

PRODUCE **GREEN** AND **PURE** LITHIUM PRODUCTS FROM YOUR BRINES!

*Seminar, lithium extraction processes
Santiago, Chile, October 10th 2019*

Guillaume de Souza, Founder

Adionics' Temperature Swing Salt Absorption (TSSA)
Technology for the valorization of dissolved compounds.

GO ON LITHIUM MARKET WITH ADIONICS' GREEN TECHNOLOGY

- Adionics based in Paris – France
- Our DNA : Green and sustainable technology development

No Brine use

No reagents

Water recycled

Low energy

- Adionics extracts directly LiCl from your brines!
- High Lithium recovery and fast process for industrial use
- International Recognitions:

Global
Cleantech **100**

2017



2018

SOLARIMPULSE
FOUNDATION

2019

HOW DO WE DO? VIA OUR TSSA TECHNOLOGY

Patented

- TSSA = Thermal Swing Salt Absorption

Temperature difference is the process driving force.

Salt is absorbed within a liquid, **Flionex**®.

- **Flionex** allows selective salt extraction → Lock and Key model

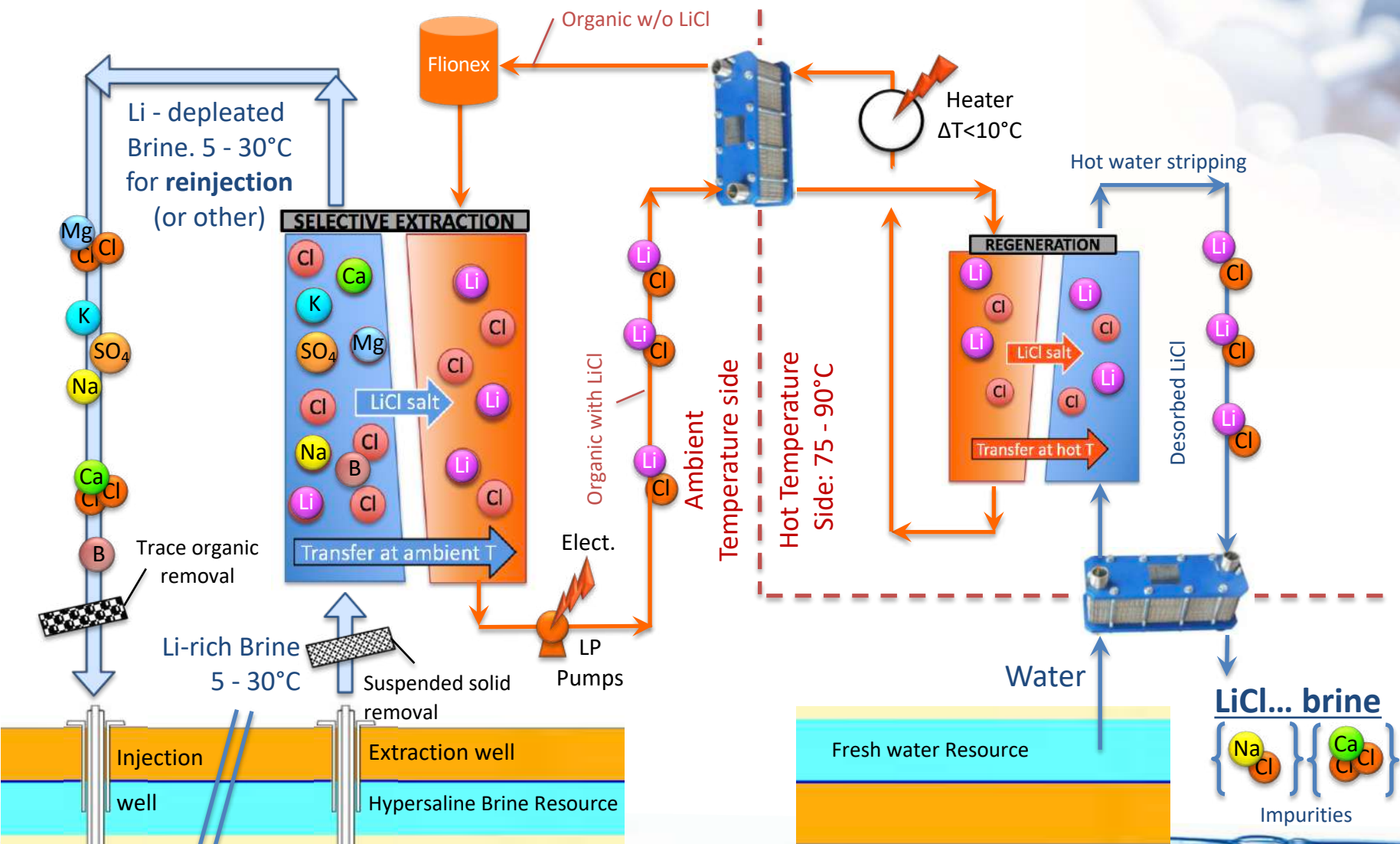


2015: 1st m³ of Flionex



- Associated to a **thermal process**, **AquaOmnes**® → Uses low grade heat (<100°C) to maintain thermal cycle.

TSSA LITHIUM PROCESS BASIC SCHEME

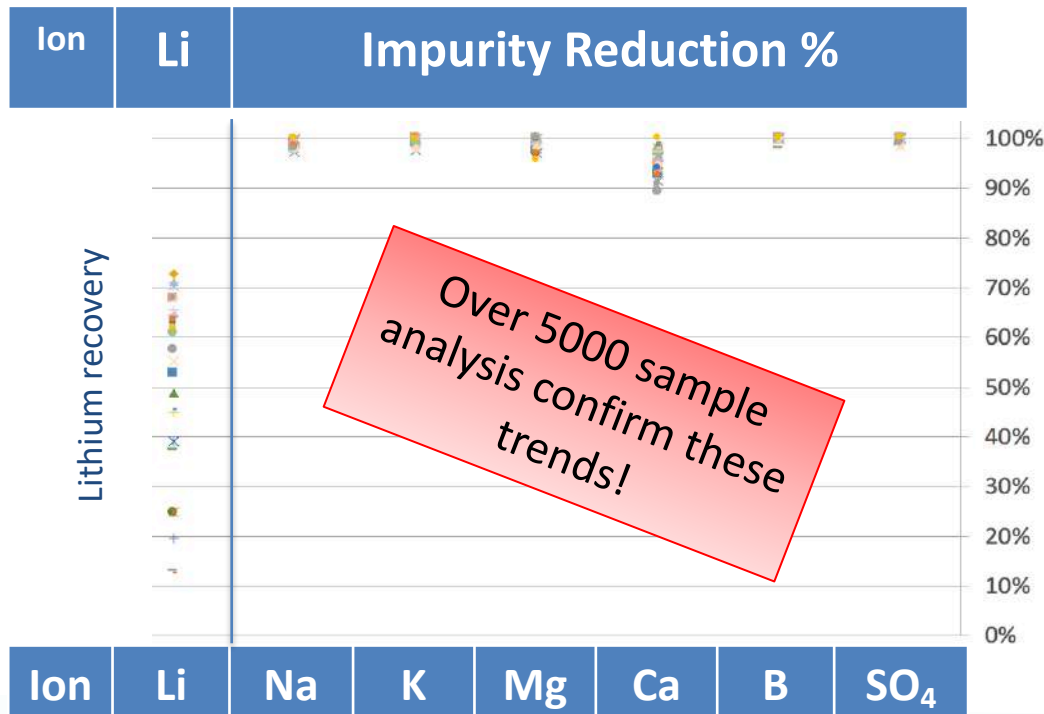


	Tested brines	Brine origins	Concentrations	Results
Feasibility studies	> 30 on natural brines from clients	Argentina, Bolivia, Chile, Europe, USA, Russia, ...	[Li] from 100 to 20,000 mg/L	Selectivity, Efficiency
Pilot studies	4 laboratory pilot runs tested on clients brines	Argentina, Chile, USA,	[Li] → 200 and 2,000 mg/L (continuous flow 2L/h of brine)	Production of LiCl
Design Examples	LiCl production yield $\geq 90\%$ (Li recovery from feed brine) 0.01 to 0.1%wt CaCl_2 , LiCl purity from 50%wt to 99%wt (NaCl as impurity)			



REMARKABLE SELECTIVITY

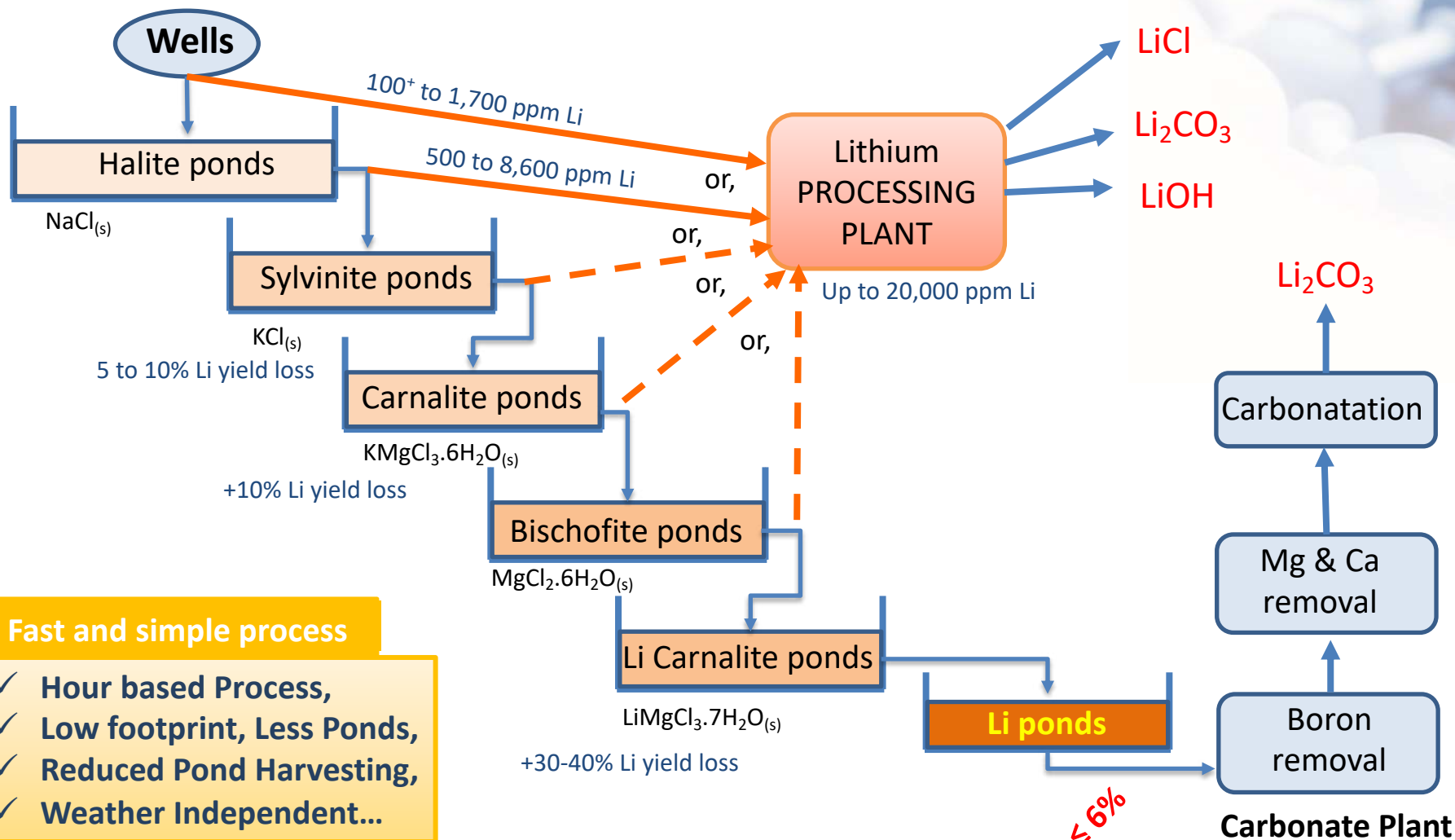
- High extraction of lithium,
- 0% of extraction on Magnesium, Boron, Sulfates, Potassium...
- Very limited affinity for Sodium and Calcium.



RESULT: Direct LiCl extraction and production with 99+% LiCl purity is expected.

- **Compiled data of Lithium Selectivity**
 - 1 vol. Brine / 1 vol. Flionex at 20°C

TSSA LITHIUM HAS LARGE APPLICABILITY WITHIN SALARS



A PROVEN TECHNOLOGY

- 2015 – 2016

Ghantoot, Abu-Dhabi

- 2017 – 2019

Martigues, France

- 2019 – 2020

→ First Worldwide

→ Optimization

→ Precommercial
on Lithium



- NaCl extraction



- NaCl extraction



- Next step:
LiCl extraction
demonstrator!

MARTIGUES' MIXER-SETTLER DEMONSTRATOR

2018/19



Cuve d'eau filtrée et recyclée



Conteneur post-traitement : filtre à sable et coalesceurs



Étage d'extraction



Cuve de stockage de Flionex®



Vue extérieure du pilote

Desalination of
50-100 m³/d
feed seawater.



Vue intérieure du conteneur d'extraction



Échangeurs de chaleur



Étage de régénération

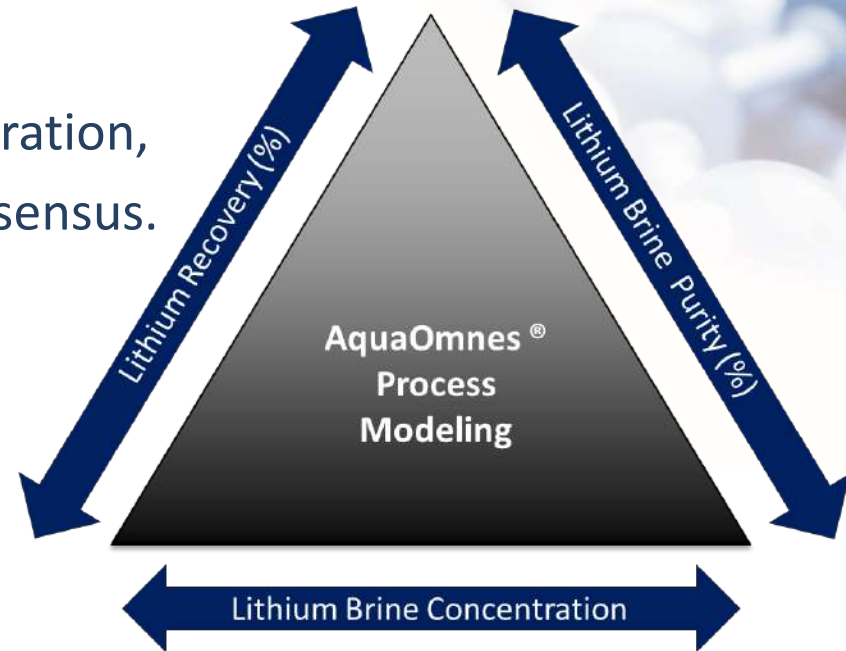
EDF Power Plant



Vue intérieure conteneur régénération

QUICK ON-SITE IMPLEMENTATION POSSIBLE

- **Well known design parameters**
 - Li-recovery / Li-purity / Li-reconcentration,
 - The best economic solution is a consensus.
- **Ready to go :**
 - Partners For Project Development and Operation in Chile,
 - Partners for large scale Flionex Production,
 - To Design, Build & Operate Liquid-Liquid Extraction Plants.



TSSA LITHIUM ADVANTAGES



Go to green process

Efficient

Li selective, No impact of Magnesium, Sulfates or Boron, Li reconcentration factor: x 5 to 20, Proven technology.

Flexible

Applicable to **all brines' chemistry** & Li concentrations (> 100 mg/L), **Adjustable** process, Pressure independent.

Green & Safe

Low energy and water use, no brine consumption, Organic free brine reinjection or reuse.

Sustainable

Water conservation, Stable Flionex, no environmental impact, well-known mixing/settling/liq-liq equipments.

Limited Logistics

Easy implementation, **no reagent, very close to no waste,** limited infrastructure, less nuisances (transport, manpower...).

CONCLUSION

Let's produce Green lithium together!

THANKS

bpi**france**



ENGIE



QUESTIONS ?



ADIONICS' OFFER: VALORIZE YOUR DISSOLVED COMPOUNDS

NaCl: 0.1 \$/kg

KBr: 3 \$/kg

LiBr: 9.5 \$/kg

KI: 50 \$/kg

Sugar

Drugs...

INCREASED ADDED VALUE

Anti Freeze

Other...

NaBr: 2.5 \$/kg

LiCl: 6 \$/kg

NaI: 40 \$/kg

LiI: 150 \$/kg

Amino acids

- System Design study: Lab tests and process modeling
- Design and build of containerized systems on « small to medium » demonstration units and industrial plants,
- Basic Design, System Development, PEA, FS, Quality Control, Start-up Consulting & Training on large plants,
- Flionex supply,
- Operating assistance :
 - ✓ On line operation follow-up & support,
 - ✓ Flionex® (solvent) samples follow-up & analysis,
- Fees for technology use as a service for green mining.



Timing : 8-10 months

Guillaume de SOUZA, Founder
guillaume.desouza@adionics.com

Head Office, R&D
2. Rue Henri Dunant
94320 Thiais – France
Tél : +33 1 49 78 13 39