
edp

FLEXnCONFU

Flexibilize non-conventional fuels

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Encontro Anual AGN

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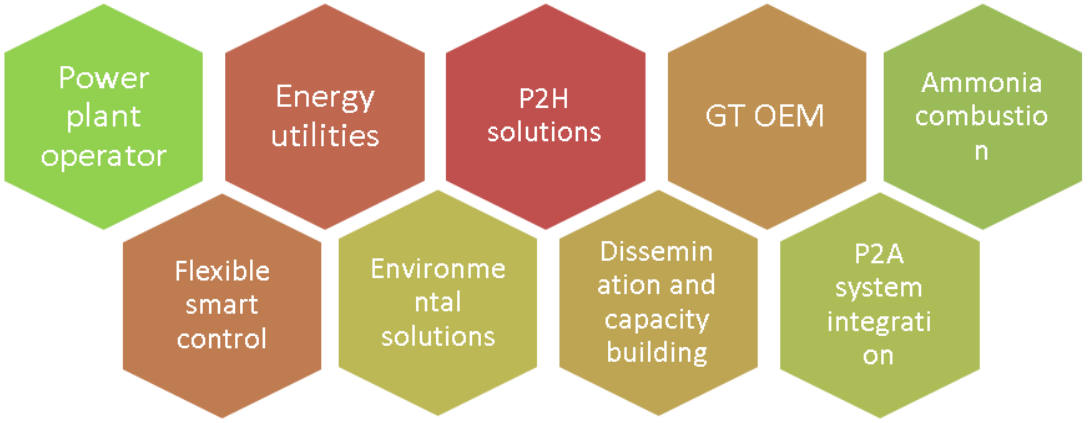
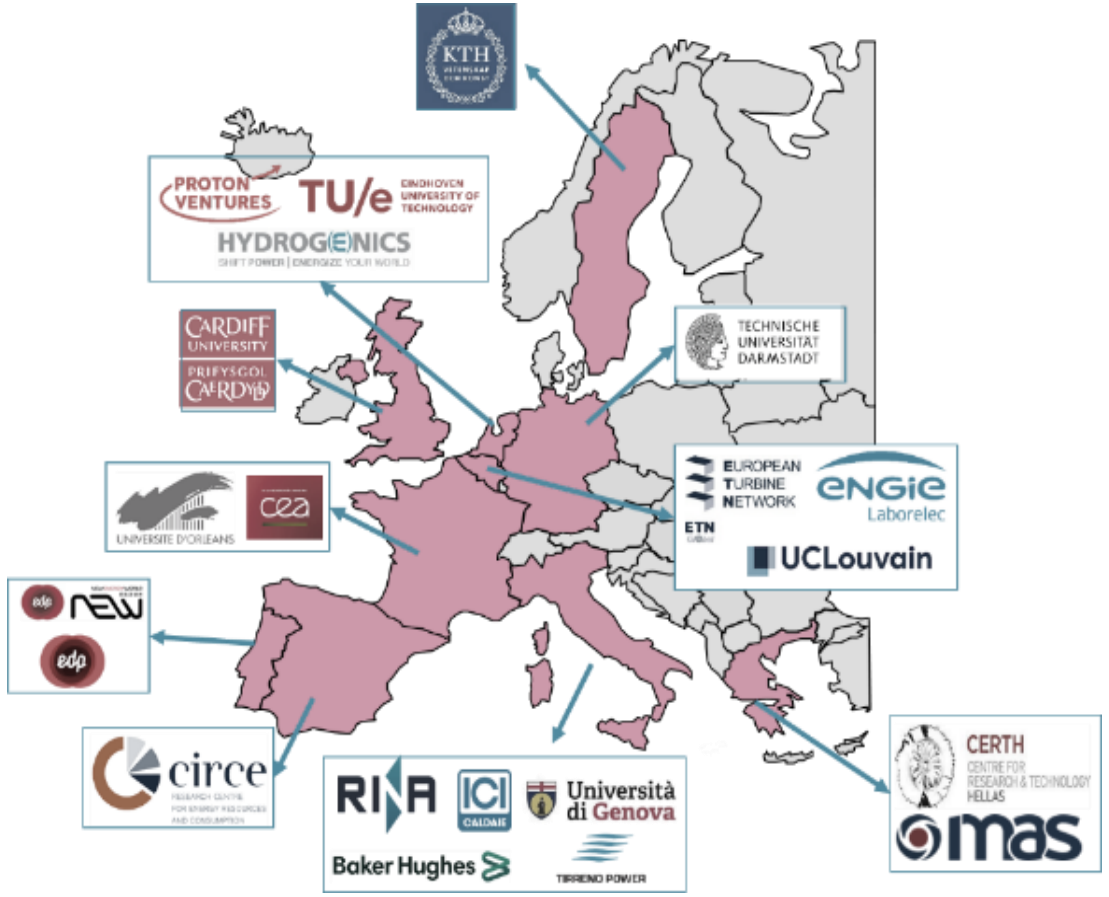
Industrial driven consortium:

- 21 partners from 10 countries
- 10 top Universities and Institutes
- 7 industrial Companies
- 3 PME's
- 1 Association





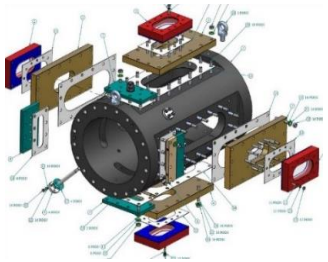
The project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 884157

Projet Pillars

PILLAR 1

USE OF NON-CONVENTIONAL FUELS IN GT/CC FOR FLEXIBILITY NEEDS AND HIGHER ENVIRONMENTAL SUSTAINABILITY

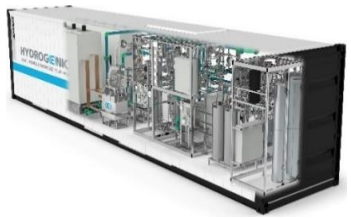
CARDIFF UNIVERSITY LAB, UK



PILLAR 2

INTEGRATION AND DEMONSTRATION OF P2X SYSTEMS IN REAL POWER PLANT

HYDROGENICS Europe NV, Belgium
onsite Hydrogen Generation Units (Alk,PEM)



PILLAR 3

DEVELOPMENT OF PROPER GRID ORIENTED CONTROL STRATEGIES

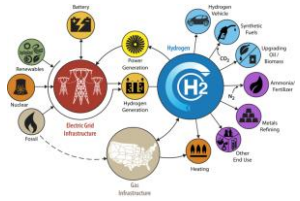
Dynamic modelling:
CIRCE , Spain
CERTH, Greece

Control strategies development:
MAS S.A. Advanced Technologies For Power and Energy , Greece

PILLAR 4

PROMOTION OF A HYDROGEN AND AMMONIA ENERGY SOCIETY

CERTH, Greece
social acceptance through a social Life Cycle Assessment
EDPP:
Awareness campaign about H2 potential and safety customer



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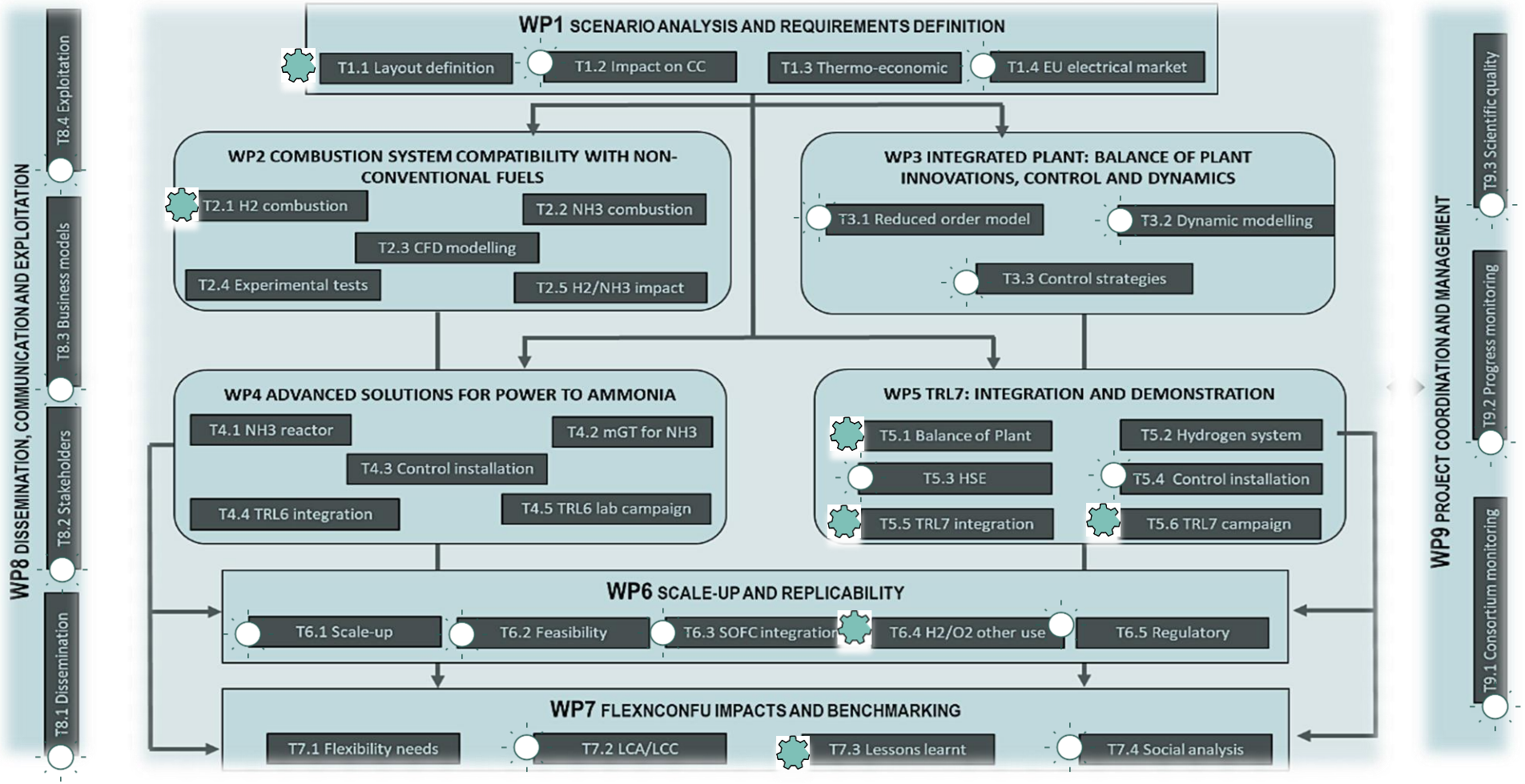
Work breakdown Structure

9 Workpackages, 39 Tasks, 58 deliverables



EDP

Leads 7 Tasks

Participate in 26 Tasks

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Demonstration will be done at diferent levels…

4 demonstrators

Outcomes:

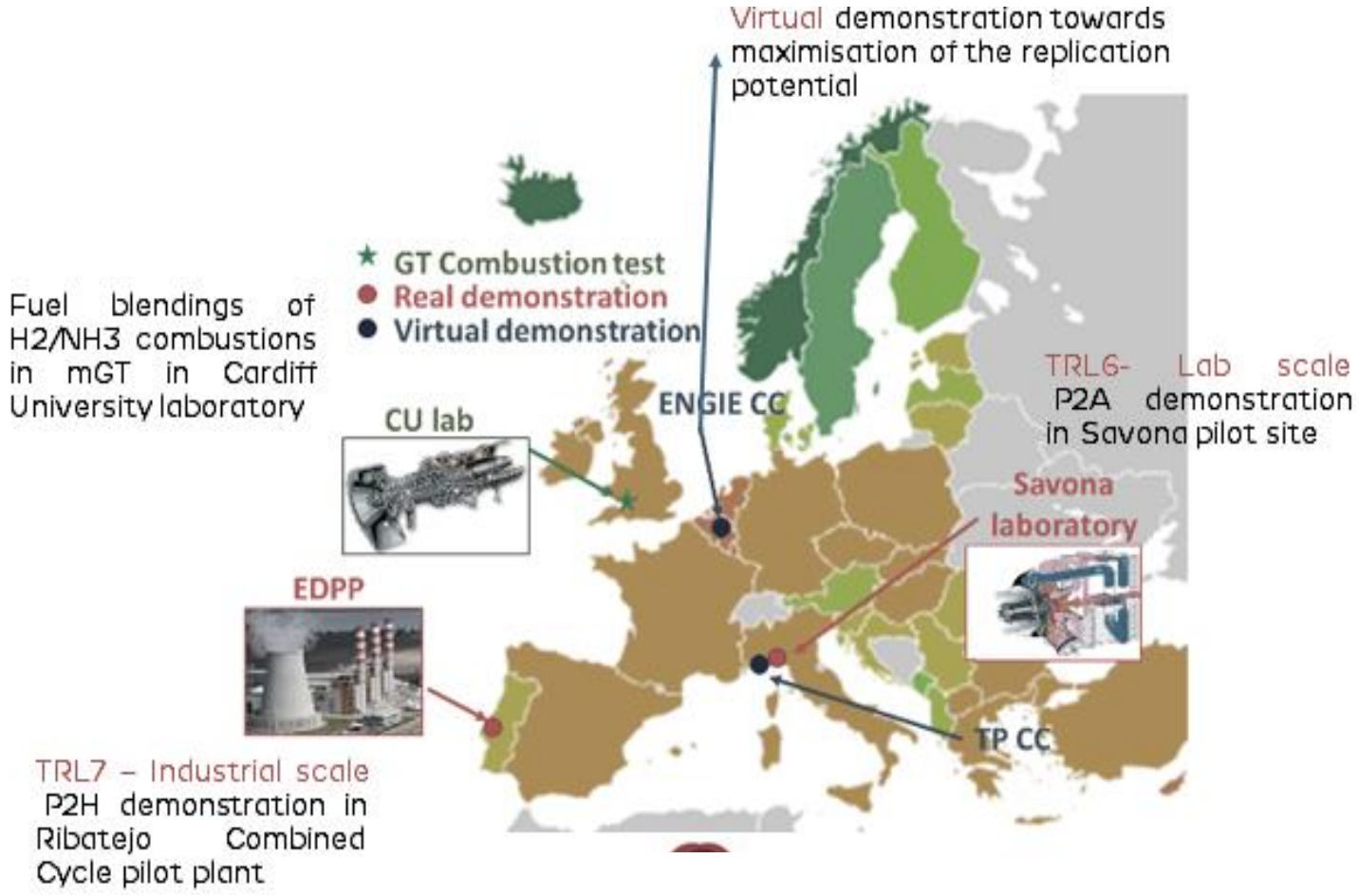
Reduction of minimum load

Increase of CC plants yearly efficiency

Reduction of yearly start-up number

Quicker ramp up/down with load gradient

Reduction of NG consumption and related emissions



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EDP is participating in a H2020 project as the test site owner for a demonstration Hydrogen production Unit

Ribatejo demonstration

Increase CCGT Power Plant flexibility
Reduce GHG emissions
Explore the energy storage concept through H_2 carrier

21 partners from 10 countries
10 top Universities
7 Major companies

Project

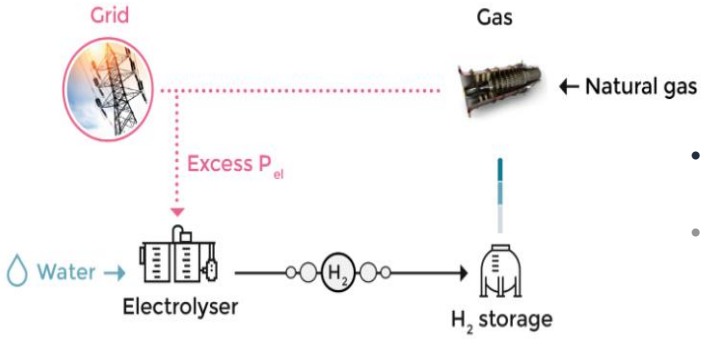
Power to hydrogen in CCGT

Description

Test in real power-to-H_2-to-power concept to increase CCGT flexibility

Status

Project started in April 2020
Construction to begin in 3Q2022
Demonstration to begin in 2Q2023



- **1,4 MW electrolyser** and directly injected in the combustion chamber
- Hydrogen generation **driven by the electricity market**

Budget:	12,6 M€
Grant EU:	9,89 M€
Budget EDP:	2,47 M€ (co-funding 1,73 M€)
Schedule:	48 months (4Y)
Demonstration:	1000 hours

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P2H Pilot Plant

Work Package Leader: EDPP

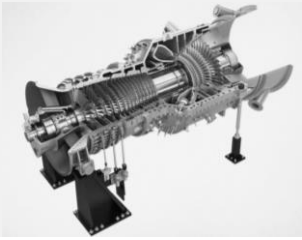
15 partners: EDPP, EDP-NEW, HYGS, ICI, MAS, RINA-C, CIRCE, CERTH, CU, NPT, UNIGE, UCL, KTH, TP, ENLAB

Main Objectives WP5 – Integration, Implementation and Demonstration

- ✓ test the integration of the P2H2P concept
- ✓ determine the flexibility of the system and of the plant (eg reduction of the technical minimum)
- ✓ explore the concept of energy storage through hydrogen

- **6 Tasks; 3 Milestones; 6 deliverables**

- **1% H_2 injection at GT (36-65 kg/h H_2)**
  - Extrapolate the general gains expected for an installation with a higher% H2 injection
  - Test different loads, and power ramps
  - Operational data (efficiency, load variations…)
- **1000 h test**
- **22 – 88 ton H_2/y**



Siemens GT: SGT5-4000F (V94.3A)
Rated Power: 265 MW
Compression Ratio: 1/17
24 Hybrid Low Nox Burners

Get experience with hydrogen …

P2H2P

Ribatejo Power Plant

Combined Cycle Power Plant

3 generators, 392 MW each

1 176 Mwe total power capacity

GT: Siemens SGT5-4000F (V94.3A)

Dry-Low Nox

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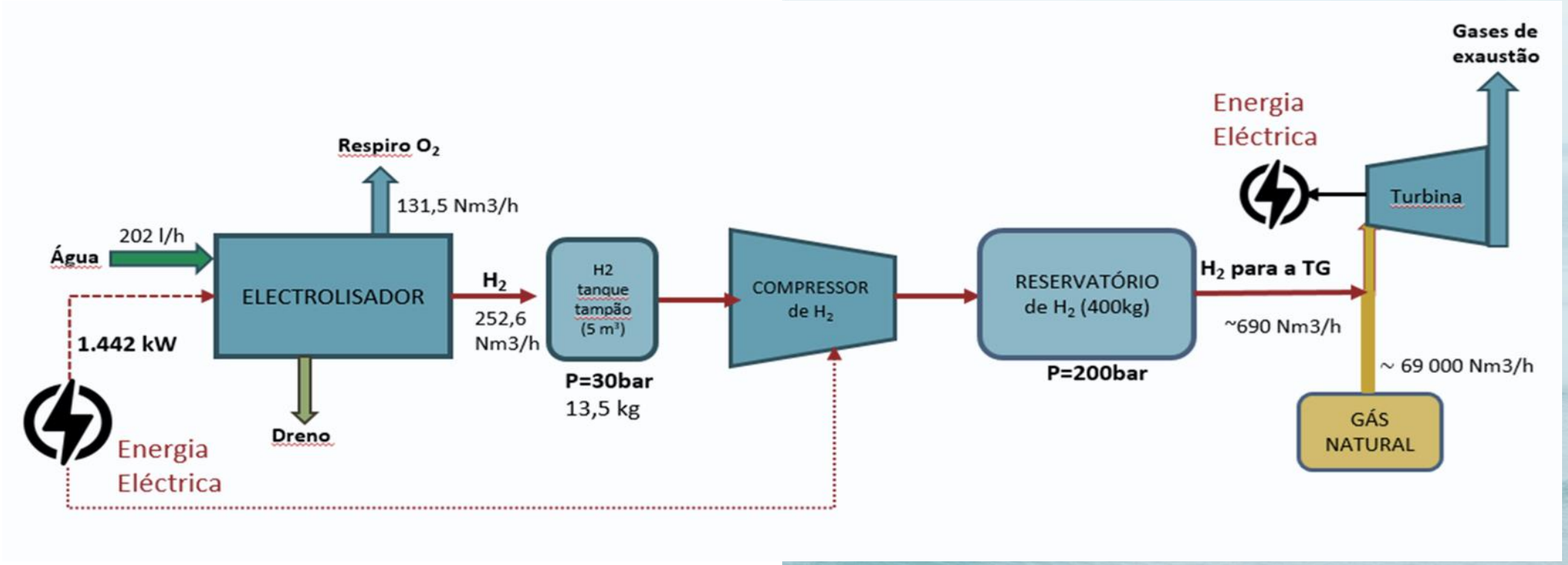
Power to Hydrogen Process



The **electrolyzer** accounts for the most of the total power requirements (94%) compared with the residual energy consumption for the auxiliaries (2,5%) and the compression system (3,6%)

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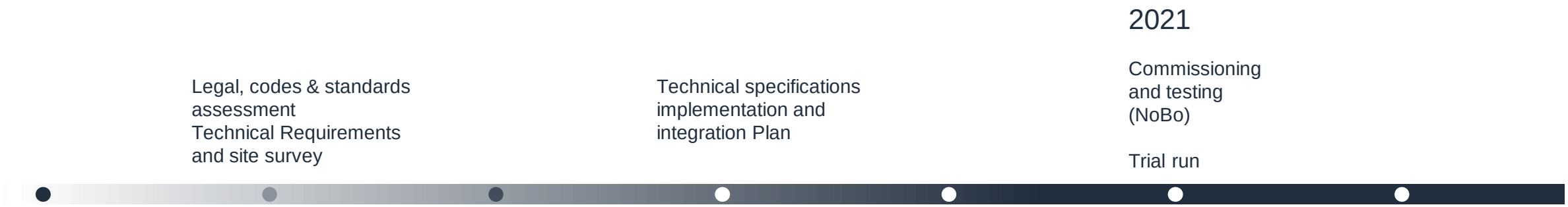
Time Schedule

2019 – Proposal preparation



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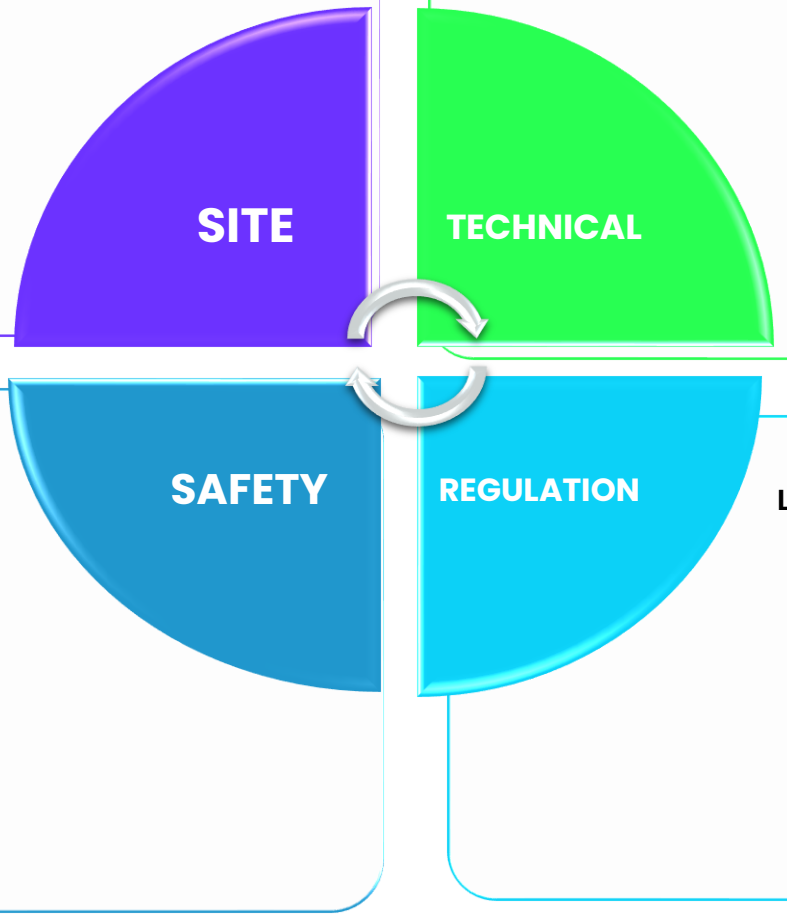
Deployment P2-X-2P in CCGT Plants



Space available – site constraints
Best location for implementation
•Safety distances
•Storage
•Tie-ins
Define layout

GT assessment; compability with non-conventional fuels ; H2 % injection
Control sys integration for GT protection
Eelectrolyzer technology assessment
BOP assessment and interfaces
Define PFD, P&ID and BOP integration

Safety reqirements assessment ! Safety standards
BoP requirements assessment
Safety requirements for GT protection
ATEX study
Risk assessment
Hazid/Hazop analysis and SIL

Licensing process
Environmental permit – Case by Case
New installation register (definition of the licensing authority – Energy or Industry Ministry)

Installation and operation
Low voltage Project
Pressure Equipment Project (PED)
SCIE (Fire fighting safety project) – ANEPC
Construction Licensing – Municipal Council

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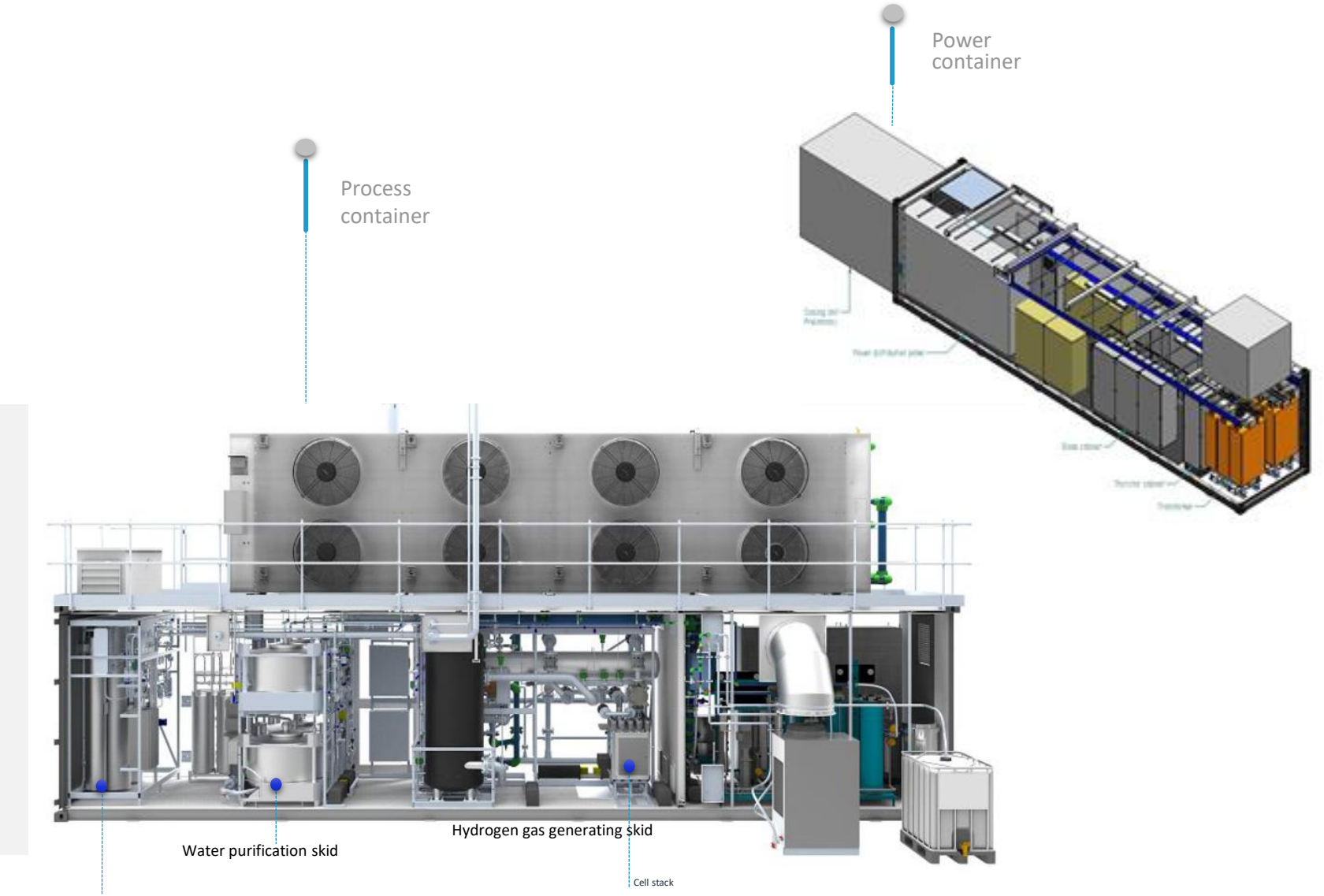
Eletrolyser

Main features

Specification

Nominal flow Minimum flow (5%-100% nominal load)	250 Nm3/h 12,5 Nm3/h
Hydrogen purity	99,998%
Ramp time min-max	< 10 s
Maximum output pressure	30 bar
Conversion efficiency at 50% flow*	≤ 4,6 kWh/Nm³
Conversion efficiency at full flow *	≤ 5,1 kWh/Nm³



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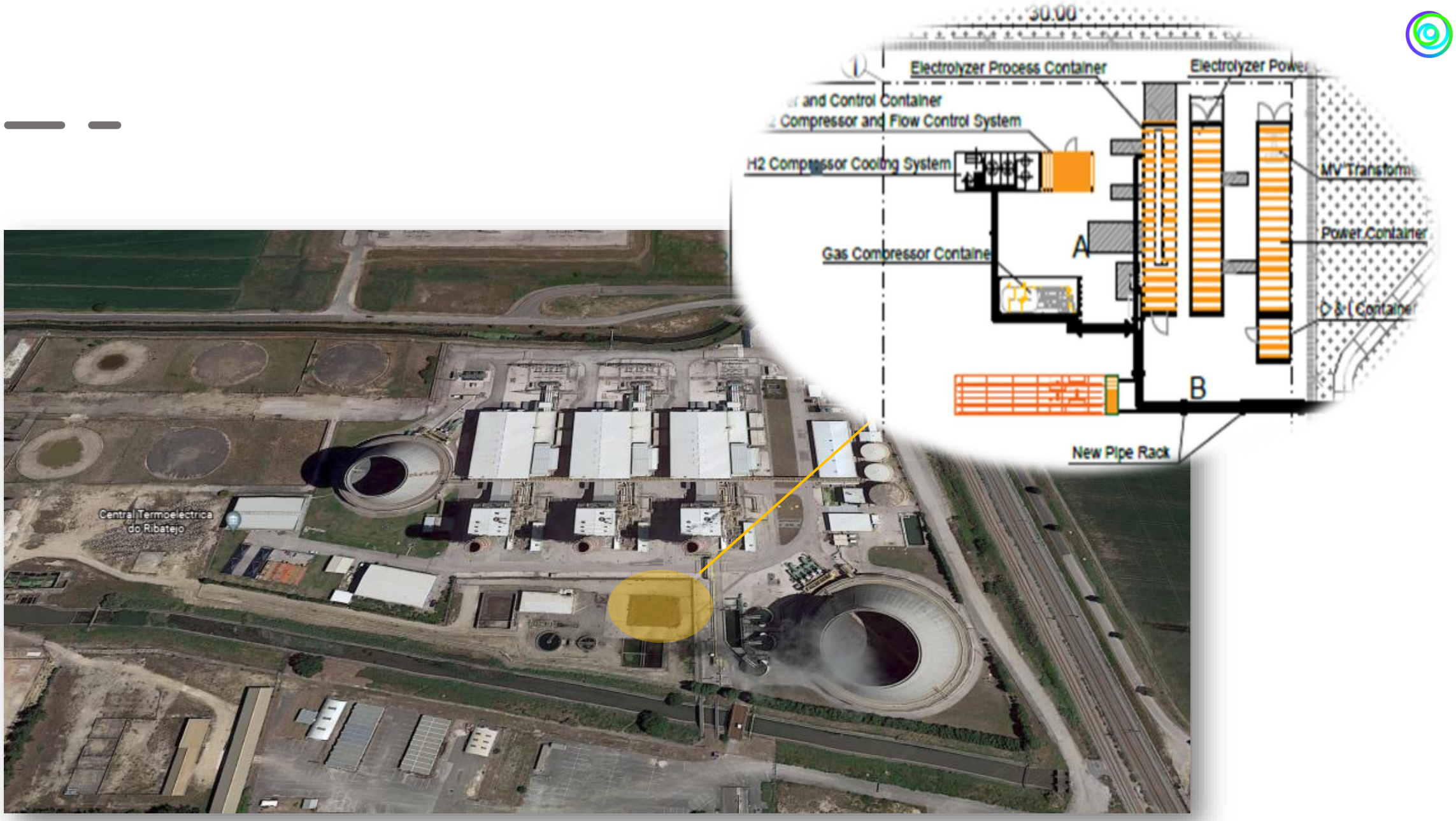

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