

Finding solutions to meet the demand for electricity



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The 4 Chilean Electric Systems



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43,6% Hydro
55,0% Thermal



Sistema Interconectado Central (SIC)

Installed capacity: 14.000 MW
Annual generation: 48.973 GWh
Maximum demand: 6.992 MW
Coverage: Regiones III a X, Región XIV y Región Metropolitana.
Population: **92,22%**

Sistema Interconectado del Norte Grande (SING)

Installed capacity : 4.600 MW
Annual generation : 16.756 GWh
Maximum demand : 2.169MW
Coverage : Regiones I, II y XV
Population : **6.25%**



99,7%
Thermal

Sistema Eléctrico de Magallanes

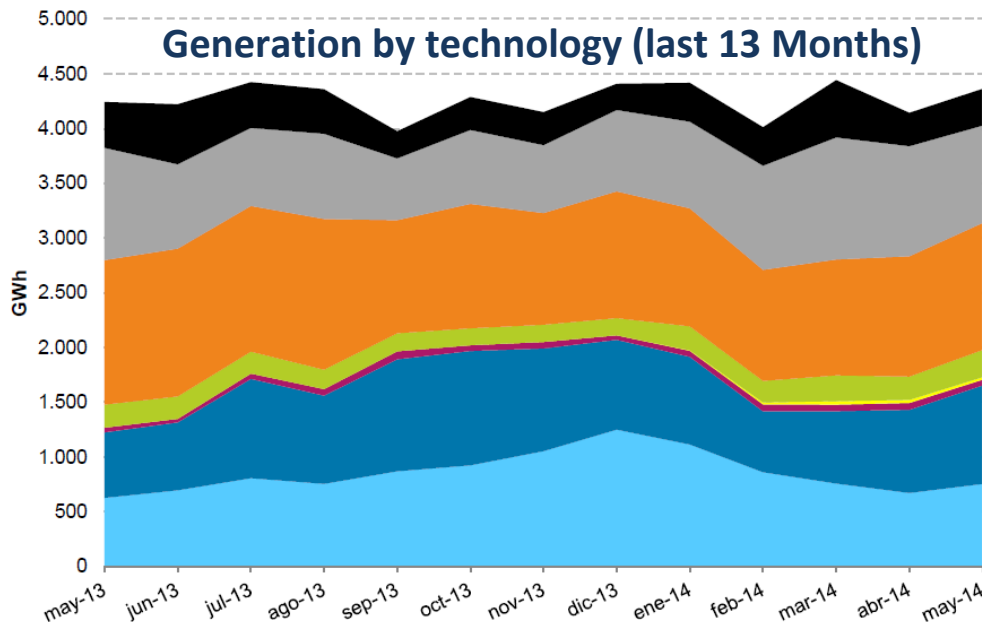
Installed capacity : 101,7 MW
Annual generation : 286,6 GWh
Maximum demand : 50,6 MW
Coverage : Región XII
Population : **0,92%**

Sistema Eléctrico de Aysén

Installed capacity : 41 MW
Annual generation: 133 GWh
Maximum demand : 22,4 MW
Coverage : Región XI
Population : **0.61%**

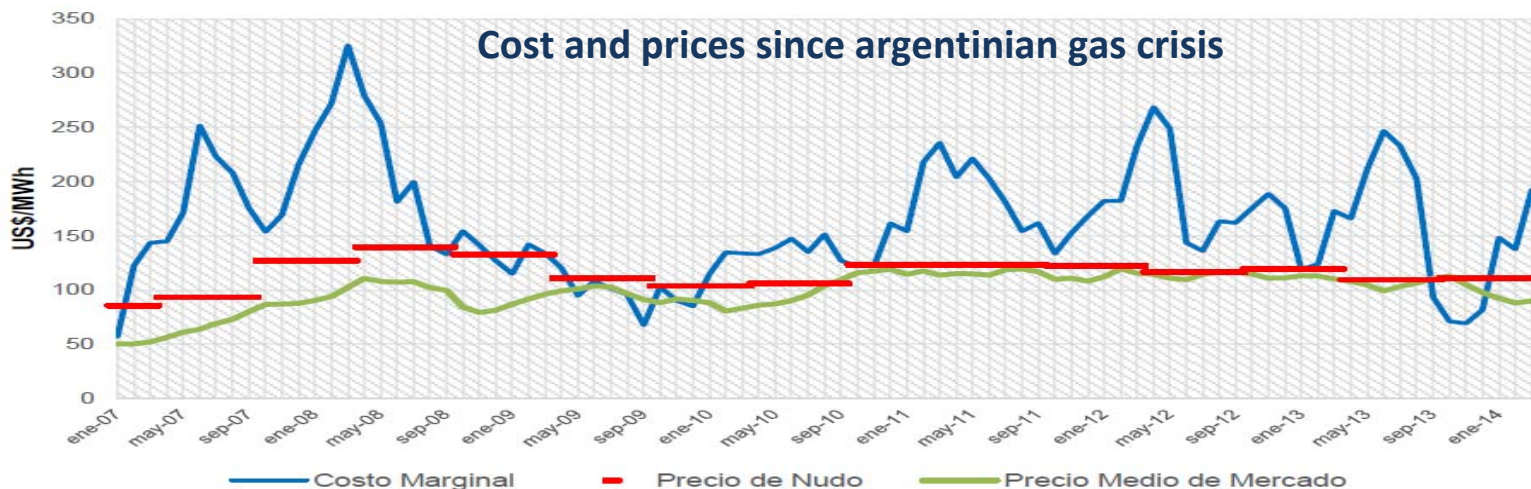
■ Pasada ■ Embalse ■ Eólica ■ Solar ■ Biomasa ■ Carbón ■ Gas ■ Derivados Petróleo

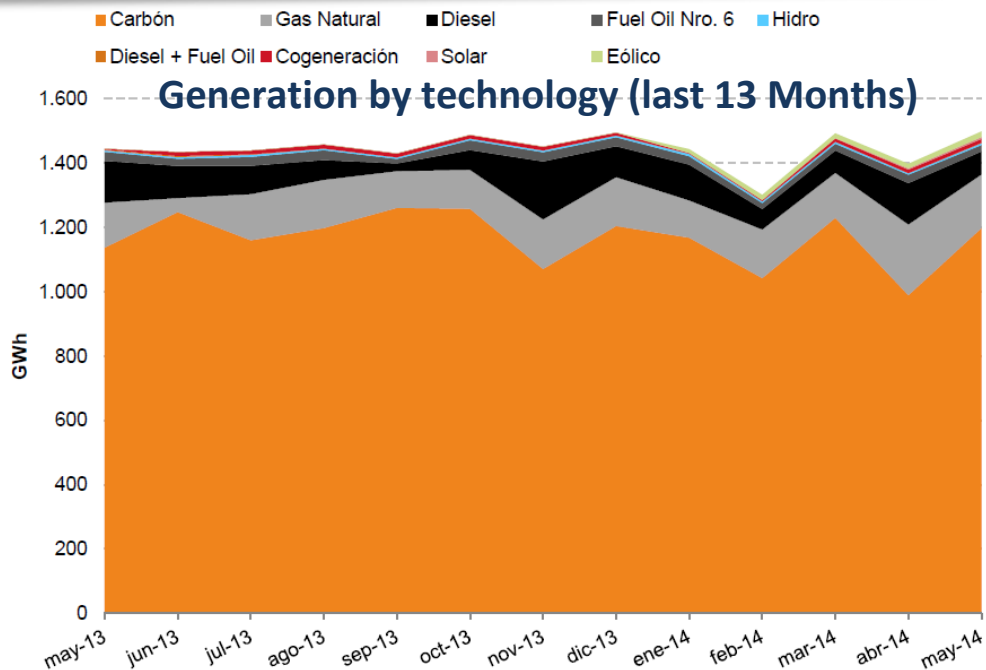
Generation by technology (last 13 Months)



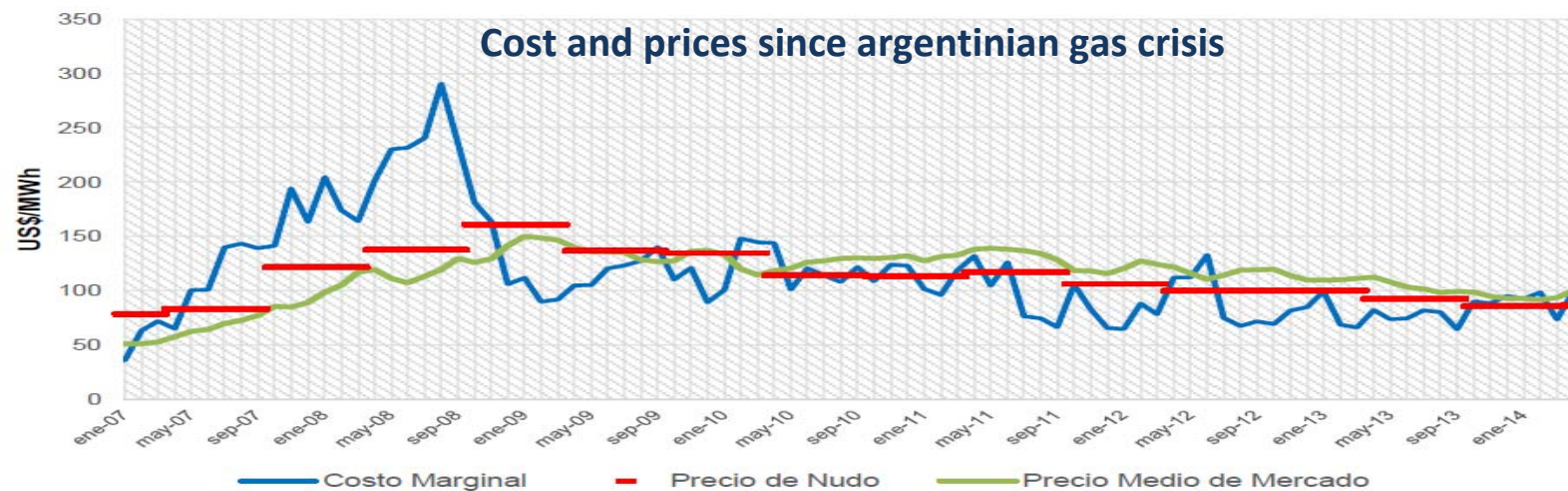
- Upward trend of fuel prices
- Unfavorable hydrologic conditions (4 years of drought)
- Uncertainty for the construction of new generation capacity
- Regulated consumers have not yet suffered price increases

Cost and prices since argentinian gas crisis





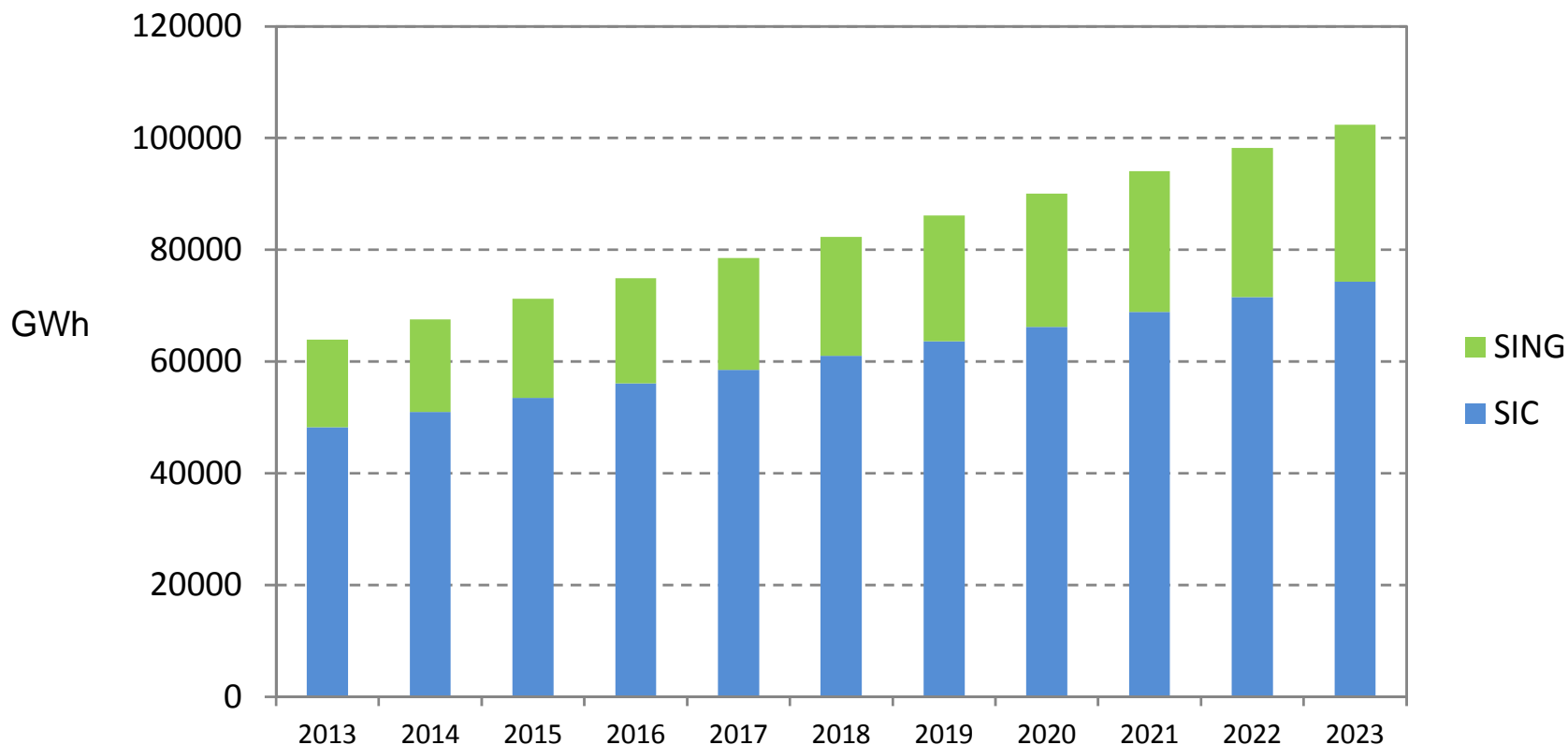
- Uncertainty for the construction of new generation capacity is lower than SIC
- There driving force is the demand of mining industry
- Price stability



Energy consumption will grow 60% in next 10 years



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Main electric systems

SIC ↑ 54%

SING ↑ 80%

The big challenge: supply to cope with demand



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Current investment climate

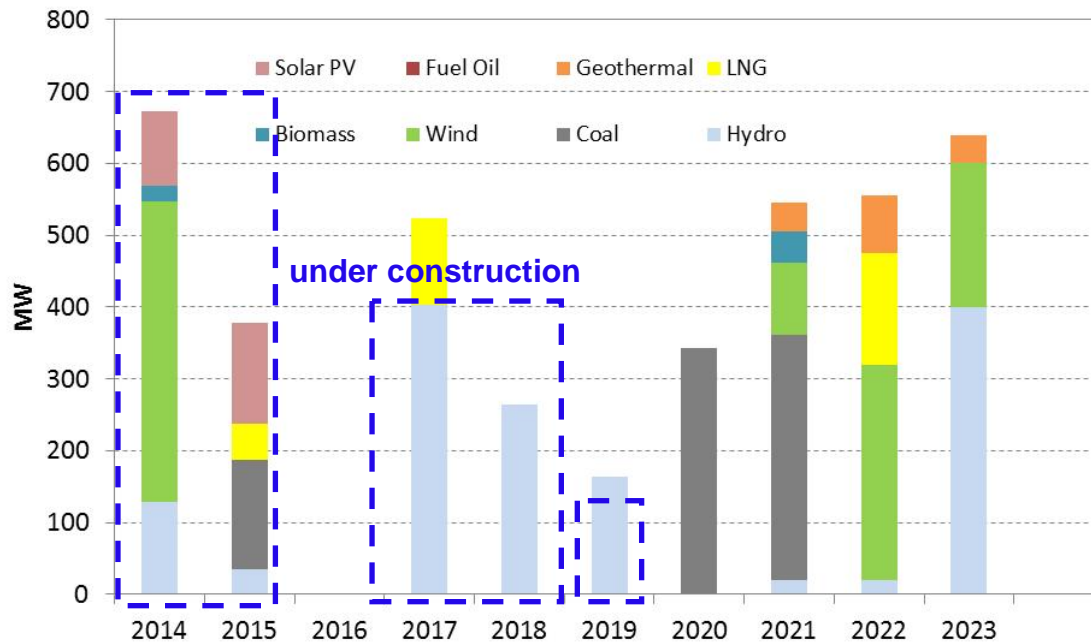
- Almost 9.000 MW stalled (more than US\$ 25 billion in investment).
- Growing opposition of organized groups of interest and local communities.
- Involvement of the Judiciary as key player.
- Increased regulatory risk: long processes for obtaining permissions and other regulatory uncertainties.
- Therefore **no enough base load capacity under construction or starting its construction in the SIC.**

Insufficient development of new generation projects



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Plan of new generation projects - CNE



Source: CNE, ITD SIC April 2014

In the SIC, of the 4.085MW in total that the CNE (the regulator) foresees for the period 2014-2023, only 46% (1861 MW) is under construction.

Almost half of the suggested projects does not even have a promoter.

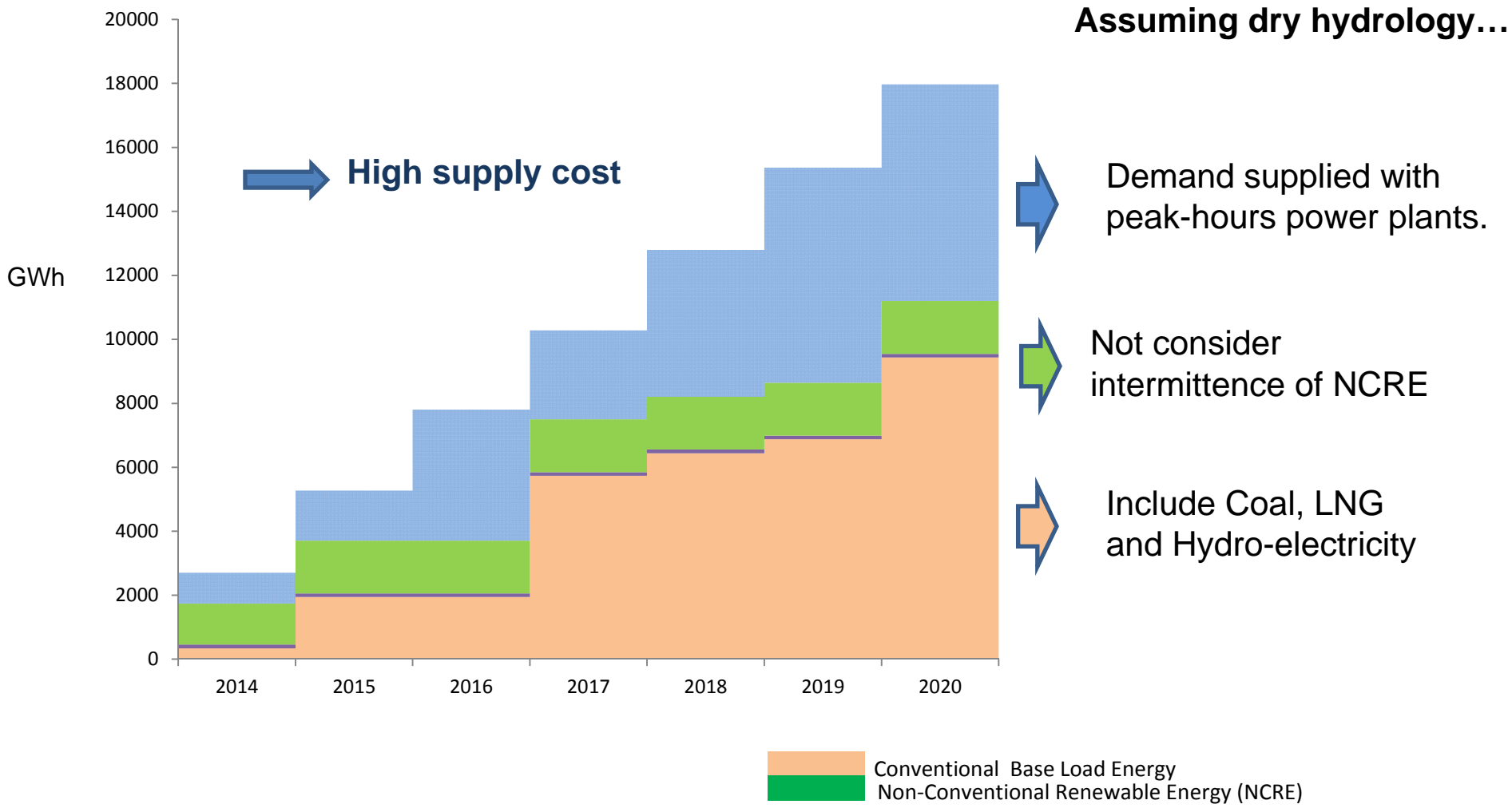
High uncertainty regarding projects development

Barrancones	540 MW
Castilla	2354 MW
Hidroaysén	2750 MW
Los Robles	750 MW
Rio Cuervo	640 MW
Achibueno	135 MW
Eólico Chiloé	112 MW
Tagua Tagua	35 MW
Punta Alcalde	740 MW
Neltume	490 MW
Energía Minera	1050 MW
Farellones	800
MW	
ERA	579 MW
Cruz Grande	300 MW

Total 11275 MW

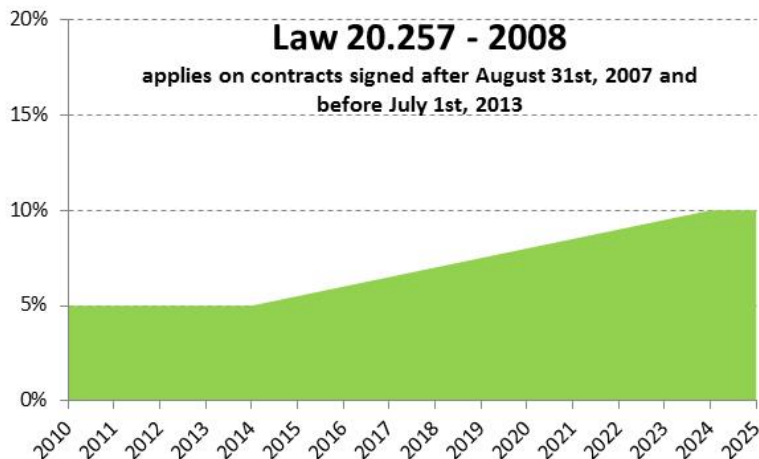
The effects in the short and middle term (SIC)

Incremental: Demand & Generation

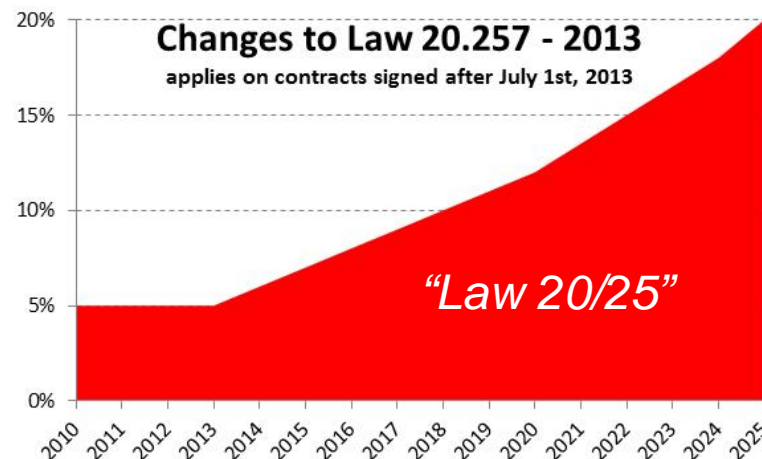


Source: Comisión Nacional de Energía, Final Technical Report April 2014 and own preparation

- Percentage of energy withdraw for the final consumer supply must be injected by NCRE: goal 20% in 2025.

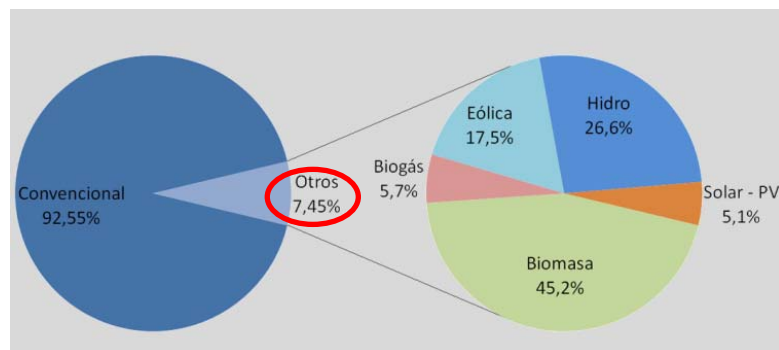


→ temporal application (old contracts)



→ definitive application (new contracts)

- The market has responded...but we need to be careful.....



Estado	Operación [MW]	Construcción [MW]	Estudios Ambientales aprobados [MW]	En evaluación [MW]
Biomasa	461	0	74	66
Biogás	43	0	1	0
Eólica	571	520	4.337	1.664
Mini-Hidro	338	85	270	202
Solar - PV	176	170	5.490	3.539
Solar - CSP	0	100	760	100
Geotermia	0	0	120	0
Total	1.589	875	11.052	5.571

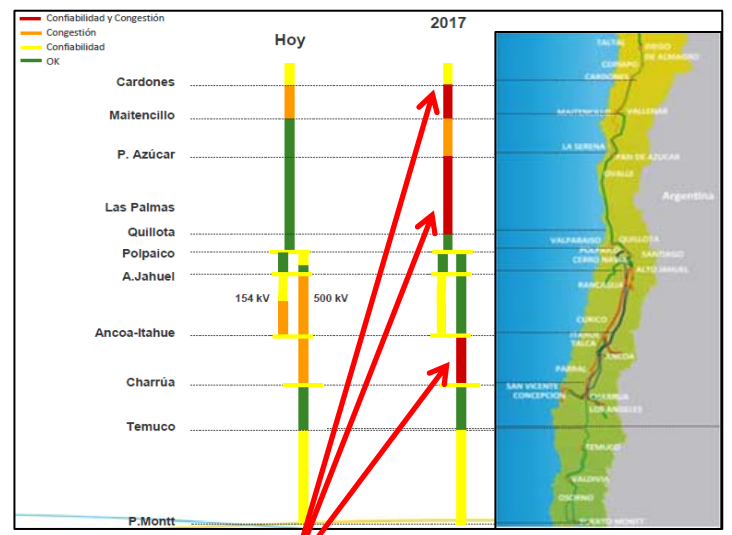
Source: Centro de Energías Renovables, Final Report May 2014

The NCRE penetration level must be in line with the overall performance

Government Actions&Goals

- Reduce energy prices in future tenders: 25% decrease in long term contracts.
- Support sustainable development of thermoelectric base load
- Increase hydroelectric development
- Encourage the integration of NCRE in compliance with the law 20/25

System and Technologic Restrictions

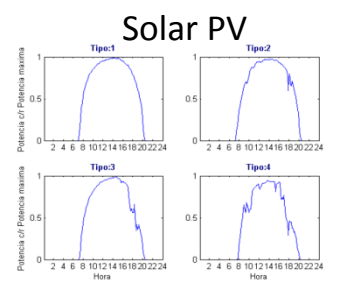
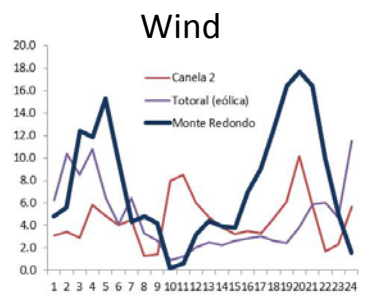


Bottlenecks

source: Transelec, CER, CDEC-SIC

- Approved environmentally NCRE: 89% (9.827 MW) are wind and solar PV projects.
- NCRE projects in environmental assessment: 93% (5.203 MW) are wind and solar PV projects.

→ **Volatility and Intermittence**



The intermittent NCRE penetration impacts

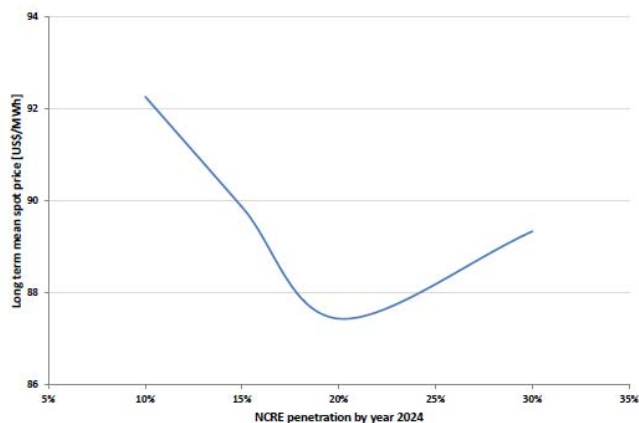


Figure 3: Mean spot price versus total NCRE penetration

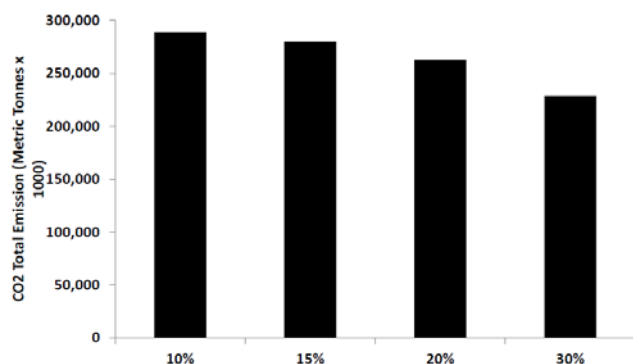


Figure 6: CO₂ emission for each scenario from April 2017 to March 2026

Table 8: Annual mean investment cost per technology installed (US\$ millions)

NCRE Scenario	Solar	Wind	Run of the River	Coal	Total
10%	39	371	315	760	1.486
15%	422	603	263	665	1.953
20%	857	789	263	570	2.479
30%	1.421	1.224	263	570	3.477

Table 9: Transmission investment for the four scenarios of NCRE penetration

NCRE Scenario	Transmission investment (US\$ millions)	Capacity Increase (MVA)
10%	245	1630
15%	404	3290
20%	404	3290
30%	494	4969

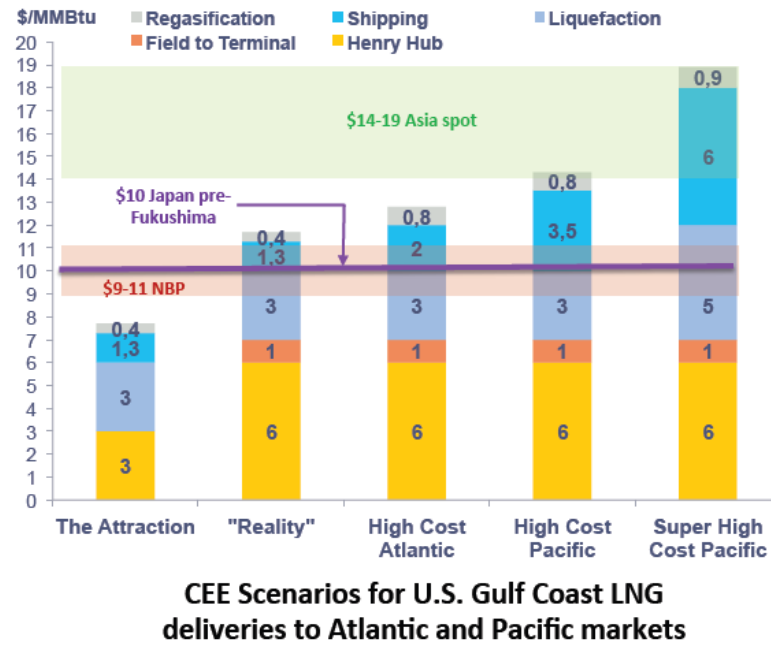
Table 12: Reserve requirement per year for each NCRE penetration scenario (MW)

Year	NCRE penetration scenario			
	10%	15%	20%	30%
2017	496	496	551	650
2018	502	502	605	733
2019	502	562	697	841
2020	505	660	782	941
2021	515	692	813	992
2022	531	729	877	1,068
2023	543	759	933	1,137
2024	545	770	944	1,169
2025	550	774	966	1,203
2026	582	809	993	1,243

So...what is the path? LNG?



Is U.S. LNG Competitive?



Moving in the direction of GNL instead of coal or hydro because of social opposition could have an important economic cost for Chile.



- ❑ Renewables are not the solution but could help (specially in the coming years). New law 20/25 set an important challenge to the system.
- ❑ Any generation alternative requires an improvement in the investment climate that should be address without delays.
- ❑ Transmission (is increasingly becoming a restriction)
- ❑ Relation between high impact projects and local communities shall be redefined in light of the “shared value” concept and contribute to social & economic progress.
- ❑ Citizens and communities shall access to sound energy information in order to improve level of discussion
- ❑ Industry shall rethink the way it relates with stakeholders

How to proceed?



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Government, Congress, the industry, consumers, NGOs, media and citizens in general: we all need to take our share of responsibility for the future.

The challenge cannot be solved by one single group.

We need information, trust, willingness to talk, long term commitments & leadership.



Chile needs more competitive supply of energy, including renewables.

The task is to achieve the adequate match between productive efficiency and sustainability, balancing local needs and national benefits

Sense of urgency: we need to start building today the capacity for tomorrow.

A big challenge for the next 4-5 years: there will be no base load capacity entering into the system.

There is a need to look for strong commitments of all actors: to overcome the common challenge we all face in the mid- and long-run.

Thank you



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