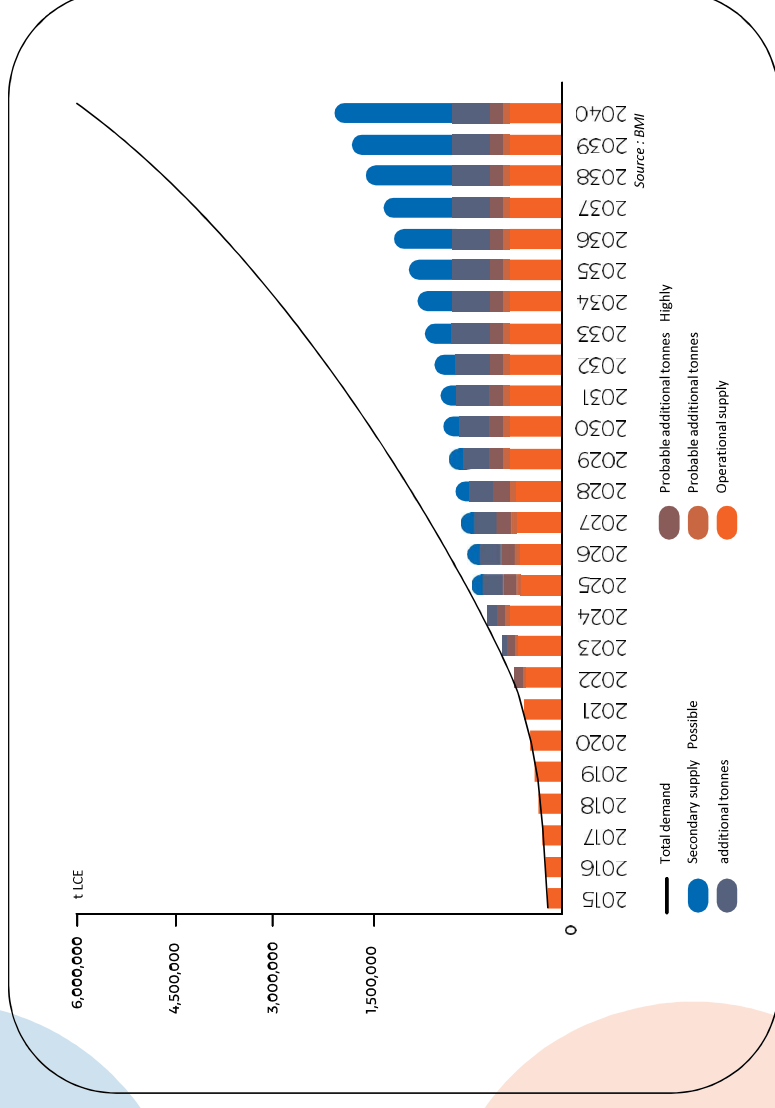




TOWARDS THE INDUSTRIALIZATION OF CLEAN LITHIUM EXTRACTION

EFFICIENT SUSTAINABLE AND PROVEN TECHNOLOGY

LITHIUM MARKET CHALLENGE : NEED TO ACCELERATE



Today Lithium need is driven by **Electric Vehicles (EV) (54%)**

Projections : global Lithium **demand x10 by 2030**

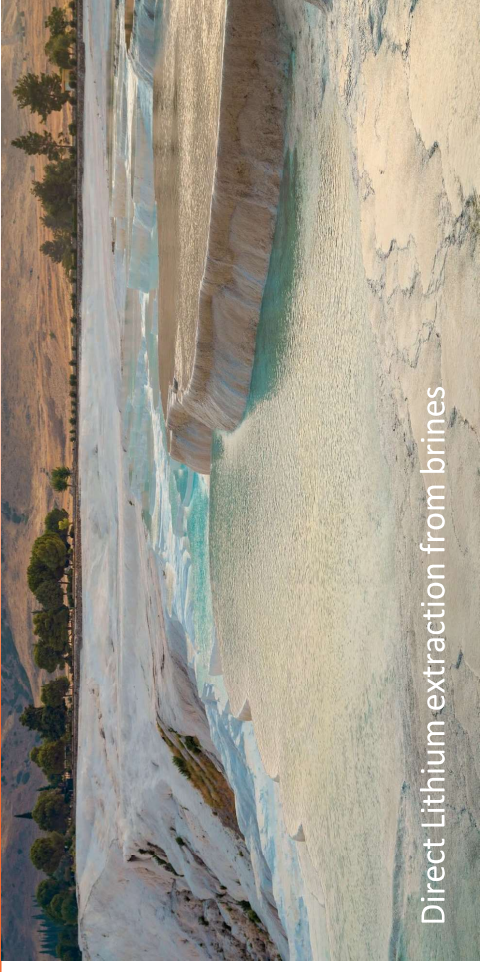
Li2 CO3 demand to be **increased 23% by year**

LiOH demand **up by 33% per year**

New mining projects currently foreseen will not be sufficient to fill the gap

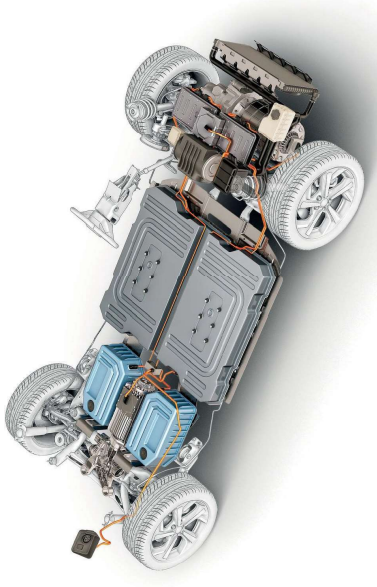
OUR MISSION : MOVING TO THE FUTURE with a GREEN TECHNOLOGY

- Accelerate world Lithium Production to match a very fast-growing demand
- Maximize Lithium recovery from brine with the highest purity
- In a sustainable way



Direct Lithium extraction from brines

Lithium Recycling from Batteries



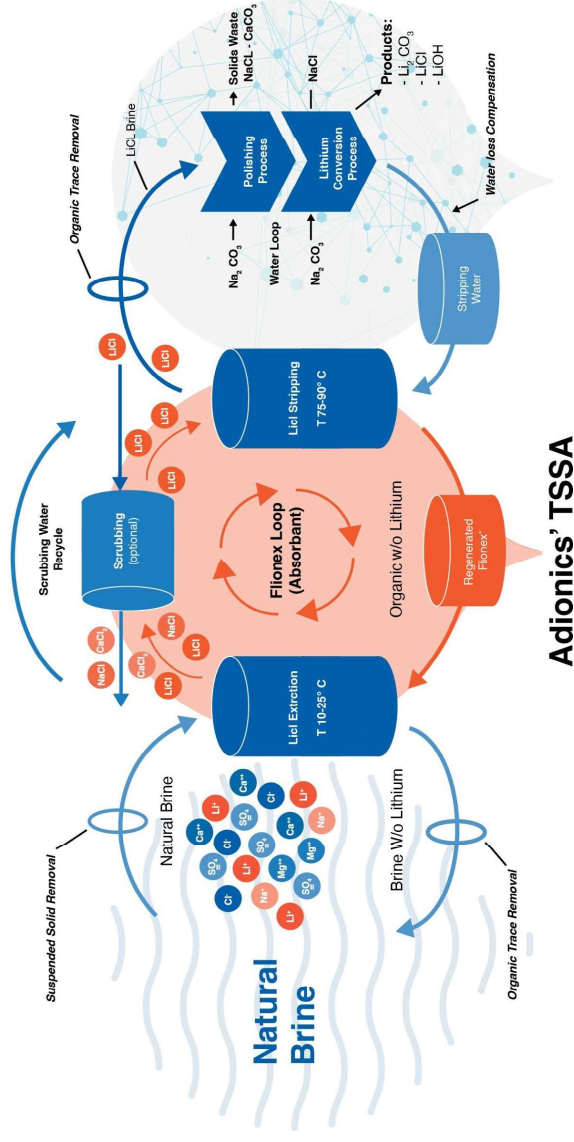
A SUSTAINABLE DISRUPTIVE TECHNOLOGY

• A CONTINUOUS FLOW 3-STEP PROCESS

- Extraction at ambient temperature
- Scrubbing
- A Simple regeneration at higher temperature **80°C**

• A patented liquid extraction media : **THE FLIONEX**

- Classical industrial equipment for liquid-liquid extraction
- Product : High Yield & High Purity Lithium Chloride brine



ADIONICS' ADVANTAGES

PRODUCTION

- **High Li yield (> 90%)**
compared to conventional solar ponds operation
- **Very high selectivity of extraction**
enables production from difficult resources (No extraction of Boron, Magnesium, Potassium, Sulfates)
- **Simplified post-processing**
leading to high end product purity
- **Unique range of application :**
from 50mg/L lithium to 80g/L lithium

ENVIRONMENT

- **No chemical reagents**
are required in ADIONICS process at any step
- **No pH modification**
along the process
- **Potential of re-infiltration or re-injection** of Li-depleted brine
- **No pre-treatment of brine**
- **Limited consumption of freshwater**
- **Very low energy consumption**
- **Very limited footprint**

FINANCIAL

- **The Lowest CAPEX and OPEX**

ADIONICS' : READY FOR INDUSTRIALIZATION

PROCESS PERFORMANCE MODELLING

- **A mathematical model** to predict performance (Yield, Purity, CAPEX & OPEX)
- **Preliminary process optimization** to reach high purity Lithium Chloride, Lithium Carbonate, Lithium Hydroxide

CL1 – PROOF OF CONCEPT

- **A ton per year LiCl** continuous extraction lab unit Lithium content in feed from 20mg/L to 50 000+ mg/L
- Location: Adionics HQ, **near Paris**, France.
- Deliverables: **LiCl concentrated brine** samples ; Validation of performance



CL15 - DEMO PLANT



- Clean Lithium Pilot: capacity of **15t / LiCl per year**
- **Battery** grade from a large range of brines from **250mg/L up to +40g / L**
- Two availabilities from June 2022: **Europe** and **Latin America**
- Ready for PFS study

Clean Lithium 250

CL250 PRE-INDUSTRIAL PLANT : RUNNING & PERFORMING

- First pre-industrial site with a capacity of 250t / year
- To demonstrate in real conditions, the major breakthrough on the market in terms of product quality, productivity, production costs and the environmental aspect
- High Purity, High Yield
- Ready for DFS
- Aimed to process 24 / 7



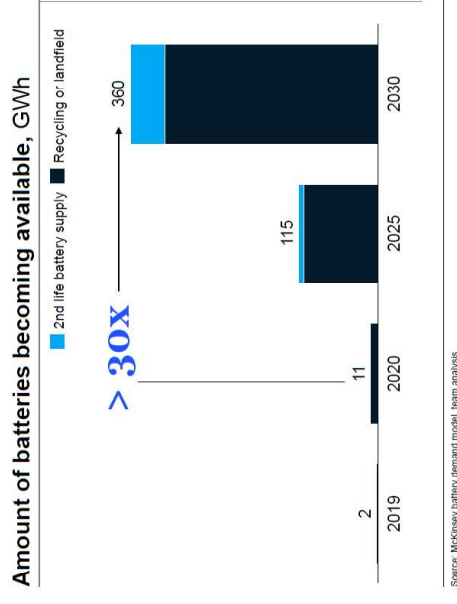
BUSINESS COLLABORATION : FROM RAW BRINE TO LiOH



- A CLEAN LITHIUM 15 pilot Plant installed in K-UTECH premises in Germany to offer a full value chain from Natural brine to LiOH / Li₂CO₃ conversion battery grade
- The collaboration between Adionics - K-UTECH will allow **Synergy effect**, taking advantage of complementary mutual infrastructure - **Cost saving Pilot Plant test runs** in controlled standardized environment for **Process optimization** and development
- **Technical Center K-UTECH:**
 - 70 years' experience with Salt processing and process design
 - 1500 m2 Technical Center with Pilot Plant Facilities
 - Qualified Specialists in Process Development Team
 - Brine and Mineral characterization in an EN ISO 17025 accredited laboratory

LITHIUM BATTERY RECYCLING: A MARKET PERSPECTIVE

- By 2030, batteries available for 2nd life will increase over 30x
- Major Assumptions
 - Most of passenger vehicles are scrapped at the end of life (approx. 13 yrs) with battery pack installed when produced
 - Only 5% change battery after 7 yrs
 - Commercial Vehicles substitute the battery pack every 5 years and are scrapped after 20 yrs
 - Consumer electronics have the fastest turnaround (approx. 3 yrs) but with a very low collection yield



Data and analysis by BNEF, Roland Zenn, and Ratel Consulting LLC

VALORIZING LITHIUM BATTERIES RECYCLING

THE FLIONEX® DLE TECHNOLOGY

- « **Early Stage Lithium Recovery** » (**ESLR**) : confirm the POC on various Black Mass (BM) samples and evaluate the CAPEX/OPEX
- « **Late Stage Lithium Recovery** » (**LSLR**) : identify improvements after first POC to facilitate the LiCl extraction in final effluents (most performing additives sources, new grade of Flionex®)

ADIONICS' MARKET FOCUS



Natural Sources

SALARS BRINES

Lithium triangle in LATAM ,
USA From 150 mg/L up to 3g/L of Li.

GEO THERMAL LI RICH BRINES

Europe & USA
From 40 mg/L of Li.

PRODUCED WATER

FROM O&G
Large resources
Low lithium content



Secondary Sources

LITHIUM BATTERY RECYCLING

Market Potential up to 1/3 of
yearly lithium consumption

Recycling from battery solution
or from black mass (after leaching)
Europe & USA Gigafactories

INDUSTRIAL EFFLUENTS URBAN MINING

