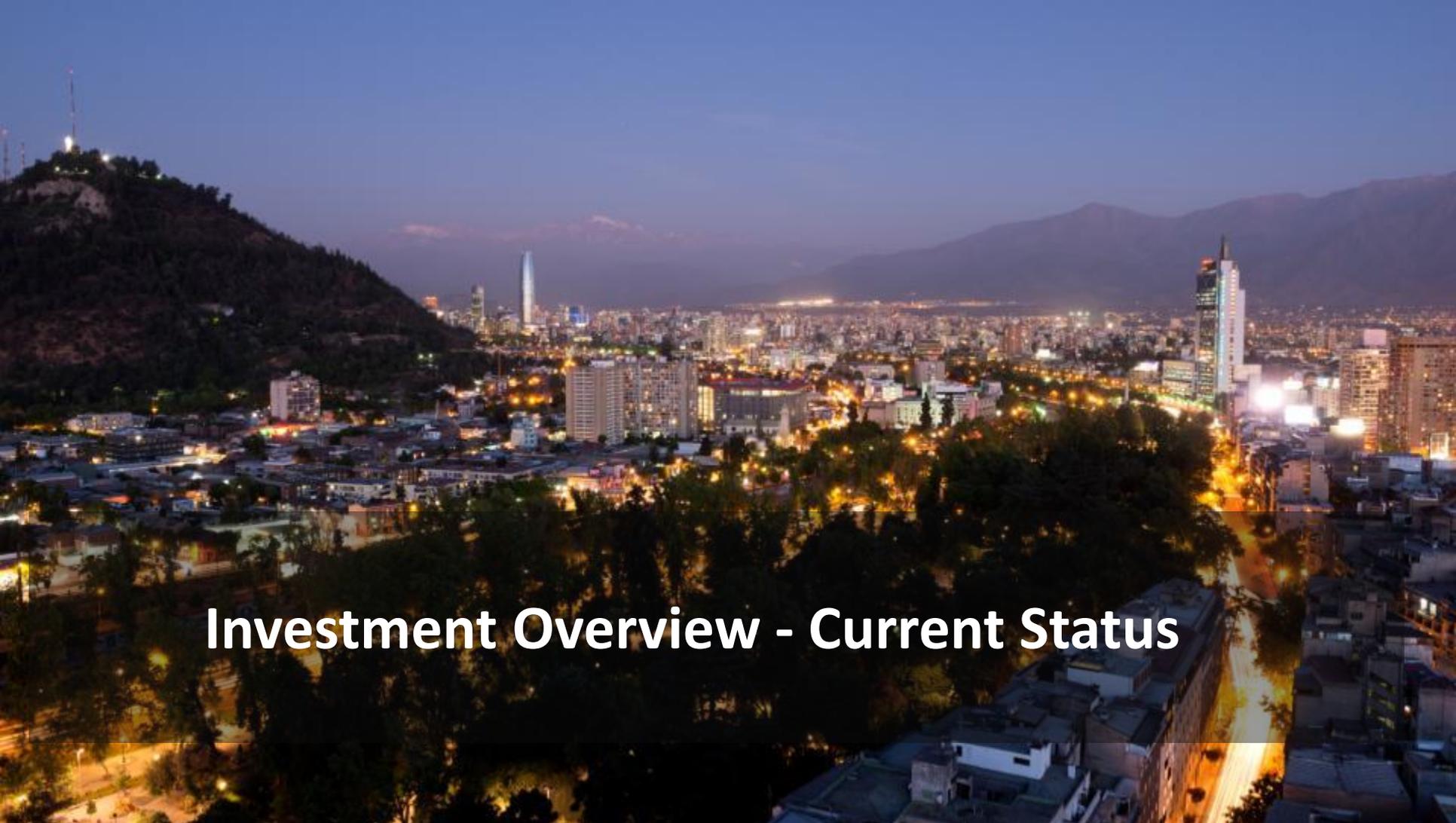
For the year 2016 the obligation will be 6%, in order to reach 20% of the energy commercialized in the year 2025, applicable to those contracts signed after the promulgation of the law.

Mechanisms for the insertion of non-conventional renewable energy and historical evolution of the norms



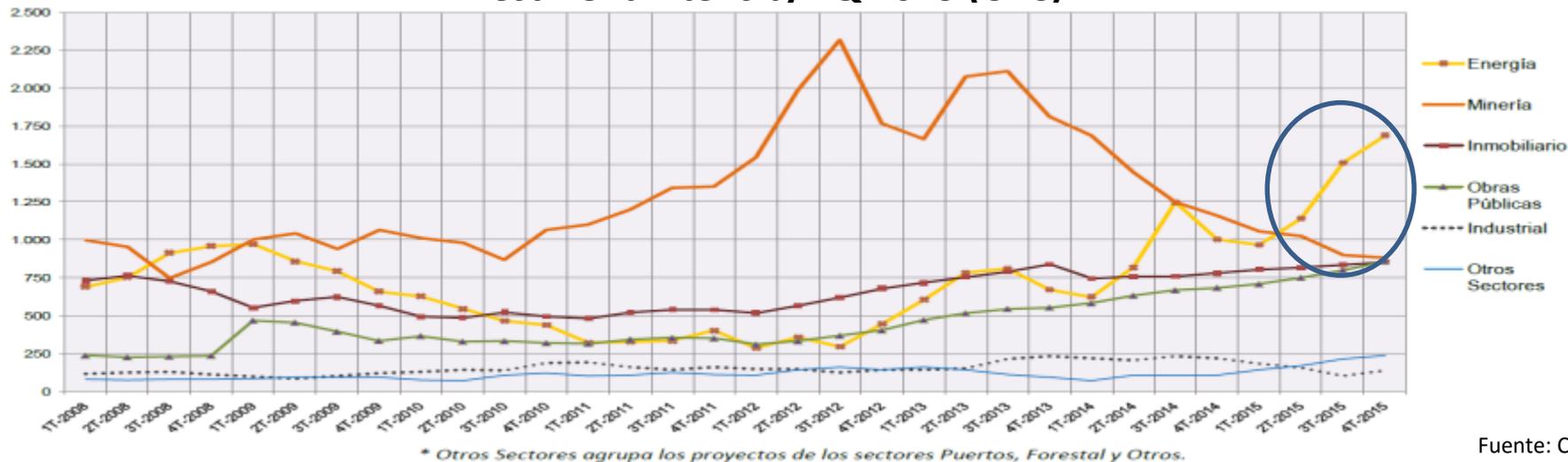
Technology Neutrality



A panoramic view of San Francisco at dusk, showing the city lights, the Golden Gate Bridge, and the surrounding hills. A semi-transparent white box is overlaid on the lower portion of the image, containing the text "Investment Overview - Current Status".

Investment Overview - Current Status

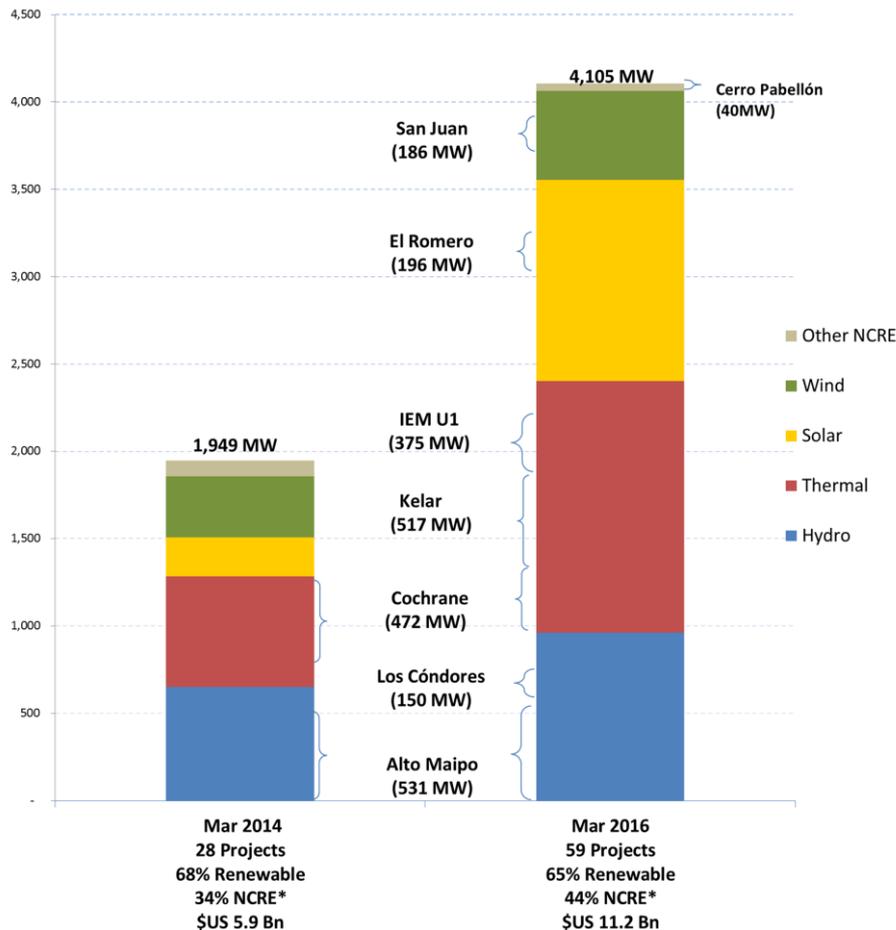
Investment Intensity 4Q 2015 (CBC)



(**): Modelo SPI: Modelo Sistema de Pronóstico de Impacto de la Inversión, desarrollado por CBC, estima el gasto por activo de cada proyecto y las correspondientes curvas quinquenales, en base a la inversión total, tipología y cronograma, para todos los proyectos considerados en los Catastros, al cierre de cada trimestre.

- The chart above show that the Energy Sector is not only the most dynamic and active sector to invest in Chile today, but also compares to the highest levels of investment of the mining boom.
- Almost one third (1/3) of the total executed public and private investment in the year 2015 in Chile is associated to the energy sector
- In the general outlook, one can observe that **all sectors** (Energy, Real Estate, Public Works, Industry and Others), except Mining (affected by the drop of commodity prices), **are growing** the last quarter of 2015, which shows a **larger dynamism of our economy**.

Power Plants under Construction (SIC + SING) March 2016



	Mar 2014	Mar 2016
Hydro	653	962
Thermal	632	1,441
Solar	223	1,151
Wind	350	508
Other NCRE	91	43
Total	1,949	4,105
% Renewable	68%	65%
% NCRE*	34%	44%
# Projects	28	59
Small Hydro Power Plants (MW)		84
# Small Hydro Power Plants Projects		23

NCRE: Non Conventional Renewable Energy concept includes Small Hydro (less than 20 MW)

NOTE: See the annexes for the detailed generation project list.

Acciona inicia construcción en Chile de una de las mayores plantas solares a nivel mundial

La firma española invertirá US\$343 millones en la construcción del proyecto El Romero Solar que estará ubicado en la comuna de Vallenar, en Atacama.

Enel Green Power inicia construcción de parque eólico en Chile

Con una capacidad instalada de 24 MW, Los Buenos Aires será capaz de producir más de 86 GWh al año una vez que esté en marcha.

14

09/2015

COMPLEJO EÓLICO MÁS GRANDE DE CHILE AVANZA SUS OBRAS EN ATACAMA

El proyecto San Juan se acerca a su peak de contrataciones. Las comunidades cercanas son capacitadas y apoyadas por la empresa.

AVANZA CONSTRUCCIÓN DE PROYECTO INFRAESTRUCTURA ENERGÉTICA MEJILLONES

PUBLICADO EL 23/12/15 A LAS 12:27 HRS.

NOTICIAS Y CONTINGENCIA CHILE

Inician construcción de Cerro Pabellón la primera central geotérmica de Sudamérica

15 JULIO 2015 hace 6 meses

ENERGÍA

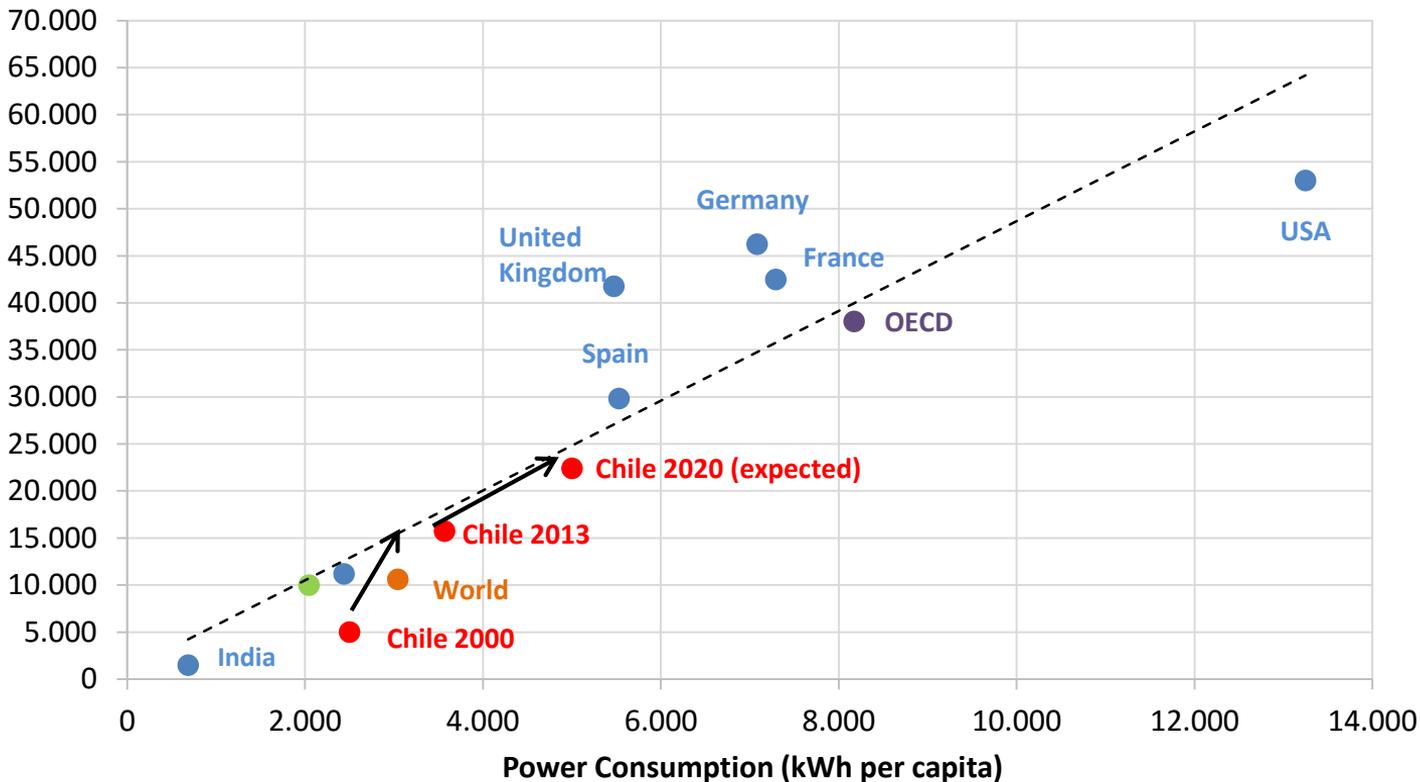
22/12/2015

EGP comienza construcción de parque eólico en Sierra Gorda con inversión de US\$ 215 millones

Se estima que esté terminado y entre en servicio a finales de 2016.

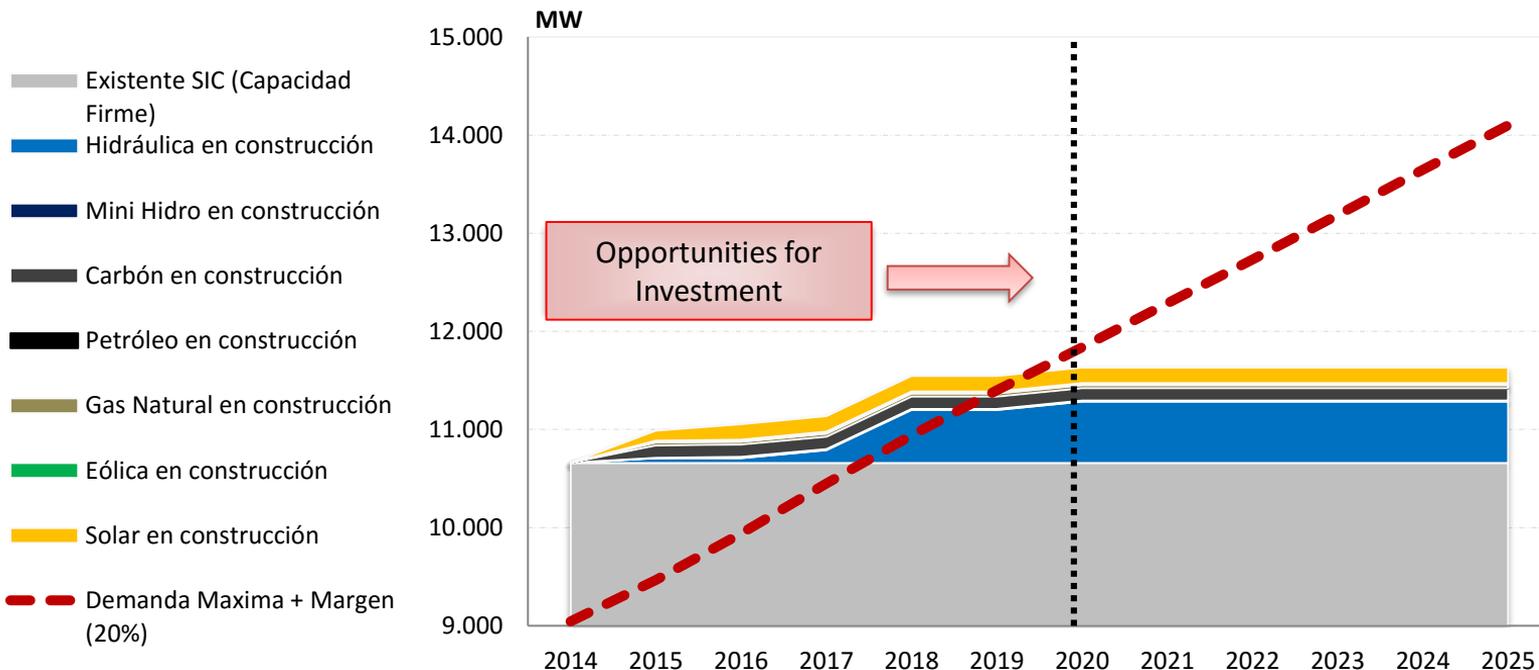
GDP vs. Power consumption (per capita)

(US\$ at current price)



Energy requirements and long-term capacity

Base Scenario



Considering only the projects under construction, in the South-Center Grid (SIC) the development of new projects is required beginning in 2021.

A high-altitude mountain landscape featuring jagged, snow-capped peaks under a clear blue sky. In the foreground, a calm lake reflects the surrounding rocky terrain and snow. The scene is bathed in warm, golden light, suggesting late afternoon or early morning. A semi-transparent dark blue banner is positioned at the bottom of the image, containing white text.

Electricity Supply Tender for Regulated Customers

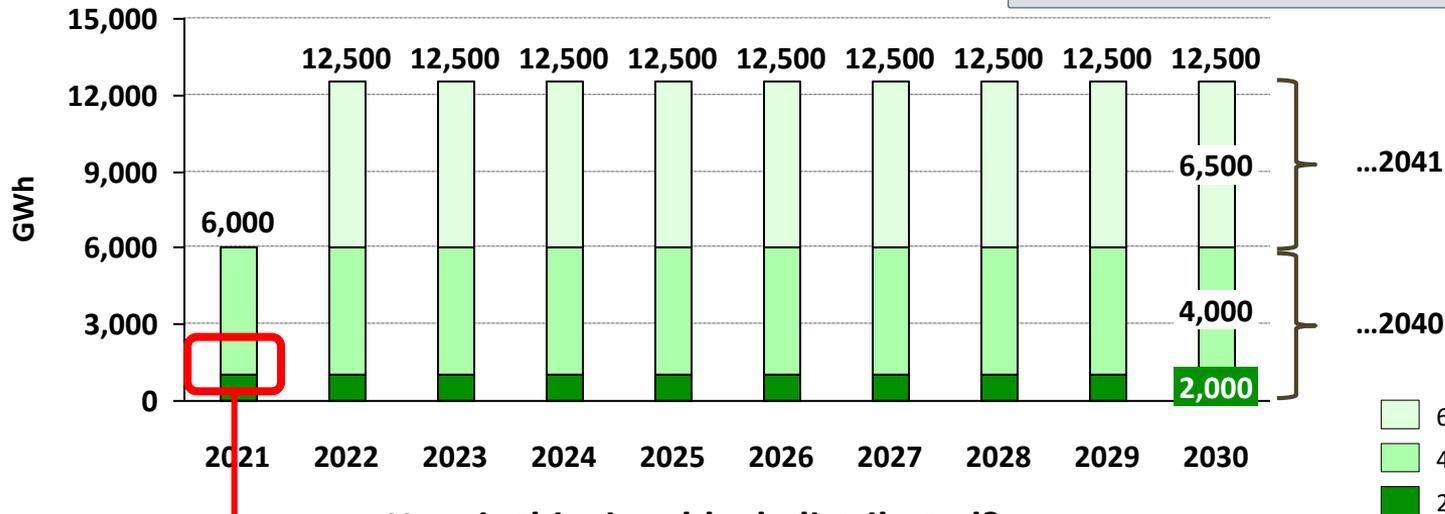
New Electricity Supply Tender for Regulated Customers Process 2015-2016:

Supply for distribution companies' regulated customers must be contracted from generators as a result of public and open tenders, conducted by the CNE (National Energy Commission).

- Open to generation companies with a credit rating of BB+ or higher.
- Tenders close in Jul 2016.
- Private 20-year contract between distributors and generators.
- Supply starting in January 2021.
- Technology neutrality.
- Maximum price is hidden.
- Contract price review because of regulatory changes.
- Option to postpone or terminate contract early (w/EIA in progress).
- Option to cede the contract to a third party, subject to the approval.

How much energy will be subject to long-term tenders?

12,500 GWh/year +10%

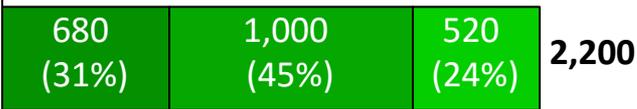


How is this time block distributed?

2,000 GWh + 10%



GWh



- 2A (23:00 - 08:00)
- 2B (08:00 - 18:00)
- 2C (18:00 - 23:00)

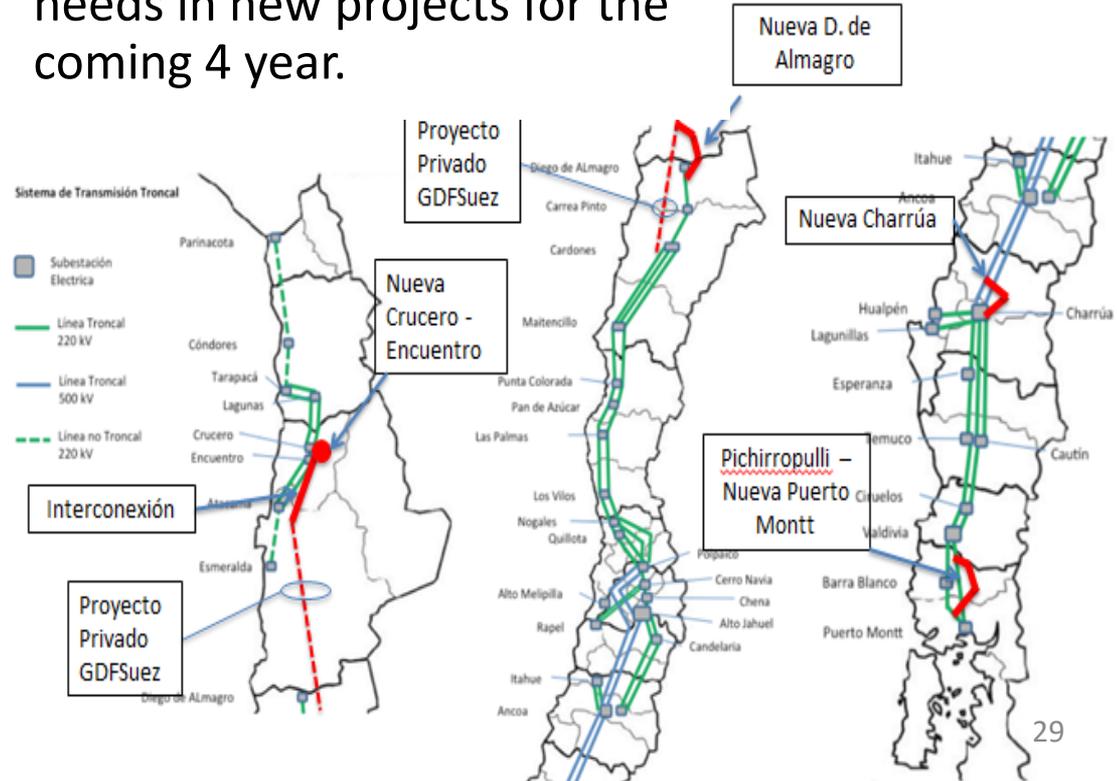
NEC

...but, we also require investment in transmission...

Opportunities in Transmission:

Currently, more than 2,000 kms (US\$ 2.5 Bn - 33 projects) are under construction.

At least, we will have similar needs in new projects for the coming 4 year.



THANKS FOR YOUR ATENTION

Additional information:

Wind Energy Explorer: <http://walker.dgf.uchile.cl/Explorador/Eolico2/>

Wind campaigns: <http://walker.dgf.uchile.cl/Mediciones/>

Renewable Energy Potential: <http://www.minenergia.cl/documentos/estudios/2014.html>

Energía abierta: <http://energiaabierta.cne.cl/>

Ministry of Energy: <http://www.energia.gob.cl/>

Ministry of Land Properties: <http://www.bienesnacionales.cl/>

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