

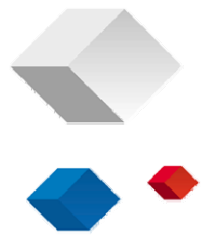


GOBIERNO DE CHILE  
COMISION NACIONAL DE ENERGIA

# **Wind energy in Chile and the Renewable Energy Law 20.257**

**Comisión Nacional de Energía  
September 2008**

# Energy Policy

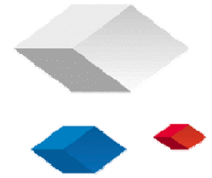


## Energy policy objectives:

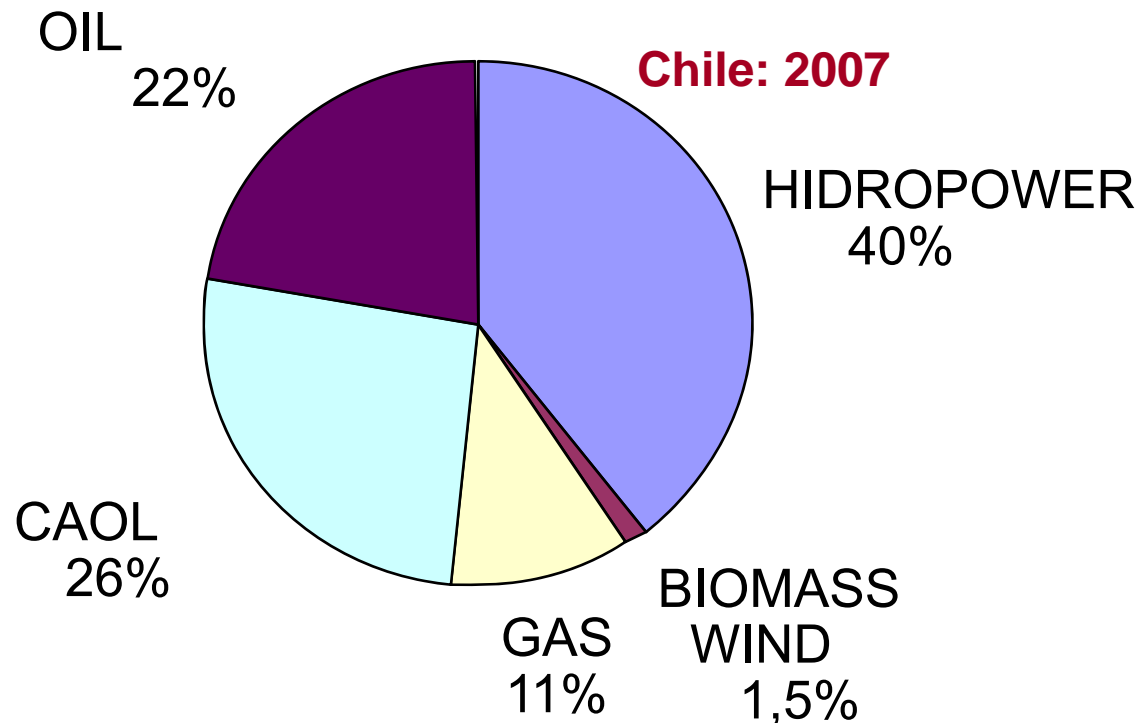
- Supply security
- Supply efficiency
- Environmental sustainability
- Equity of energy supply

Until 2004 the main focus was on supply efficiency.

# Renewable Energies: participation in power generation



The national power generation has a high participation of renewable energies. In 2007, 41% of the total capacity was generated by renewable energies.



# Power Sector



Fuente	Hidráulica > 20 MW	Comb. Fósiles	Total Convencional	Hidráulica < 20 MW	Biomasa	Eólica	Total ERNC	Total Nacional	ERNC %
<b>SING</b>	0	3589	<b>3589</b>	13	0	0	<b>13</b>	<b>3602</b>	0.4%
<b>SIC</b>	4771	4035	<b>8806</b>	104	191	18	<b>313</b>	<b>9118</b>	3.4%
<b>Aysén</b>	0	26	<b>26</b>	20	0	2	<b>22</b>	<b>48</b>	45.8%
<b>Magallanes</b>	0	80	<b>80</b>	0	0	0	<b>0</b>	<b>80</b>	0.0%
<b>Total</b>	4771	7729	<b>12500</b>	136	191	20	<b>347</b>	<b>12847</b>	2.7%

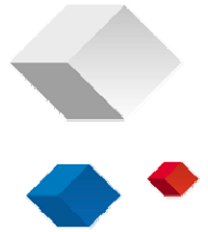
\*excluding biomass

**Total installed capacity in Chile: 12.847 MW**

**SIC: 9.118 MW**  
**SING: 3.602 MW**

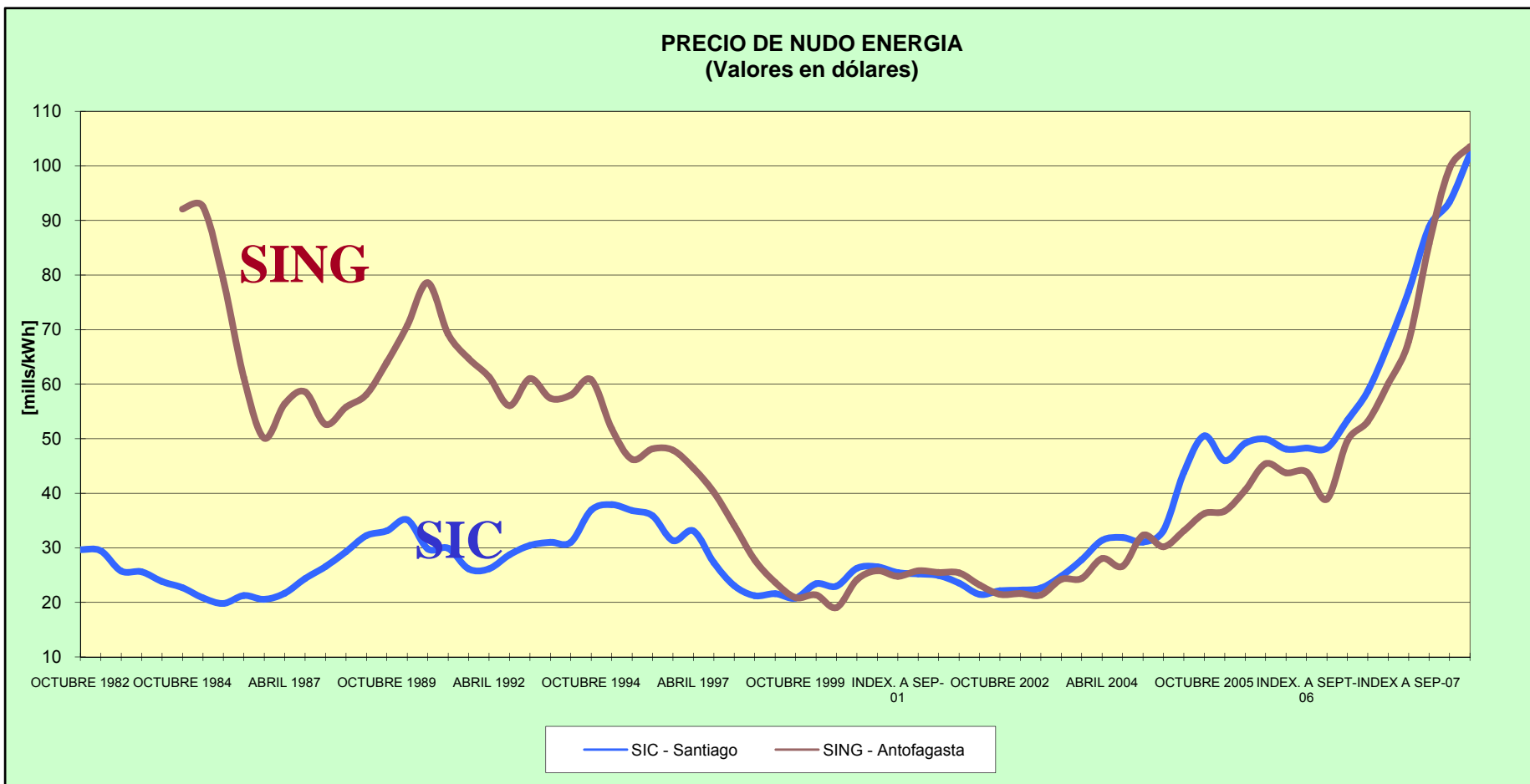
**Aysen: 47,9 MW**  
**Magallanes: 79,6 MW**

# A more favourable environment for wind energy in Chile

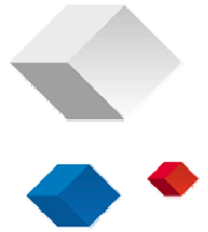


1. Legal changes and preferential treatment for non conventional renewable energies (ERNC).
2. Increase of power generation costs.
3. Pre-investment subsidies and soft loans for renewable energy projects (ERNC) by CORFO.
4. Elaboration of public information regarding the potential of wind energy and guideline for the environmental impact assessment of wind energy projects.
5. **Renewable Energy Law** (20.257): obligation to supply 10% of the commercialized energy from renewable energy.

# Evolution of regulated energy prices

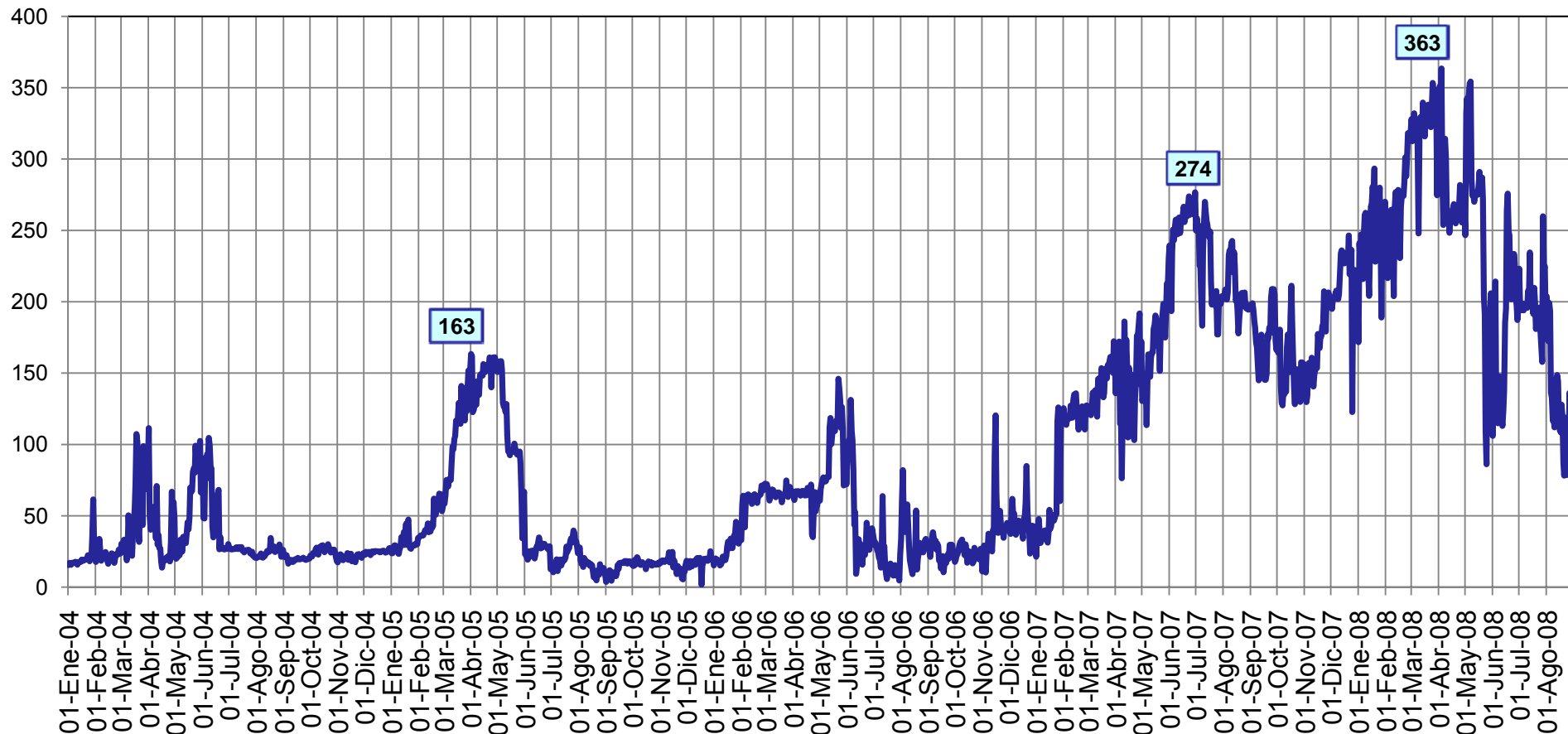


# Evolution of SPOT prices

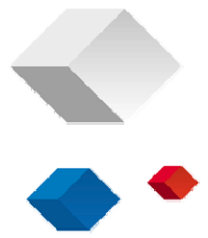


## Costo Marginal del SIC Enero 2004 - Agosto 2008

USD



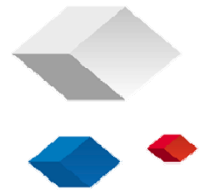
# Guideline for the environmental impact assessment of wind energy projects



The guideline contains information on how to present wind energy projects to the environment impact assessment system (SEIA), in order to obtain the environmental approval

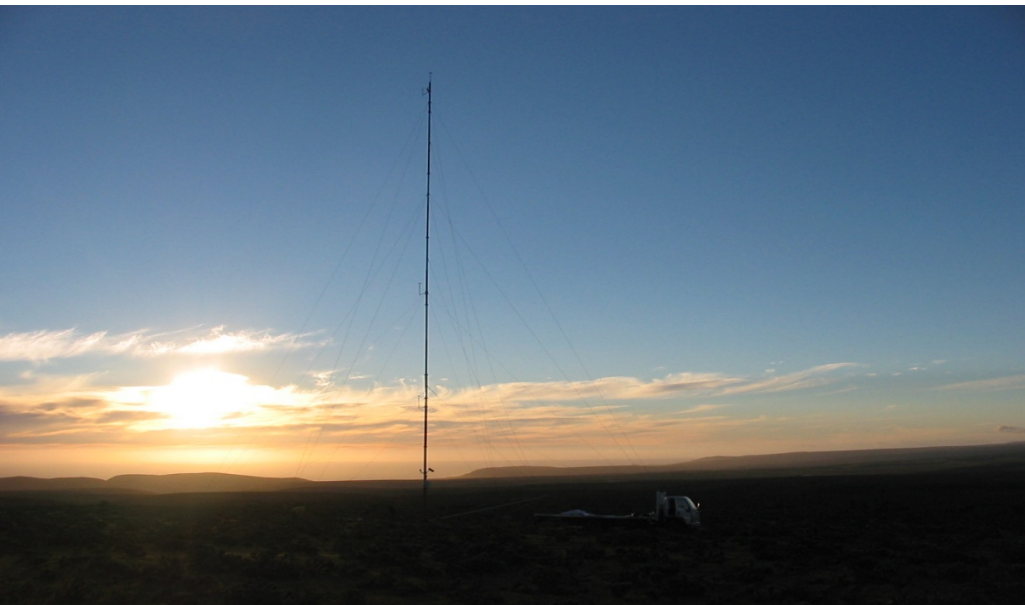


# Public information on wind energy ressources



Wind measurements (GTZ/PNUD/CNE) in:

- High potential areas
- Areas with ongoing feasibility studies.
- 9 wind stations (3 de 40m, 6 de 20m)
- Soon to come: wind measuring campaign in the north of Chile (20 wind stations).



# Public information on wind energy resources

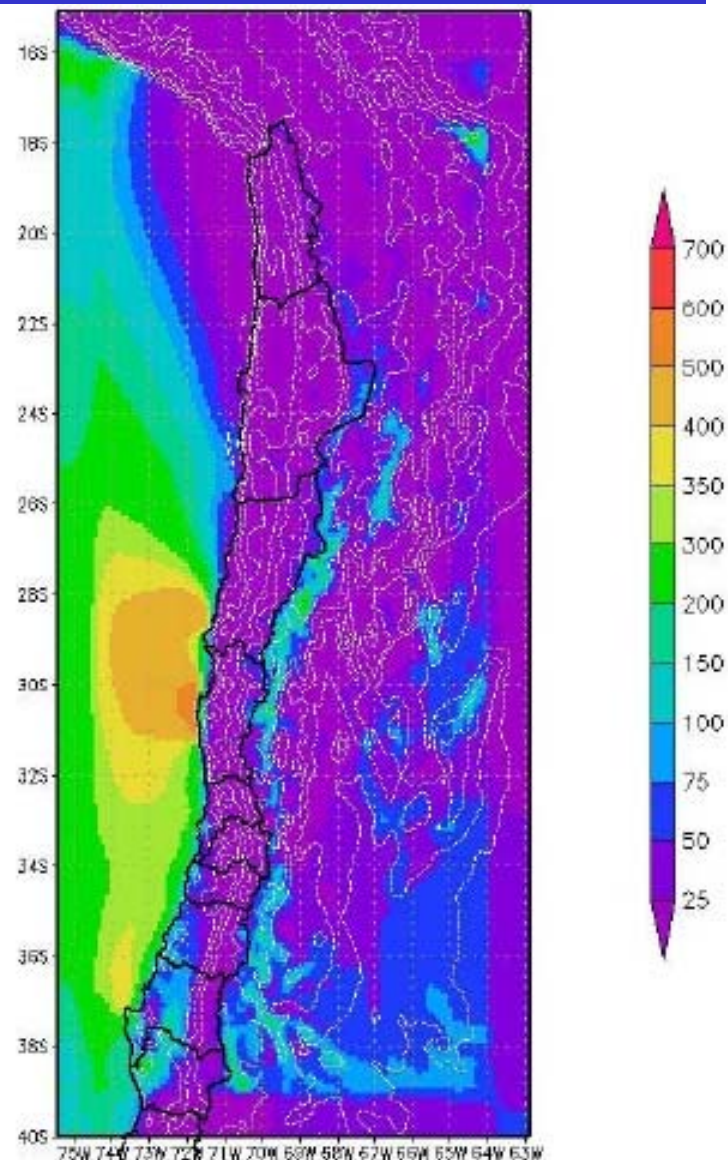


## Compilation of observational wind data:

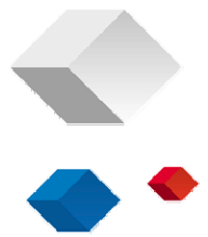
- Approx. 150 stations within the SIC.
- Public data base.

## Meteorological modeling:

- Analysis of satellite data
- Validation of mesoscale models.
- For area comparison, not to define wind potential.



# Legal changes

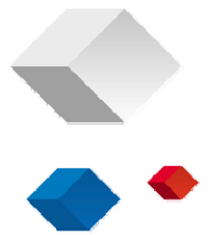


Laws 19.940 and 20.018 improve the technical and economic viability of small renewable projects:

- **Access to the energy markets is secured** for any generator, independent of its size.
- Application of **non discriminatory** conditions also **for small** generators (< 9 MW).
- **Simplified** commercial **treatment for small** generators (< 9 MW)
- **Open access** to the **distribution** network for **small** generators (< 9 MW).
- Total or partial exemption from wheeling charge on main transmission lines for renewable generators smaller than 20MW.

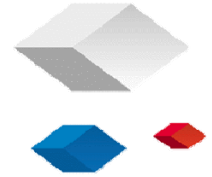
# Legal changes

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## **Ley 20.257: Renewable Energy Law Inacted on April 1, 2008**

# ¿What are Non Conventional Renewable Energies (ERNC) in Chile?



ERNC are a subgroup of renewable energies.

## Renewable Energies

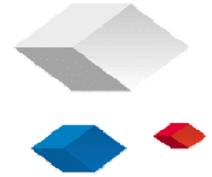
- Hidro > 20 MW
- Hidro  $\leq$  20 MW
- Biomass and Biogas
- Geothermal
- Solar
- Wind
- Maritime energies:
  - Sea currents
  - Tidal energy
  - Wave energy



**ERNC**

**Energías Renovables  
No Convencionales**

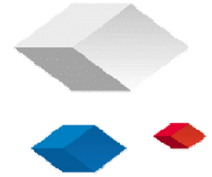
# Contents of the Law 20.257



## ERNC Obligation :

- Energy sellers (SIC and SING) have to prove that a percentage of their commercialized energy each year is generated by ERNC.
- The obligation comes into force for energy commercialized **from 2010 onwards**.
- The obligation lasts for 25 years (**until 2035**).
- It applies to energy sources that by contract **supply free clients and distribution companies from 31/08/07 onwards**.
- The required percentages for each year are as follows:
  - 2010-2014: **5%**
  - 2015-2024: annual increase of 0,5% (2015: 5,5%; 2016: 6% etc.)
  - from 2024 onwards: **10%**.

# Contents of the Law 20.257



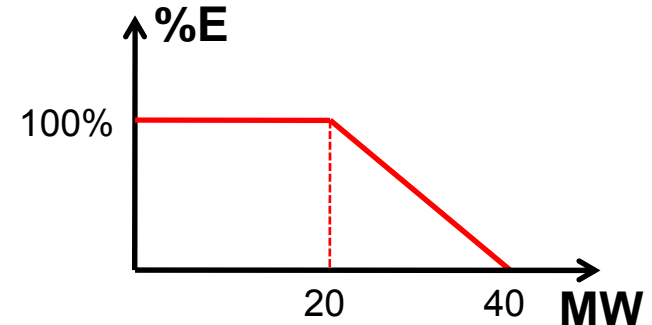
## Possible means of generation to fulfill the obligation:

- **ERNC**: Non Conventional Renewable Energies
- A proportion of the energy production of hydropower plants of up to 40 MW is accepted to fulfill the obligation :

20 MW → 100% of energy

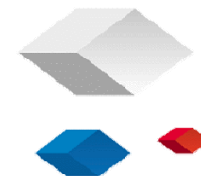
30 MW → 50% of energy

40 MW → 0% of energy



- **Only new projects** are accepted: connected to the electricity grid after 01/01/2007.

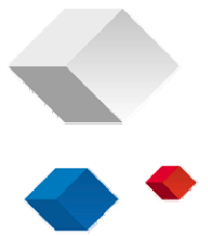
# Impacts of the Law



- Traditional generators **incorporate either own or contracted** ERNC projects into their portfolio.
- Creation of **a new market for ERNC** project developers: energy companies that commercialize energy need to fulfill the obligation.
- ERNC projects will be **the most efficient ones**, because traditional generators will have to internalize the costs into their offers at the final market.
- **Impact** on the generation **costs: either zero or minimal**, because there exists a growing competitive portfolio of ERNC projects.

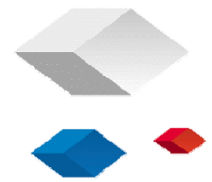
# Renewable energies

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## Wind energy projects

# Growing interest for ERNC projects in Chile



The economic conditions for the development of ERNC are improving.

## Approved projects in the SEIA\* and projects under evaluation

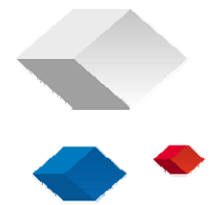
Tipo	Aprobados		En Trámite		Totales	
	Nº	MW	Nº	MW	Nº	MW
Hidro	24	216	3	19	27	235
Eólicos	7	262	6	630	13	892
Biomasa	5	71	1	41	6	112
<b>Total</b>	<b>36</b>	<b>549</b>	<b>10</b>	<b>690</b>	<b>46</b>	<b>1239</b>

Moreover, there have been identified about 180 initiatives in different stages of maturity, from the project idea up to projects in construction or operation.



\* Sistema de Evaluación de Impacto Ambiental:  
Environmental Impact Assessment System

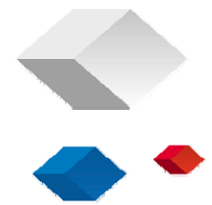
# Wind energy development



- In December 2007 the first wind farm in the SIC was installed: Canela I de 18,15 MW.
- It is expected that by 2010 about 150 MW of wind energy are connected to the SIC.
- At present, 892 MW of wind energy projects are under evaluation by the SEIA or have been approved.
- These projects represent only a minor proportion of the national wind energy potential. For example, there are large potential areas on the coast, south of Tongoy:

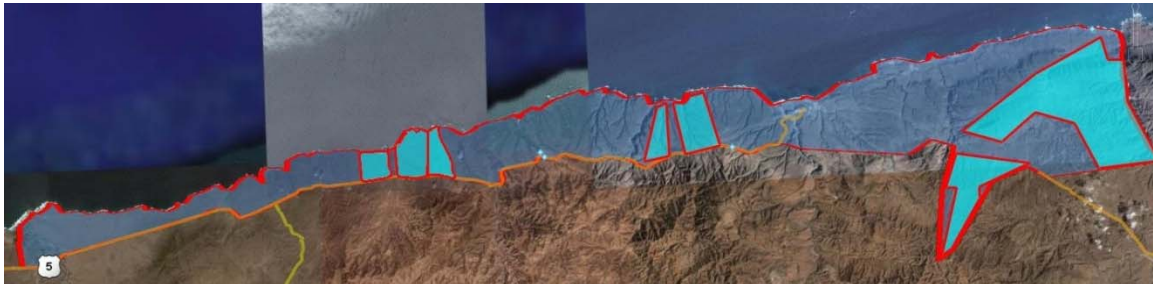


# Wind energy development



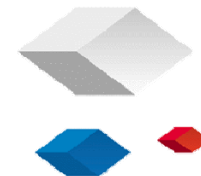
## Wind energy development:

- Punta Colorada: 36 MW
- Monte Redondo: 74 MW
- Canela 1: 18,15 MW
- Canela 2: 69 MW
- Totoral: 44,6 MW
- Talinay: 500 MW
- Punta Curahumilla: 9 MW
- Laguna Verde: 24 MW
- Hualpén: 20 MW
- Chome: 12 MW



**END**

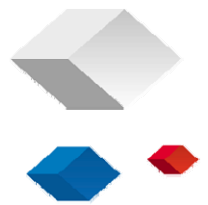
# Motivation for the establishment of a law for the development of ERNC



In spite of the legal modifications that already have been carried out, like subsidy programs and convenient market conditions, there still exist difficulties regarding an adequate integration into the electricity market. These can be briefly described as follows:

- Requirement of business models with low uncertainty regarding revenues in the long run, due to being very capital intensive.
- Innovation risk: Due to their sizes and complexity ERNC projects are less attractive for companies already well-established on the Chilean electricity market than traditional projects.
- Commercialization risk: The major part of the companies promoting ERNC are non-traditional and have difficulties to compete on the market in order to gain contracts with well-established companies on the electricity market.

# Law 20.257



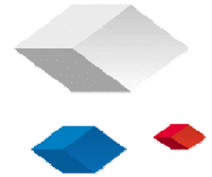
## Objective:

Create the conditions for the implementation of ERNC projects and generating an electricity market for these technologies.

## General principals:

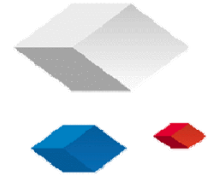
- Efficiency and competition: It is supposed to stimulate the concretion of more economic projects.
- Efficacy: It is supposed to assure the incorporation of ERNC projects into the electricity market.
- Equity: It is supposed to have an impact on regulated as well as free clients.
- Legal simplicity: Compatible with the Law on General Electricity Services (Ley General de Servicios Eléctricos) and the electric market.

# Content of the Law



## Flexible mechanisms of fulfillment:

- The injections of ERNC to the grid can be sourced from an electricity system different than that to which the obliged company is connected to.
- The injections of ERNC of the year prior to the requirement can be used to fulfill the obligation.
- It is allowed to postpone for one year 50% of the fulfillment of the obligation.
- It is allowed to exchange excesses in fulfillment among the obliged companies.



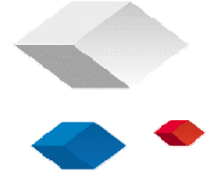
# Content of the Law

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## Sanctions for non-fulfillment:

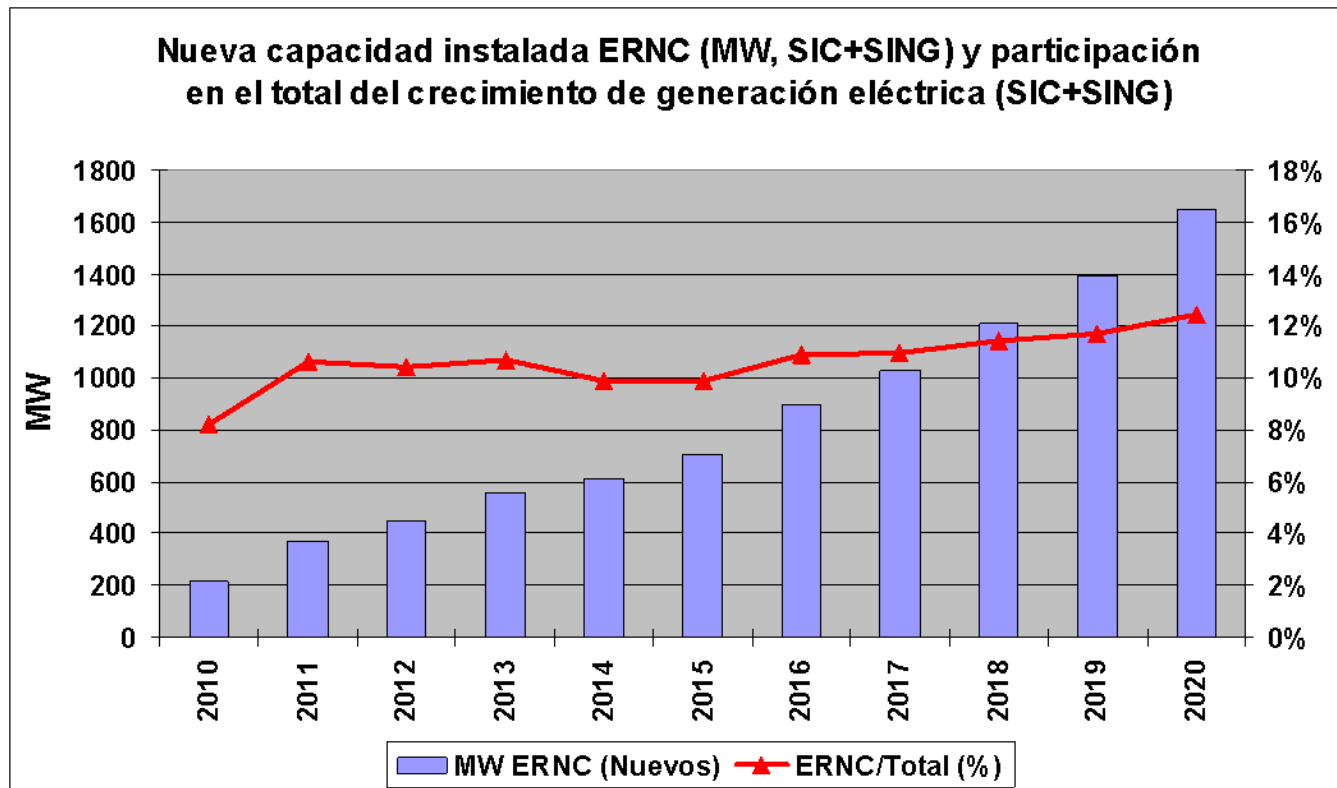
- Proportional charge for the amount of NCRE not having been supplied: 0,4 UTM for each MWhr not being supplied (29 US\$/MWhr on 05/06/08).
- If a company does not fulfill the obligation 3 years in a row the charge will increase to 0,6 UTM/MWhr (42 US\$/MWhr on 05/06/08).
- The paid charges are passed on to the clients (consumers) of those companies which fulfilled the obligation, in proportion to the consumed energy per each client.

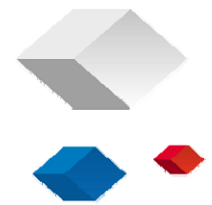
# Intended impacts of the Law (1)



An adequate application of the law accelerates the development of a market related to NCRE and will create a fortified demand:

- Estimation of the impact of installed NCRE capacity: 200 MW by 2010 and about 1400 MW by 2020 (accumulated new capacity).
- About 11% of the amount of electricity generation in the next decade is supposed to come from NCRE.





## Example of incentive mechanisms

**Hydropower station Puclaro:** 5,4 MW on the base of the irrigation water reservoir Puclaro. Inaugurated on May 6, 2008.

- Benefiting from pre-investment subsidies of CORFO (2005).
- Using soft loans of CORFO (Líneas de intermediación financiera).
- Long term energy contract with Guacolda S.A., allowing them to fulfill the obligation of the Law 20.257.

- Irrigation farmers are shareholders in the project.
- Connected to the distribution network.

