COPPER AT OUR CORE

ATLANTIC COPPER
Una compañía del grupo Freeport-McMoRan

FREEPORT
FOREMOST IN COPPER

# *Atlantic Copper – Water Footprint Reduction Challenges in a Primary Copper Smelter*

*INTERNATIONAL COPPER STUDY GROUP*

**Joint Study Groups' Seminar**

*14 OCTOBER 2026*

FCX LISTED NYSE

ICMM Member

THE COPPER MARK — All Operating Sites

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## INDEX



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A Freeport-McMoRan Company

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- Atlantic Copper
- Water challenge for a copper smelter.
- Innovation project developed
- Conclusion

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- Spanish Company belonging to the leading US natural resource corporation Freeport-McMoRan
- Copper smelter & refinery in the port of Huelva, south-west Spain, since 1970.
- Produces high-grade refined copper and sulfuric acid from copper concentrates from ore mined in various parts of the World
- Spain´s first refined copper producer and Europe third largest
- The direct, indirect and induced employment generated by the Company is estimated at 3,000 jobs

3

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# Atlantic Copper: A Point of Reference

## #1

**In copper production in Spain and 3rd smelter in Europe**

**In sulphuric acid prodution** in Spain

## LEADERSHIP

**In energy efficiency in the world**. One of the lowest energy consumption per ton of concentrate

**In exports** from the southerm half of Spain

In female leadership (58% of women in Senior Management & 33% in Line Management)

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# Our History

History → Future

## 1970 – 1993

### Huelva Smelter is born

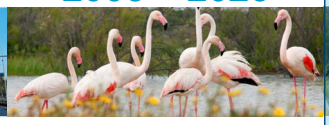
- Technology step change to increase the initial 50,000 tpy to 150,000 tpy
- Flash smelting technology introduced in 1975.

## 1993 – 2004

### FCX acquirees AC in 1993

- Expansion Project from 150,000 tpy to 300,000 tpy
- Permanent Cathode Technology
- Efficiency and quality breakthrough

## 2005 – 2025



### Performance Towards Excellence

- Significant Safety improvements
- Energy: world leadership
- Environmental: beyond regulations
- People: Top Employer Company

## 2026 – 2030

### Innovation & ESG Oriented Strategy

- Safety “0” incidents
- Shift to Renewables
- Decarbonization
- Sharp reduction of Water footprint
- CirCular Project

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# Production Capacities

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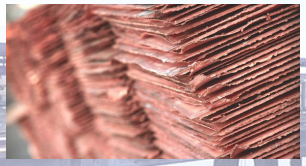
DRY COPPER CONCENTRATE
**1,100,000 t**



**Copper** → 300,000 t Anodes
⇩
286,000 t Cathodes

**Precious Metals** → Anode Slimes (Gold, Silver, Palladium, Platinum)

**Others** →
- 1,100,000 t Sulfuric Acid
- 650,000 t Iron Silicate
- Gypsum, Copper Telluride, Ni carbonate

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## Understanding Water Challenges in Copper Smelting Operations

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# An ambitious agenda for 2030

SUSTAINABLE DEVELOPMENT GOALS

***Metals industry contribution***

**Optimize water consumption and reuse**

6 CLEAN WATER AND SANITATION

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

SUSTAINABLE DEVELOPMENT GOALS

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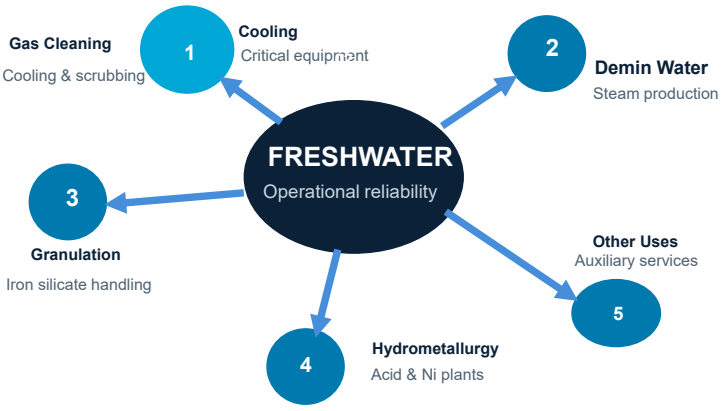
# Where is water used in a Copper Smelter?




**ESSENTIAL OPERATIONAL USES**

**THE CHALLENGE** Maintain operational reliability while reducing the freshwater footprint.

**TOTAL FRESHWATER CONSUMPTION**

**1.7**

**MILLION m³ / YEAR**

EQUIVALENT TO

**40,000**

**PEOPLE**

average annual water consumption

THE SCALE OF THE CHALLENGE

17

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# Reducing Our Water Footprint: From Challenge to Action

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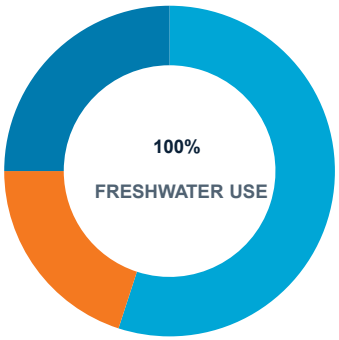
**FRESHWATER GOES....**




**55% Evaporation & Dissipation**
Cooling towers and granulation

**20% Process Use**
Acid, demineralized water and hydrometallurgy

**25% Effluent Generation**
Gas cleaning and process circuits

**OUR STRATEGIC PRIORITIES**

**01 REDUCE**
Overall freshwater consumption

**02 RECOVER & REUSE**
Water from process effluents

**Our goal: less freshwater intake, greater reuse and a more resilient smelting process.**

17

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# How We Are Addressing the Water Challenge

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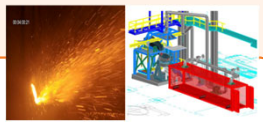
**Two project pathways: reduce freshwater demand and recover water from effluents**

## REDUCE WATER CONSUMPTION
Avoid or eliminate water use at source

**01 New SCEF Ceramic Filter**
Dry gas cleaning technology that eliminates water use in the former wet scrubbing process.



**02 WhISPER**
Waterless iron silicate production using an innovative air-based process.

**LESS FRESHWATER CONSUMPTION**

## RECOVER WATER FROM EFFLUENTS
Treat, recover and return water to the process

**3.1 Phase I: New Wastewater Treatment Plant**
Improved treatment and partial reuse of process effluents.

**3.2 Phase II: REDSCOPE**
Advanced effluent recovery designed to maximize water reuse.

**MORE WATER BACK INTO THE PROCESS**

17

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# New SCEF Ceramic Filter

REDUCE WATER USE

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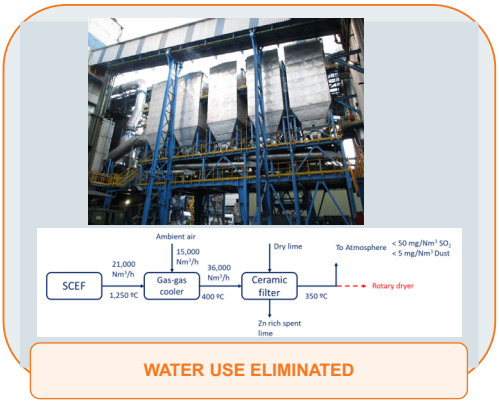
## Replacing wet gas cleaning with dry filtration eliminated water use in the SCEF gas-cleaning process




WATER USE ELIMINATED

**REGULATORY DRIVER**

Stricter BAT dust-emission limits for the non-ferrous metals industry.

**INNOVATIVE TECHNOLOGY CHANGE**

Wet scrubbing replaced by ceramic filtration and dry lime injection for $SO_2$ removal.

**WATER BENEFIT**

The dry gas-cleaning system no longer requires water, reducing the smelter's freshwater footprint (~94,000 m3/year water consumption reduction)

**PROJECT JOURNEY**

| 2015–2016 | 2017 | 2018 |
|---|---|---|
| 1 Semi-industrial testing | 2 Feasibility & basic engineering | 3 Commissioning |

**One technology change delivered both regulatory compliance and a lower water footprint.**

**STATUS** IMPLEMENTED AND OPERATIONAL

18

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WHISPER

Waterless Iron Silicate Production with Energy Recovery

REDUCE WATER USE

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**NEW TECHNOLOGY**: Innovative and sustainable pyro-metallurgical system to produce iron silicate with the use of air instead of water (current technology)

**THREE POTENTIAL BENEFITS**

**WATER**
Significant reduction in freshwater consumption

**ENERGY**
Recovery of heat from molten iron silicate (metallurgical slag)

**PRODUCT**
Improved iron silicate quality and new applications

**PROJECT JOURNEY**

**2019–2022** EIT RawMaterials is supported by the EIT, a body of the European Union

Pilot tests validated air-based iron silicate atomizationpotential commercial applications.

**2023–2025**
Pre-feasibility studies (SENER, 2023) assessed a full-scale plant.

**BROWNFIELD INTEGRATION**

Deployment remains under assessment due to investment requirements and integration complexity.

CAPEX: *60-71MM€*

*Potential energy (~50 GWh/yr net, 67 GWh/yr gross) and water (~622,000 m3/yr net) savings*

**High water-saving potential, subject to technical and economic feasibility.**

**STATUS** UNDER FEASIBILITY ASSESSMENT

19

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# RED SCOPE

## Recovery of Effluent Discharge for Sustainable Copper Processing in Europe

RECOVER & REUSE

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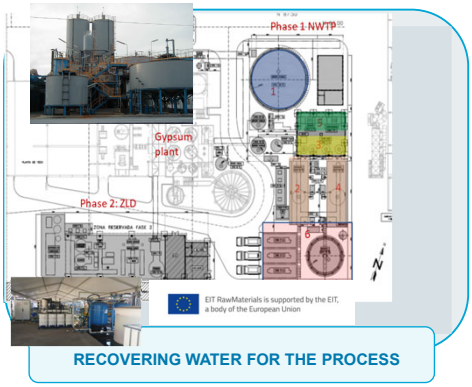
**An advanced treatment solution designed to recover treated effluent and return water to the production process.**




RECOVERING WATER FOR THE PROCESS

### PROJECT JOURNEY

**PHASE I: New Wastewater Treatment Plant (2022)**

Industrial plant using mature, proven and standard technologies such as physicochemical treatment and ultrafiltration.

**PHASE II: 2018–2021**
**Innovative pilot plant validation**

Pilot results supported the development of an industrial-scale recovery solution: reverse osmosis, evaporation and crystallization.

**ZLD plant construction: 2024–2026**

Commissioning of the full-scale plant is in progress and will enable the **recovery of 150,000–350,000 m³/y as process water.**

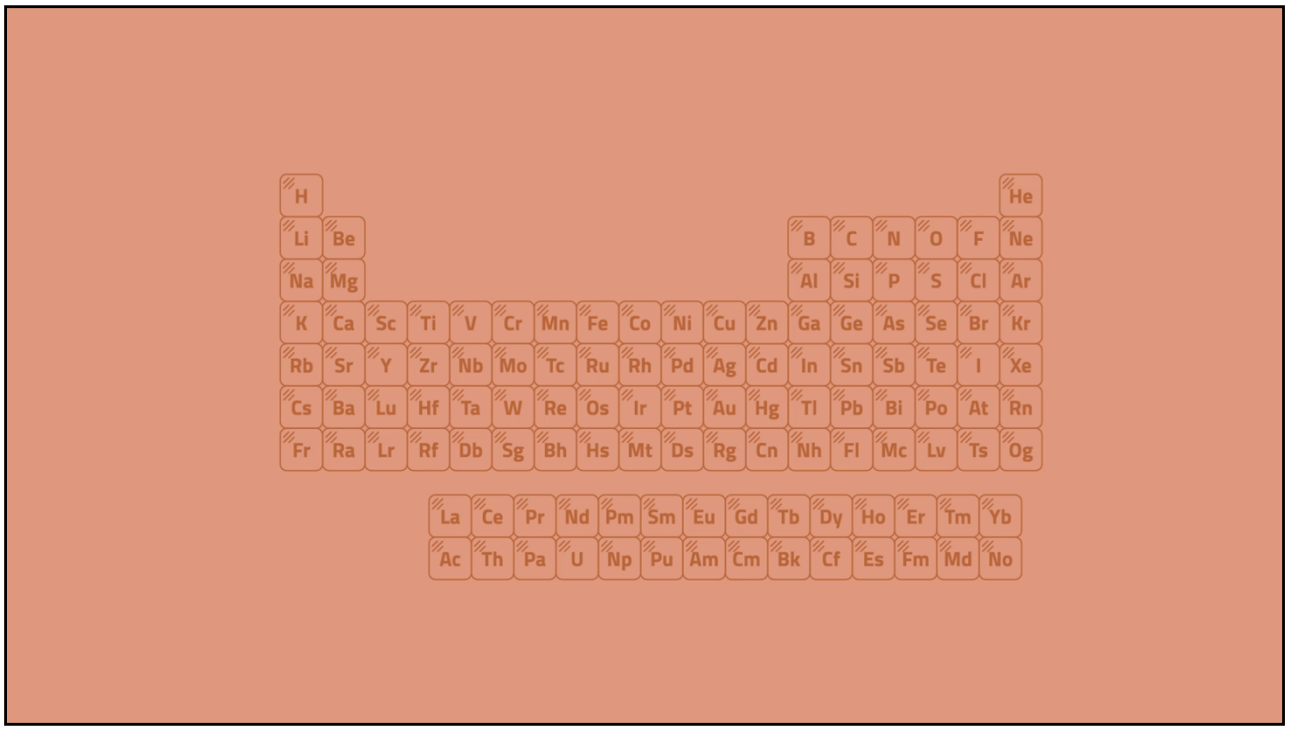
### KEY CONSIDERATIONS

A **key challenge** is finding the optimal balance between water recovery, energy use, brine management, waste generation and operating costs. A **pragmatic and sustainable solution** has been adopted, **maximizing water recovery flexibility while supporting our commitment to reducing water consumption** in a water-scarce region.

The Phase II plant was designed as ZLD; given these considerations, Atlantic Copper will operate it under a **flexible operating model**, recycling **30–70% of the water** and discharging the brine in compliance with our Integrated Environmental Permit (AAI).

**The goal is to find the most sustainable balance between water, energy and residual waste.**

**STATUS** IMPLEMENTED IN PHASES • FULL DEPLOYMENT UNDER EVALUATION

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# Conclusions

**Water is a strategic resource**

Water scarcity is a global challenge and a key priority for the copper smelting industry.

**Circular Economy is in our DNA**

Reduce, Reuse, Recover, Recycle and Reprocess guide Atlantic Copper's water strategy.

**Sustainability requires balance**

Water recovery must be weighed against energy use, brine management and waste generation.

⚠ **Cross-media effects** must be considered when designing, building and operating a ZLD plant: **hence our flexible operating model**.

**Innovation is essential & Collaboration accelerates progress**

Industry, technology providers, research centers and universities must work together

⚠ **Public institutions** may not innovate on our behalf, but they **play a crucial role in supporting and facilitating the innovation journey** (e.g., EIT RawMaterials).

**Contributing to SDG 6 by improving water efficiency**

Atlantic Copper: Two EMAS objectives focus on lower water consumption and increased water reuse

**In a high water-stress region, water efficiency is both an environmental responsibility and a strategic business imperative.**

2018

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# THANKS

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# ANNEX

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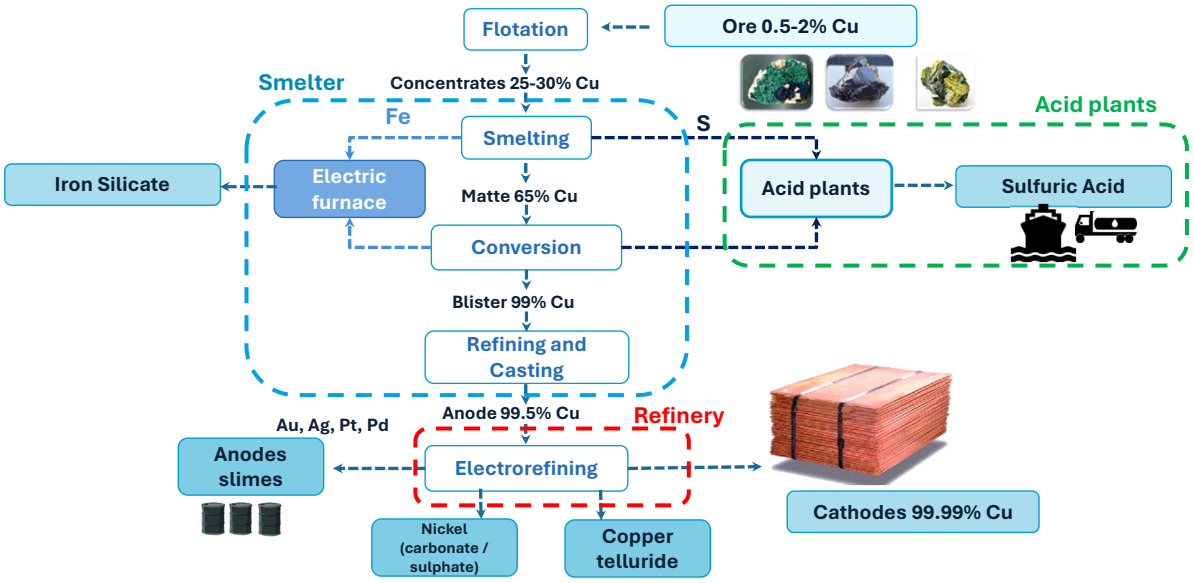
# The Process

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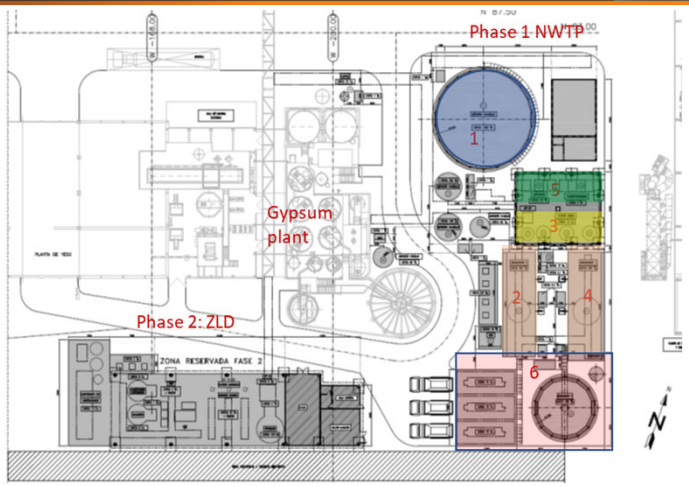
# Layout: current strategy plant operation

## Phase 1: New WWTP

1. Homogenization of the basic and neutral wastewater streams in a 1,500 m³ tank
2. Pretreatment together with the effluent of the gypsum plant. This is a physicochemical treatment at pH 10-11.
3. Sand filtration and reuse of part of the pretreated effluent in the Smelter
4. Polishing. This is a physicochemical treatment at pH 8-9.
5. Ultrafiltration of the treated effluent as a final step before its discharge
6. Dehydration system of the sludges produced in the treatments.




## Phase 2: Efluent recovery plant (ZLD)

Under construction and will allow the recovery of 150.000-350.000 m3/y as process water

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# Committed to the Environment

## 3. Contribute to circular economy as a driver of European Green Deal

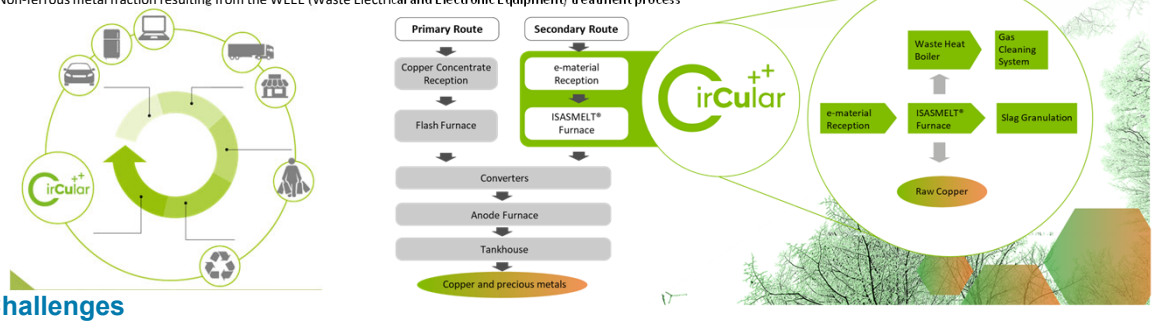
**Achievements: Project CirCular**

2019-2021 Pilot plant tests and basic engineering of a plant to treat e-material [(1)] in the smelter to recover contained Cu, Ni, Sn and precious metals

2022 Financial approval of the construction of a plant to treat 60,000 tpy of e-material. CAPEX 310 MM€

2023-2027 Construction and commissioning of the CirCular plant

(1) Non-ferrous metal fraction resulting from the WEEE (Waste Electrical and Electronic Equipment) treatment process




## Challenges

- Pretreatment of printed circuit boards (PCB's)
- Treatment of other-materials such as *black mass* from batteries recycling, exhausted catalysts and the copper rich fraction from spent solar panels

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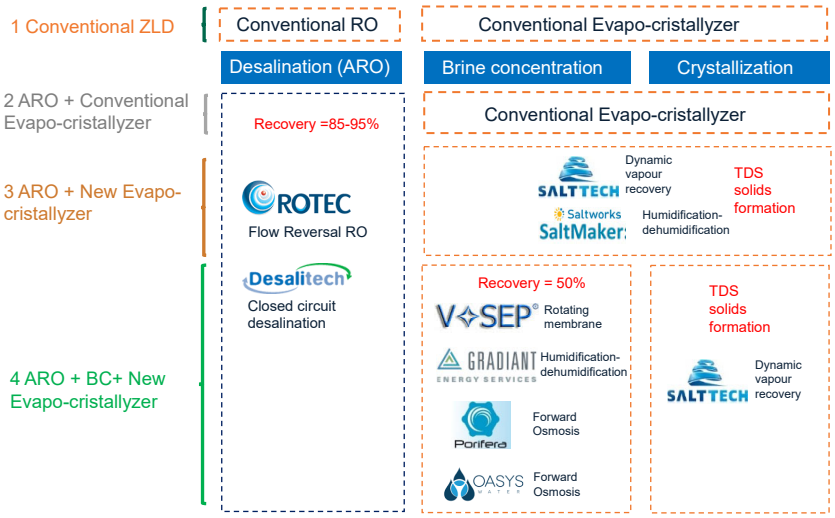
# Feasibility Study

RED SCOPE

New technologies and new processes



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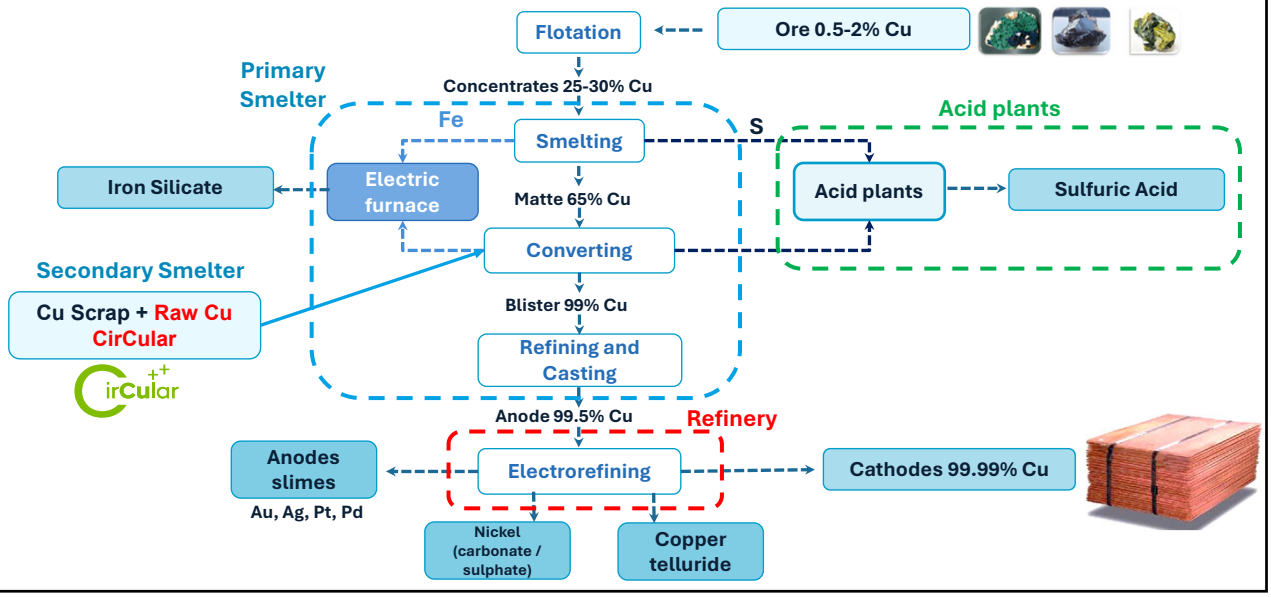
# Primary smelter and refining

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# Atlantic Copper Key figures

**+55 years**
transforming **essential products:** copper & sulfuric acid

**$178 Million***
Annual **Economic Contribution**

**$34 Million**
**Average annual CAPEX** in Innovation, Environment, Safety and Operational and Energy Efficiency

**$2,500 Million**
**Average annual revenue**

**$30 Million**
Annual contribution **via taxes in Andalusia**

**2,500 Employees****
**Quality Employment.** Direct, indirect and induced employment.

*Average data 2017 – 2024*
*(*) OPEX & CAPEX.*
*(**) Source. Annual Report AIQBE.*
*(***) Includes direct and indirect taxes.*