

What to expect from the Chilean lithium industry after the National Commission's advancement plan?

Shanghai, June 2015

AGENDA



1. Lithium reserves
2. Lithium regulation in Chile
3. Rockwood and SQM: current situation and projects
4. National Lithium Commission



- 1. Lithium reserves**
2. Lithium regulation in Chile
3. Rockwood and SQM: current situation and projects
4. National Lithium Commission

1. Lithium reserves



- Lithium is the lightest metal and the least dense solid element.
- Lithium is found in continental brines, in hard rock minerals (mainly in the form of spodumene) and also in other type of deposits.
- Chile and Bolivia have about 2/3 of worldwide reserves in the form of continental brines.
- **Lithium minerals** are concentrated to roughly 5% lithium and can be directly used in glass and ceramic processes and they also can be further processed to produce lithium carbonate and lithium hydroxide.
- **Brine-based** processes produce concentrated lithium chloride solutions, which then are transformed into lithium carbonate or chloride.



Continental Brines



Geothermal Brines



See



Hard rock minerals

1	H Hidrógeno 1,00794	3	Li Litio 6,941
		4	Be Berilio 9,012182
		11	Na
		12	Mg

1. Lithium reserves

Brine deposits



- The **Salar de Atacama** in Chile has the best quality reserves of lithium in terms of lithium to potassium concentration as well as low magnesium to lithium ratio.
- Lithium carbonate **production costs** in Chile are the lowest among the industry, not only because of the characteristics of the Salar de Atacama, but also because it is considered as a by-product of potash (SQM), so part of the CAPEX is shared between the two products.

Deposit	Deposit type	Li	K	Mg	Ca	SO4	Mg/Li	SO4/Li	Ca/Li	SO4/K
Salar de Atacama Average (Rockwood Lithium and SQM)	SulpoMag- Li ₂ SO ₄ - LiCl- CaCl ₂	1,835	22,626	11,741	379	20,180	6	11	0.2	0.9
Salar de Hombre Muerto (FMC)	Na ₂ SO ₄ - K ₂ SO ₄ - Li ₂ SO ₄	744	7,404	1,020	636	10,236	1	14	0.9	1.4
Silver Peak (Rockwood Lithium)	Na ₂ SO ₄ - K ₂ SO ₄ - Li ₂ SO ₅	245	5,655	352	213	7,576	1	31	0.9	1.3
Salar de Olaroz (Orocobre)	Na ₂ SO ₄ - K ₂ SO ₄ - Li ₂ SO ₆	774	6,227	2,005	416	18,630	3	24	0.5	3.0
Salar de Cauchari (LAC)	Na ₂ SO ₄ - K ₂ SO ₄ - Li ₂ SO ₇	618	5,127	1,770	476	19,110	3	31	0.8	3.7
Salar de Maricunga (Li3)	KCl-LiCl- CaCl ₂	1,036	8,869	8,247	11,919	1,095	8	1	11.5	0.1
Salar de Uyuni Average	SulpoMag- Li ₂ SO ₄	424	8,719	7,872	557	10,342	19	24	1.3	1.2
Salar de Rincón (Rincon Lithium)	SulpoMag- Li ₂ SO ₄	397	7,513	3,419	494	12,209	9	31	1.2	1.6
West Tajinaier (CITIC)	SulpoMag- Li ₂ SO ₄	256	8,444	15,737	ND	35,315	61	138		4.2
Zhabuye Salt Lake	Li ₂ CO ₃ -Na ₂ SO ₄	1,217	17,083	17	-	38,917	0	32		2.3

1. Lithium reserves

Brine deposits



- The **Salar de Atacama** in Chile has also the best quality reserves of lithium in terms of environmental conditions: with a high evaporation rate and low precipitations

	Salar Surface	Altitude	Precipitation	Evaporation rate	Depth ?
Deposit	Km2	m	mm/year	mm/year	m
Salar de Atacama Average (Rockwood Lithium y SQM)	3000	2300	15	3200	
Salar de Hombre Muerto (FMC)	565	1300	100	2710	
Silver Peak (Rockwood Lithium)	83	4100	130	1300	
Salar de Olaroz (Orocobre)	250	3900	100	2600	600
Salar de Cauchari (LAC)	28	3900	100	2600	600
Salar de Uyuni Average	10582	3650	168	1789	
Salar de Rincón (Rincon Lithium)	260	3700	100	2650	
Salar de Maricunga (Li3)	145	3800	125	2400	
Zhabuye Salt Lake	247	4412	150	2300	
West Tajinaier (CITIC)	570	2700	25	2800	

1. Lithium reserves

Salars in Chile



- According to the Sernageomin¹, the Chilean salars with the highest potential (in terms of a future source of lithium supply) are (excluding Atacama) Maricunga and Pedernales.

Salar	Lithium concentration (ppm)	Area (km ²)	Li/K
Group I: Maricunga, Pedernales, La Isla, Quisquiro	423 – 1,080	80 - 335	0,08 – 0,18
Group II: Punta Negra, Aguas Calientes Centro, Pajonales, Aguilar, Tara, Parinas, Pujsa	220 – 620	18 – 250	0,04 – 0,30
Group III: Aguas Calientes Norte, Talar, Aguas Calientes Sur	205 – 290	15 – 27	0,03 – 0,24

¹: National Geological and Mining Service (Servicio Nacional de Geología y Minería)

1. Lithium reserves

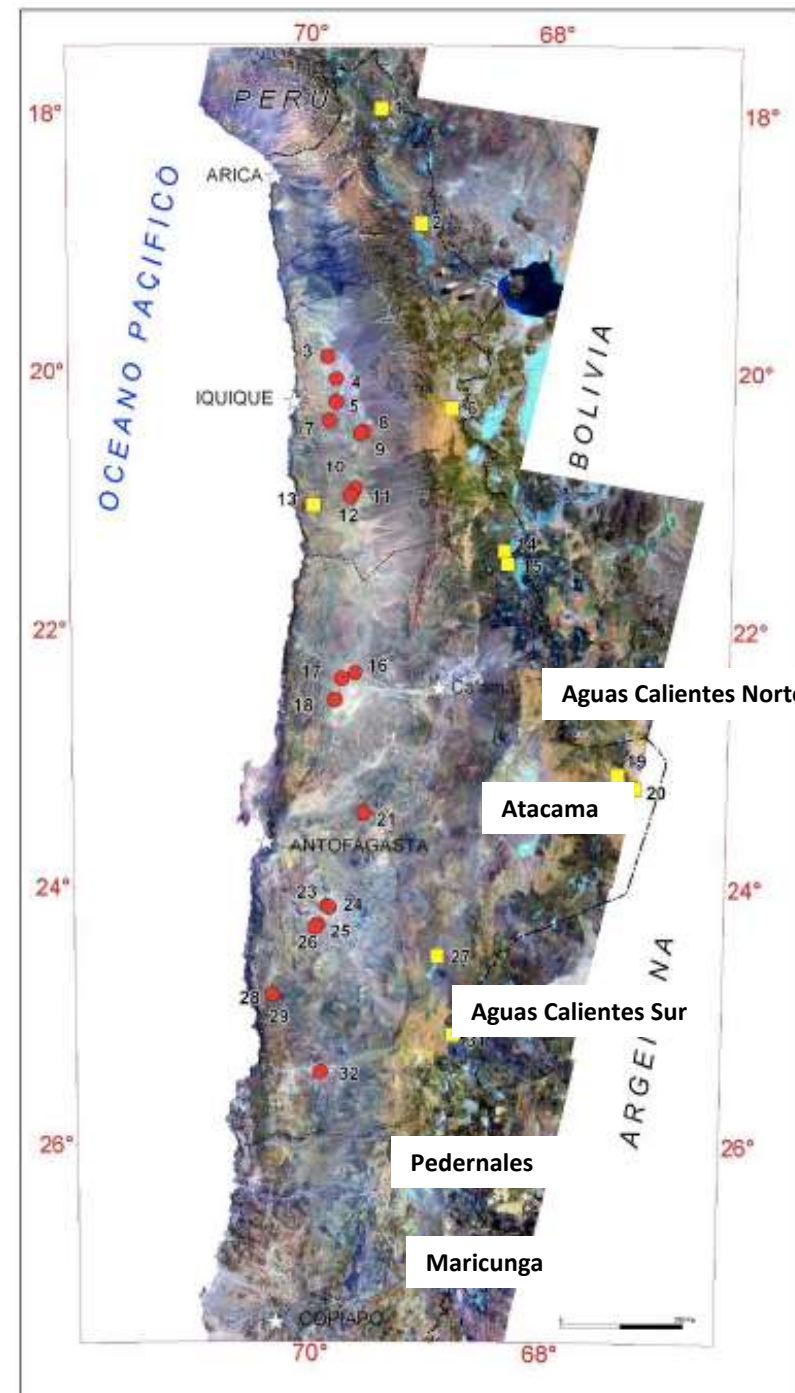
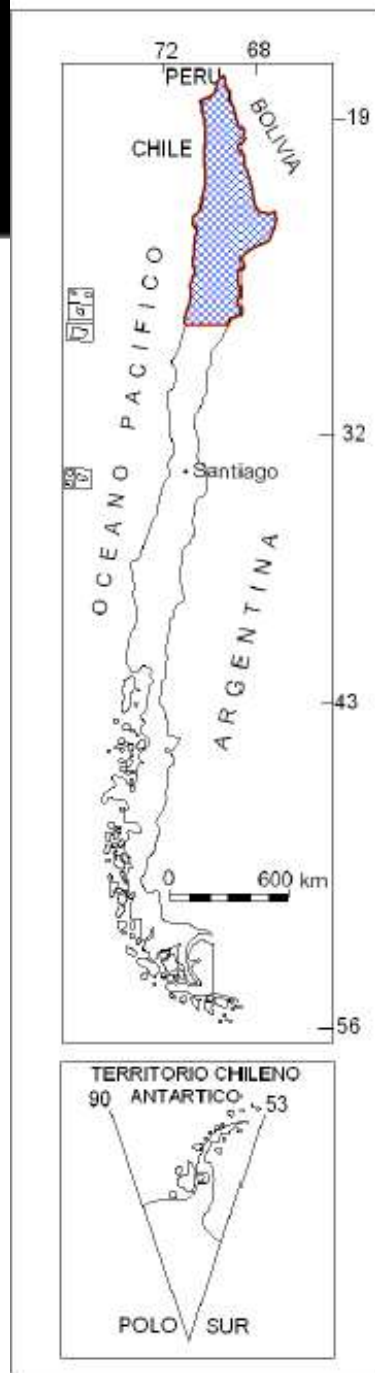
Salars in Chile



SALARES ZONA NORTE								
salar	Li (mg/L)		K (mg/L)		Li/K		Li/Mg	
	Mín.	Máx.	Mín.	Máx.	Mín.	Máx.	Mín.	Máx.
Atacama	>1.000	-	>10.000	-	-	-	-	-
Tara	3	440	6	700	0,07	0,81	0,16	0,97
Aguas Calientes Norte	25	130	6,5	1.020	0,13	0,5	0,1	0,5
Pujsa	1	400	16	3.400	0,04	0,12	0,04	0,26
Loyoques ó Quisquiro	6	425	22	1.650	0,17	3,32	0,13	0,18
Aguas Calientes Centro	5	45	150	1.025	0,02	0,05	0,01	0,03
El Laco	2	32,5	95	1.850	0,02	0,03	0,01	0,06
Aguas Calientes Sur	0,5	17,5	45,5	900	0,01	0,06	0,01	0,03
SALARES ZONA SUR								
salar	Li (mg/L)		K (mg/L)		Li/K		Li/Mg	
	Mín.	Máx.	Mín.	Máx.	Mín.	Máx.	Mín.	Máx.
Aguas Calientes Sur Sur	0,1	8,5	3	1.050	0,03	0,04	0,01	0,09
Pajonales	4,5	57,5	285	2.825	0,02	0,03	0,01	0,03
Gorbea	5	500	25	5.000	0,06	0,2	0,01	0,01
Agua Amarga	13,7	60,5	185	2.035	0,03	0,08	0,01	0,05
La Isla	13	1.150	42	108.000	0,01	0,31	0,14	0,22
Aguilar	350	375	2.600	2.600	0,14	0,14	0,05	0,06
Parinas	7	400	41	6.000	0,07	0,19	0,1	0,11
Grande	4	123	176	2.770	0,0004	0,02	-	-
Pedernales	130	423	-	-	0,07	0,08	-	-
Maricunga	1	1.050	-	-	0,14	0,18	-	-

1. Lithium reserves

Salars in Chile

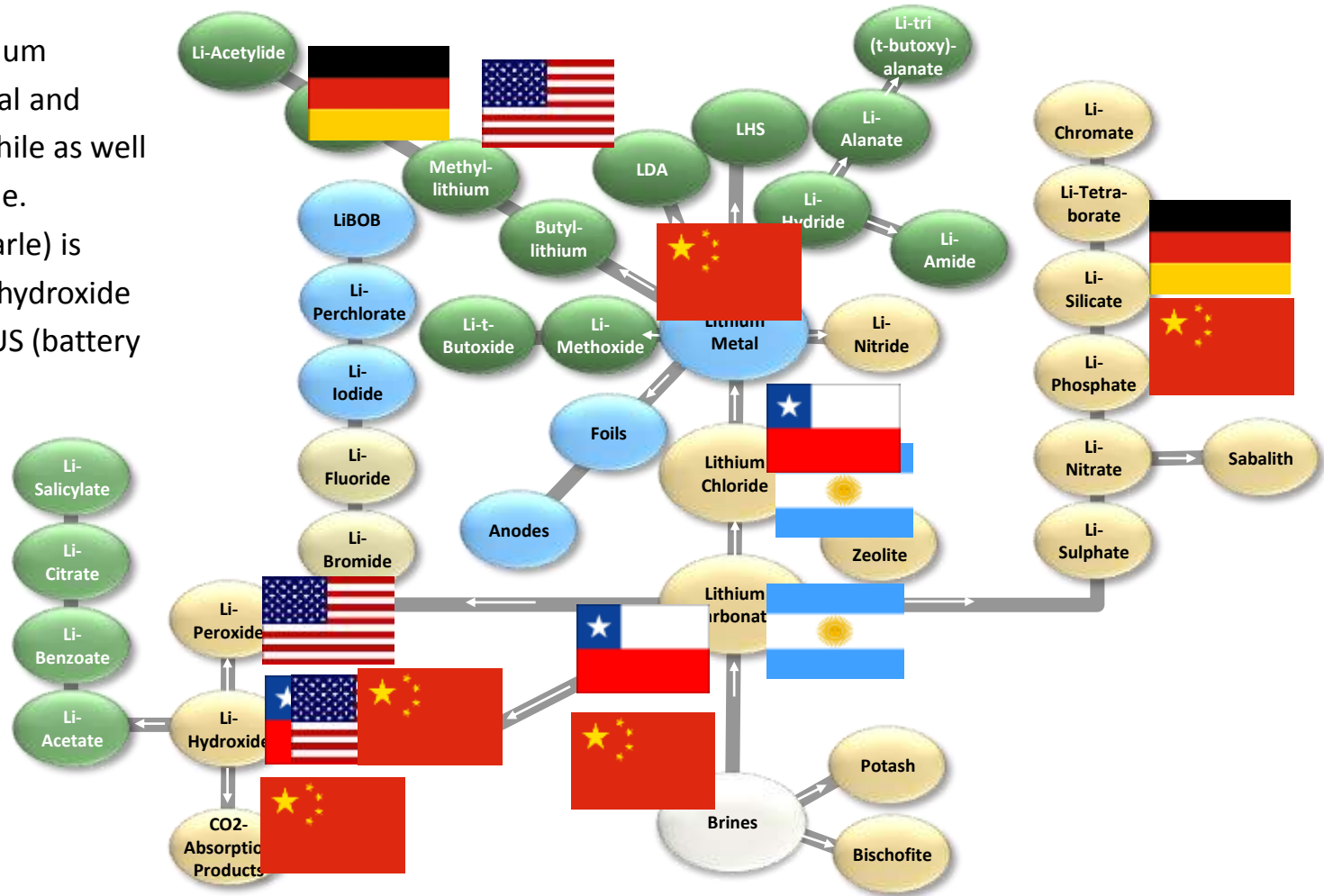


1. Lithium reserves

Chile is the largest producer of basic chemicals, mainly lithium carbonate and it is not integrated into higher value added products...



- SQM produces lithium carbonate (technical and battery grade) in Chile as well as lithium hydroxide.
- Rockwood (Albemarle) is expanding lithium hydroxide production in the US (battery grade).



Source: Rockwood Lithium.



1. Lithium reserves
- 2. Lithium regulation in Chile**
3. Rockwood and SQM: current situation and projects
4. National Lithium Commission

2. Lithium regulation in Chile

Some of history



- In **1965** the Chilean government created the **Chilean Nuclear Energy Commission (CCHEN)**, and in 1975 established lithium as a “material of nuclear interest”, this implied that lithium could not be extracted nor produced without direct approval of the CCHEN. The regulation gave the CCHEN the authority to expropriate all materials considered to have nuclear interest.
- In **1975** **Foote Minerals** and **CORFO** (governmental entrepreneur agency) created the **Sociedad Chilena del Litio (SCL)** (with a 65% and 45% of the ownership respectively) for the exploration and exploitation of the Salar de Atacama’s brine.
- In **1979** the **Chilean government reserved all lithium to Government interest**, with two exceptions: previous existing rights and those rights that were already in process stage the year of the decree’s announcement.
- In **1980** the **CCHEN gave SCL authorization for the production and sale of 200,000 tones of Li**, this authorization included all uses with the exception nuclear fusion. This contract expired on 2001, but it was renewed. If this quota is not reached, the contract is renewed every 5 years until reached.
- In **1983** it came into effect the **Organic Law of Mining Concessions and the new Mining Code**, which confirmed the 1979 decree for all new mining concessions, excluding all the concessions constituted prior this law: CORFO rights in Salar de Atacama and Ana Maria rights in Salar de Pedernales. It also established that the rights that have grantable minerals could be exploited with prior announcement to the authorities if there is any non-grantable mineral.

2. Lithium regulation in Chile

Some of history



- In **1984 SCL started to produce lithium carbonate** for the first time in Chile, with an annual capacity of 13,000 tones. At the end of the 80s CORFO sold its participation to Foote (Foote was bought by Cyprus and then by Chemetall, then by Rockwood and now is part of Albemarle).
- In **1986 CORFO, Amax and Molymet formed Minsal** S.A. (with a participation of 25%, 63.75% and 11.25% respectively) with the purpose of extract minerals from Salar de Atacama brines. The association had a production limit of 181,000 tones as Li in 30 years.
- In **1993** SQM bought Amax and Molymet's lithium business and in 1995 CCHEN confirmed the authorization to **sell lithium with a limit of 180,100 tones or until 2030** (whatever comes first) and CORFO sold its shares to SQM. By the end of 1996 SQM was producing lithium carbonate.
- Early **2012** the Chilean government announced the "Competitive Agenda" on which the opening of the lithium industry was part of several measures that aimed to increase competitiveness in the country. In this context, in June the government called for a **tender for an extraction quota of 100,000 tones of LI** in a period of 20 years.
- **SQM offered US\$ 40.6 million** and was awarded with the quota, but afterwards the bidding was declared null because SQM didn't meet the tender rules as it has pending lawsuits with the government.
 - The Posco Consortium (Posco, Mitsui, Daewoo and Li3 Energy) offered US\$ 17,3 million
 - Chilean entrepreneur Francisco Javier Errázuriz offered US\$ 5,7 million (NX-UNO Peine)

2. Lithium regulation in Chile

Current exploration and exploitation concessions in Chile



- In June **2014** the President of Chile formed a **National Lithium Commission** in order to propose a new lithium policy. The Commission gave the recommendations to the President on early 2015.
- All of **exploration concessions in Chile** currently valid are regulated by the Mining Code of 1983 which states that lithium is not concessible. Only 0.8% of these concessions are owned by the government through Codelco (Salar de Pedernales)
- **Exploitation** concessions represents 34.4% of total concessions and all of them are owned by the Government and are regulated by the old Mining Code (1932)
 - CORFO controls 36.3% of total mining property and covers 54.6% of the Salar de Atacama´s surface.
 - ENAMI controls 3.0% of mining property at the Salar de Aguilar
 - Codelco controls 100% of mining property at the Salar de Pedernales
 - Codelco controls 18% of mining property at the Salar de Maricunga

AGENDA



1. Lithium reserves and supply
2. Lithium regulation in Chile
- 3. Rockwood and SQM: current situation and projects**
4. National Lithium Commission

2. Rockwood and SQM: current situation and projects



Company	Surface	Brine consumption	Lithium capacity	Potash capacity	Contract expiration	Quota
SQM	819 km ²	Up to 1,700 l/s	48,000 tones	2,000,000 tones	2030	180,100 Li
Rockwood Lithium	167 km ²	142 l/s	25,000 – 27,000 tones, expansion to 48,000 – 50,000 tones	135,000 tones	Renewable every 5 years	200,000 Li

- As of December 2014, accumulated lithium production reached around:
 - SQM: 91,000 tones Li
 - Rockwood Lithium: 80,000 tones as Li

2. Rockwood and SQM: current situation and projects

Rockwood Lithium (Albemarle)



In Chile Rockwood Lithium has two projects in order to increase production capacity of lithium carbonate and lithium chloride:

1) Increase the brine extraction at the Salar de Atacama

- The project involves the progressive increase in the extraction rate of lithium brines from the Salar de Atacama to 300 liters per second from the 142 liters per second currently authorized (80,000 m³/year). Originally the Company requested permit to extract up to 600 liter per second. The project considers a total investment of US\$ 17 million.
- The project was presented as an EIA (Environmental Impact Study) to the environmental authority in May 2009 but was rejected in September 2011. The authority stated that the study did not give enough information in order to properly measure the impact that the project would cause in the protected areas.
- In October 2011 the Company appealed the decision to the environmental authority of Antofagasta, whom reconsidered the project and allowed it to re-enter into the evaluation system under specific circumstances.
- The company asked the authority to extend the period for the consolidation of the information until December 2015.

2. Rockwood and SQM: current situation and projects

Rockwood Lithium (Albemarle)



- This project is crucial for Rockwood Lithium, as without the permission to increase the brine extraction rate, the company would not have enough raw material to meet the new production capacity that is building in La Negra.

2) Expansion of the production capacity at the chemical plant, La Negra.

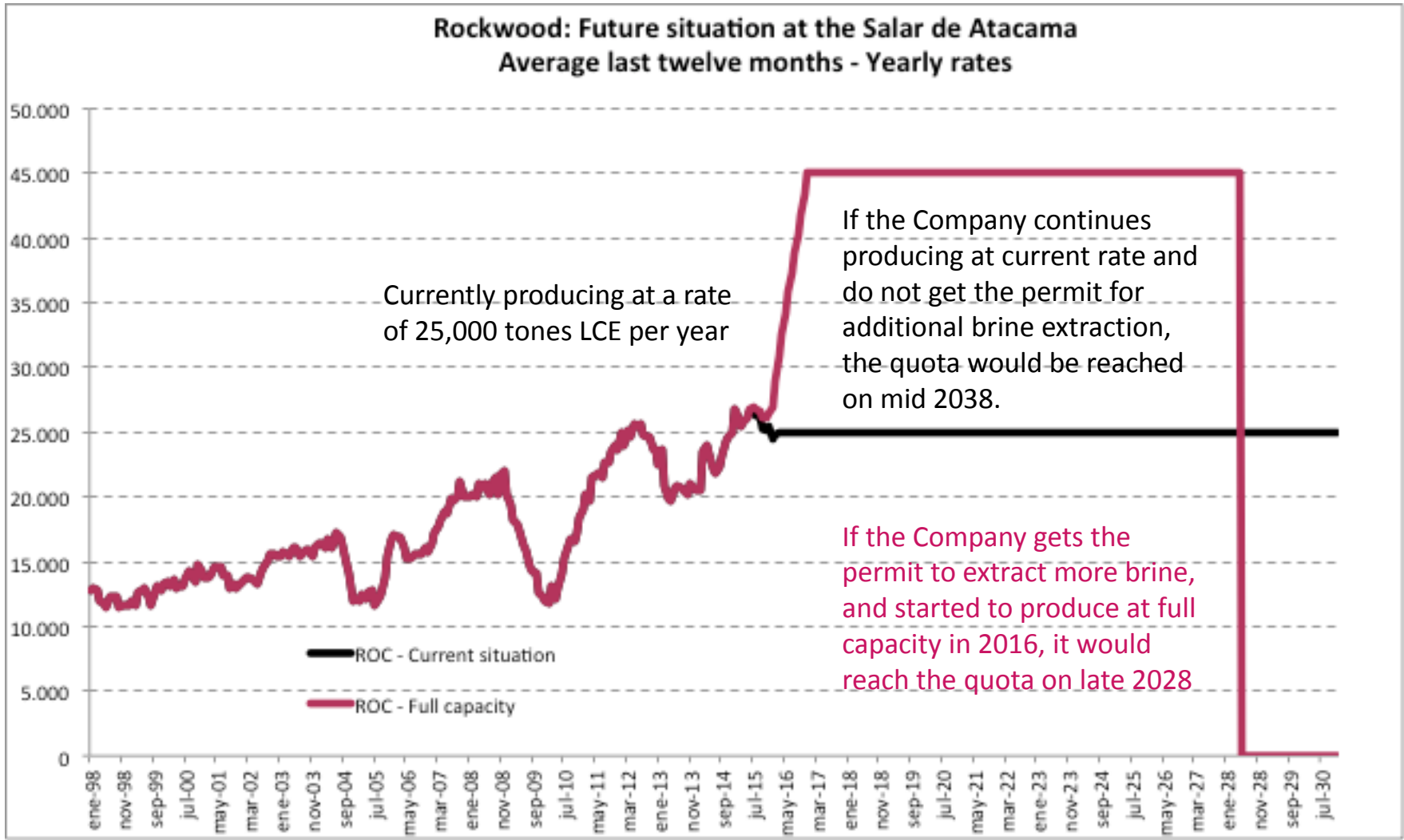
- The project is already approved and construction is finished.
- The project considered increase production capacity from 53 million pounds per year (24,000 tones LCE) to 100 million pounds per year (about 50,000 tones LCE).

Other projects in Chile

- NX-Uno Peine (Salar de Atacama): originally requested permit to extract 230 l/seg, but it is suspended until 2016.
- Li3 Energy (Maricunga): In April 2015 the company announced that it would continue with the next phase of exploration and development work at Maricunga.

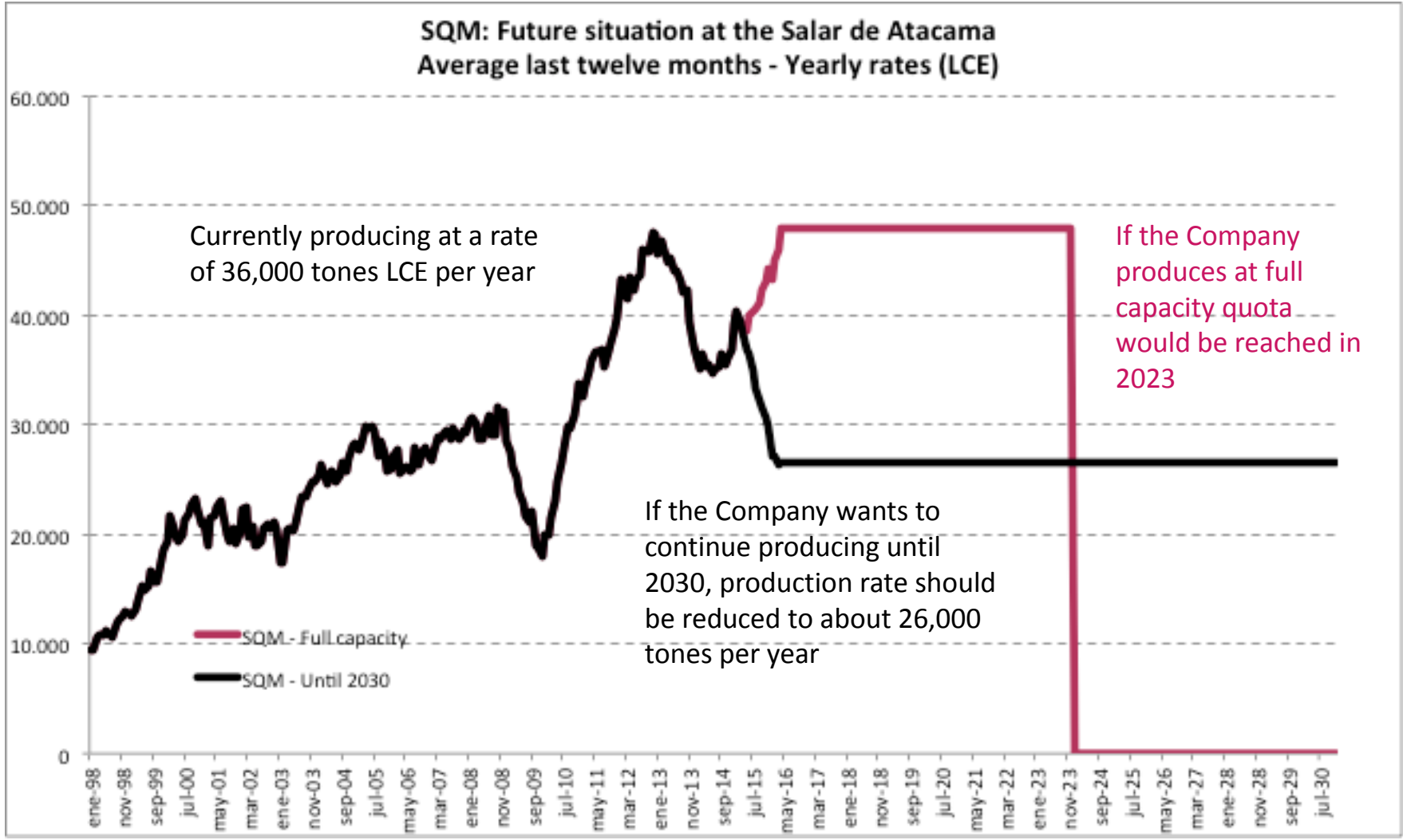
2. Rockwood and SQM: current situation and projects

Rockwood Lithium (Albemarle)



3. Rockwood and SQM: current situation and projects

SQM



3. Rockwood and SQM: current situation and projects

Summary



- Chile currently has about **38% of market share of the total lithium supply**
- In the case of lithium carbonate, **Chilean's market share increases to 60% - 65%**
- In the future new production would enter into the market:
 - Li_2CO_3 : Projects in Argentina (Orocobre/Toyota Tsusho, Lithium Americas/Posco, Galaxy/Sal de Vida, among others)
 - LiOH : China, Nemaska Lithium (Canada), Albemarle (US), Lithium Americas/Posco (Argentina)
- Chilean's market share would be reduced significantly:
 - SQM and Rockwood Lithium: Contracts with Corfo until 2030
 - SQM is in an arbitration process with Corfo
 - Rockwood needs the permit to increase brine extraction
 - The development of a third player in Chile is needed – **National Lithium Commission's proposal**



1. Lithium reserves and supply
2. Lithium regulation in Chile
3. Rockwood and SQM: current situation and projects
- 4. National Lithium Commission**

4. National Lithium Commission



- The National Lithium Commission was formed in June 2014 and started working on early July 2014.
- It was formed by 20 members including economists, lawyers, geologists, representatives of local communities, etc. and was supervised by the Chilean Mining Minister, Ms. Aurora Williams.

Agreements and proposals:

- Salars in Chile are complex-dynamics ecosystems that contains lithium, potassium, boron, among other minerals.
- Any development or project should consider a global view of the Salar, including all of its components and impacts on the environment and local communities. Given that, it is necessary to consider the concept of shared value.
- Lithium continues to be considered as an strategic mineral for the country, not only for its potential in energy applications, but also for all of the externalities that its extraction generates on the Salars. **Given that, the Commission agreed to remain lithium as a non concessible mineral.**

4. National Lithium Commission



Agreements and proposals (cont.):

- The role of the Government should be strengthened:
 - As part of the development of new projects
 - Bringing the conditions and incentives with the objective of giving more value added in the Country: this doesn't mean to produce cathode materials in the Country, but we could advance forward the production of lithium compounds with higher value added and/or advanced in the production processes in order to be more competitive
 - In terms of the knowledge of the specific characteristics and conditions of the Salars in Chile and their reserves.
 - The Commission proposed the creation of a State-owned company for the development of projects through third-parties agreements. The company can also develop a project by itself.

4. National Lithium Commission



Agreements and proposals (cont.):

These are a long-term proposals....but in the meantime?

- The Commission recommended the President to mandate Codelco to start developing Maricunga with a third party, and after a State-owned company is created Codelco would transferred the property.
- SQM and Rockwood are excluded of these proposal (for now) as both companies have current contracts with the Government of Chile.
- The President received this proposal in January 2015, and it is expected that sooner than later she should be publicly announcing a new lithium policy.

Many thanks for your attention.

Please ask a copy of this presentation at info@signumbox.com



Fidel Oteíza 1921, office 1001 – Providencia, Santiago, Chile

info@signumbox.com

562-29460407

569-66690429

www.signumbox.com