

# Patented power generation technology based on Ion Power Plants

A qualitative and quantitative description derived from the project to install  
a prototype at Adolfo Suárez Madrid-Barajas airport

- February 2th, 2024 -



## Contents

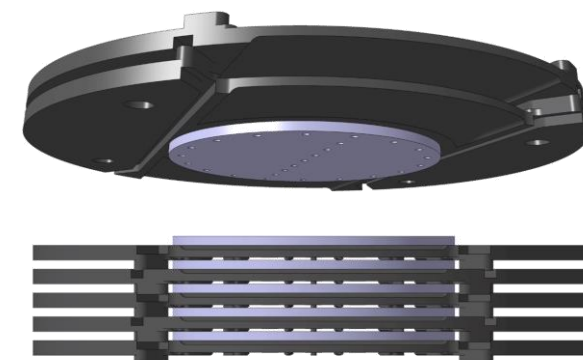
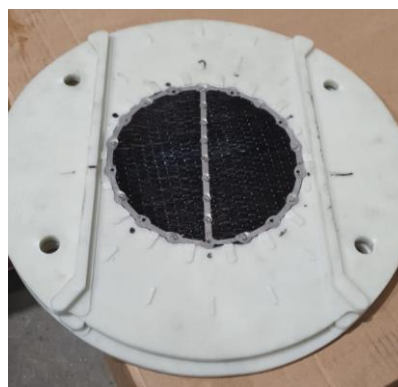
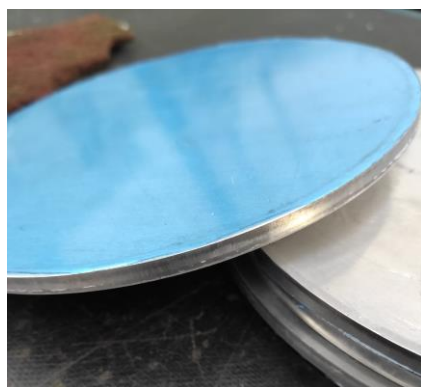
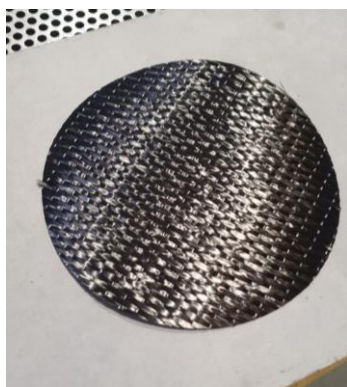
1. Description of the patented innovative technology
2. Balance of inputs and outputs generated based on the Barajas prototype
3. MWh price estimation with one anode replacement (2 cycles)
4. Scaling magnitudes based on the airport prototype
5. Industrial property coverage



## What is an Ion Module?

It is a generator capable of providing energy through a solution of water and salt, **without needing to be connected to the electrical grid.**

Electricity is produced through the kinetics of the electrolyte, when circulating through a closed circuit it passes through various filters and electrodes, oxidizing the metals it contains inside and preventing the polarization of the anode.



## Patented technology



**WO 2023/218112 A2**



**EP 3 442 090 B1**



**EP 3 795 536 A1**



### Reference electrolyte composition

- 7,500 litres of water
- 35 g/litre of salt
- 400 ppm cloro
- 3 per thousand phosphoric acid

HYDROGEN PRODUCTION BY ANODIC DEPOLARISATION



### Some theoretical numbers

1,728.9 kg of aluminium would be capable of generating 5.04 GWh of energy during 25,777.89 hours of operation of the prototype with a continuous power delivery of 195.68 KW.

For reference, it can be estimated that a metric ton of aluminium can cost between 1,800 - 2,400 USD.

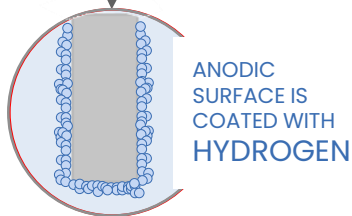
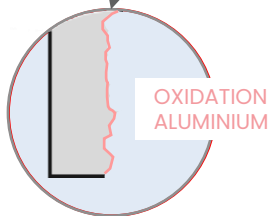
### SYSTEM INPUT

WATER + SALT + TRICHLORINE TABLETS + PHOSPHORIC ACID

ANODO ALUMINIUM

CARBON NANOTUBE CATHODE

TWO EFFECTS ON THE ANODE



RECIRCULATION

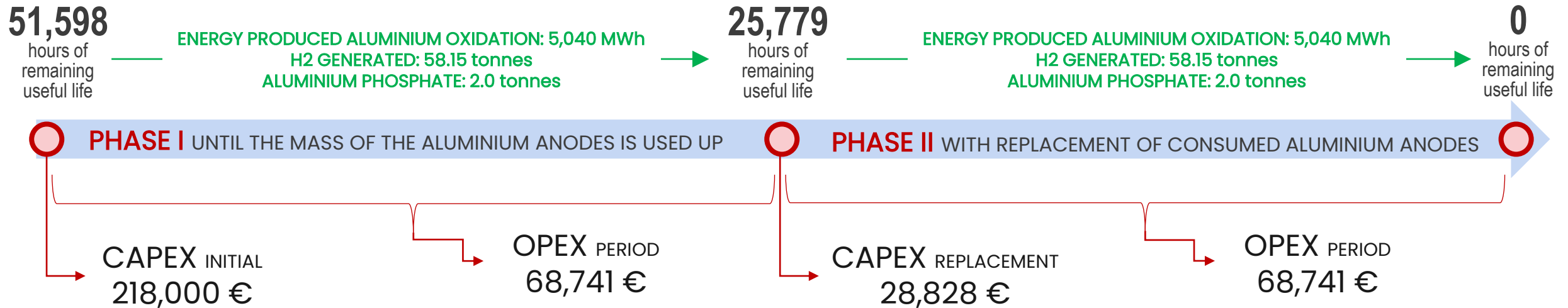
### SYSTEM OUTPUT

- ELECTRICITY → CONSUMPTION POINTS
- HYDROGEN → VENT (USABLE)
- ALUMINIUM PHOSPHATE → COLLECTED IN FILTERS
- WATER + SALT + CHLORINE + PHOSPHORIC ACID → RECIRCULATION



### CO2 emissions

2 - 6 g CO2 emitted for each kWh of energy generated  
 2g if the aluminium is manufactured in the EU / 6g if the aluminium is manufactured in China



CAPEX TOTAL + OPEX TOTAL = 218,000 + 28,828 + 68,741 + 68,741 = 384,310 €

ENERGY PRODUCTION BY OXIDATION OF ALUMINIUM = (5,040 + 5,040) x = 10,080 MWh

H2 GENERATED = 11.28 KgH<sub>2</sub>/hour x 20% efficiency x 25,779 hours/phase x 2 phases = 116,315 kgH<sub>2</sub> = 116.31 tonnes

ALUMINIUM PHOSPHATE = 2.0 tonnes per phase = 4.0 tonnes

VALUATION H<sub>2</sub> = 116.31 tonnes x 2,000 €/ tonne = 232,620 €

VALUATION ALUMINIUM PHOSPHATE = 4.0 tonnes x 2,500 €/ tonne = 10,000 €

**PRODUCTION AND BY-PRODUCT  
SALES PRICE ASSUMPTIONS  
CONSERVATIVE WITH RESPECT  
TO VALUES REPORTED IN THE  
IONIC CERTIFICATE**

ENERGY COST WITHOUT BY-PRODUCTS = 384,310/10,080 = 38.12 €/MWh = 0.038 €/kWh = **3.8 € cents/kWh**

ENERGY COST WITH BY-PRODUCTS = (384,310 - 232,620 - 10,000)/10,080 = 14.06 €/MWh = 0.014 €/kWh = **1.4 € cents/kWh**

# 4

## SCALING MAGNITUDES BASED ON THE AIRPORT PROTOTYPE



200 KW



x 1

2 MW



x 10

10 MW



x 50

50 MW



x 250

60 m2 of floor space

600 m2 of floor space

3,000 m2 of floor space

15,000 m2 of floor space

2 40-foot container

20 40-foot container

100 40-foot container

500 40-foot container

10,080 MWh (2 cycles)

100.8 GWh (2 cycles)

504 GWh (2 cycles)

2,520 GWh (2 cycles)

CAPEX + OPEX

without reducing by-products

384,310 € (2 cycles) ▽ 2%

ENERGY = 3.8 € cents/KWh

CAPEX + OPEX

without reducing by-products

3.76 M€ (2 cycles) ▽ 2%

ENERGY = 3.7 € cents/KWh

CAPEX + OPEX

without reducing by-products

18.45 M€ (2 cycles) ▽ 2%

ENERGY = 3.7 € cents/KWh

CAPEX + OPEX

without reducing by-products

90.43 M€ (2 cycles)

ENERGY = 3.6 € cents/KWh

CAPEX + OPEX

reducing by-products

141,690 € (2 ciclos) ▽ 2%

ENERGY = 1.4 € cents/KWh

CAPEX + OPEX

reducing by-products

1.33 M€ (2 ciclos) ▽ 2%

ENERGY = 1.3 € cents/KWh

CAPEX + OPEX

reducing by-products

6.32 M€ (2 ciclos) ▽ 2%

ENERGY = 1.2 € cents/KWh

CAPEX + OPEX

reducing by-products

29.77 M€ (2 ciclos)

ENERGY = 1.2 € cents/KWh



A large, light blue graphic of a double quote mark, consisting of two mirrored shapes pointing towards each other.

**we bring  
the future  
closer**