



Research Centre for
Greenhouse Gas Innovation

RCGI

- ✓ Focus on reducing greenhouse gas emissions
- ✓ Support for Brazil to achieve Nationally Determined Contributions (NDCs) through Research and Innovation
- ✓ Transdisciplinary approach: researchers and specialists from different areas of knowledge unite their efforts to find solutions
- ✓ Long-term investment in research
- ✓ Support for Brazil in its consolidation as a global power in renewable energy



University of São Paulo
BRAZIL



115,100 PEOPLE

60,000
UNDERGRADS

37,000
POSTGRADS

5,200
FACULTY

12,900
STAFF

22%

OF BRAZILIAN SCIENTIFIC PAPERS
(*clarivate analytics*)

Among the **10** Research Institutions with the highest number of publications in the world

ANNUAL BUDGET: 1,50 BILLION USD

Source: USP Statistical Yearbook 2023

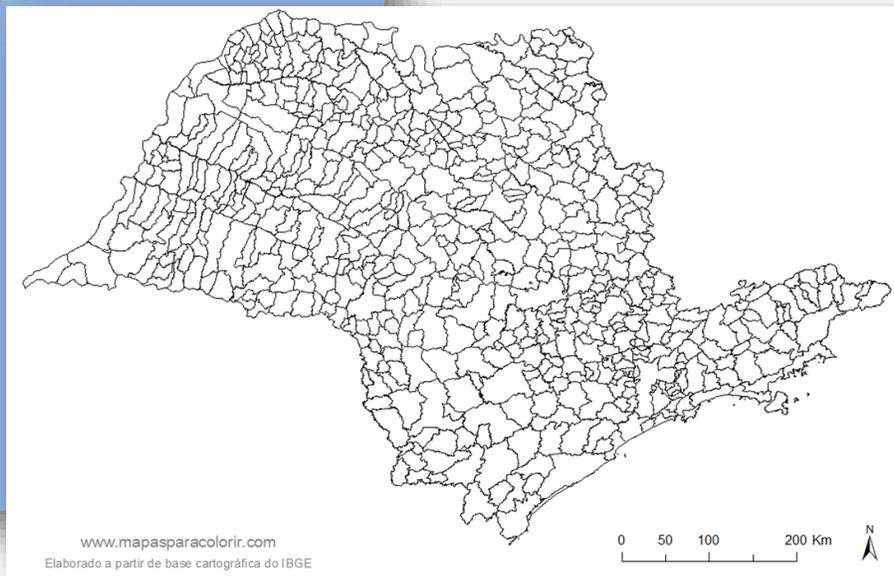


SÃO PAULO STATE

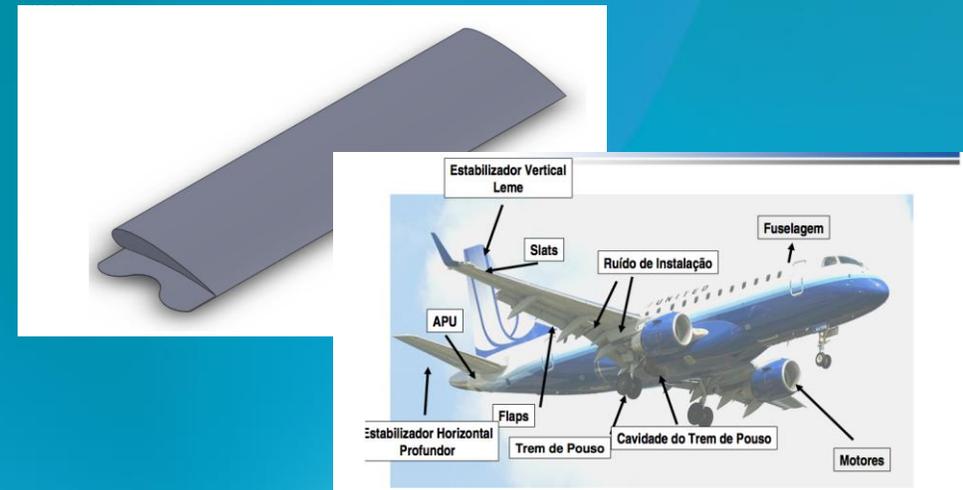
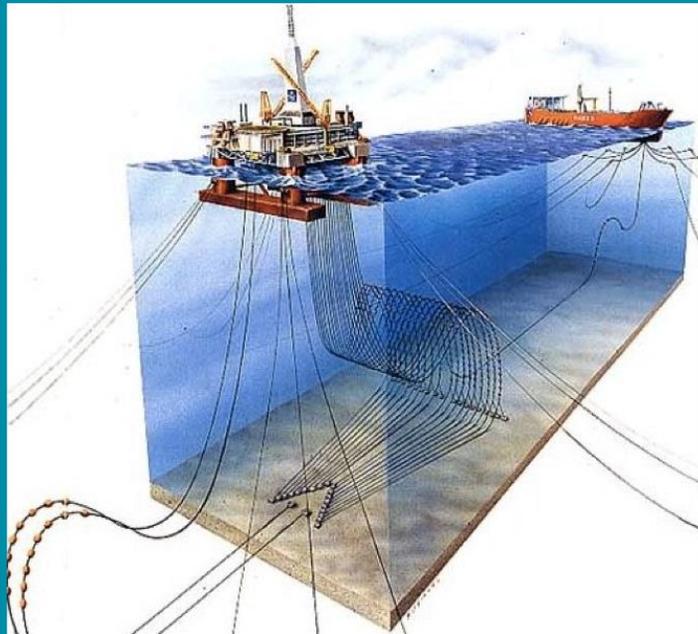
Total area: 248,200 km²
2.9% of Brazil, slightly smaller than UK

Population: 44,420,459
22% of Brazil - Almost like the entire population of Argentina

GPD: 2,0 trillion BRL
34% of Brazil, 20th world economy

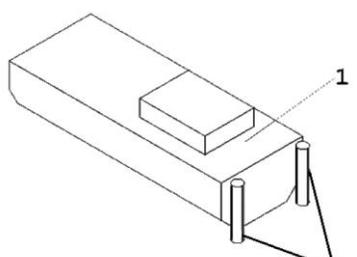


Importance of Public & Private Partnerships in Research, Development and Innovation



Motivation
 Secondary Instabilities in the Wake
 Two circular cylinders in tandem
 Stalled airfoil
 VIV: High lift device
 Fapesp-BG Gas Innov

Building a concrete knowledge: "from the possible to the necessary":
 NDF Infra-structure



I. Korkitchko, J.R. Meneghini / Journal of Fluids and Structures 34 (2012) 259–270

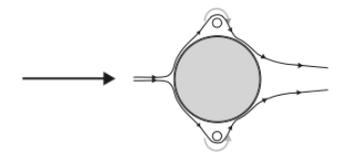


Fig. 8. Schematic of the flow around the circular cylinder with MSBC.



**RCGI Headquarters at
UNIVERSITY OF SÃO PAULO,
Brazil.**

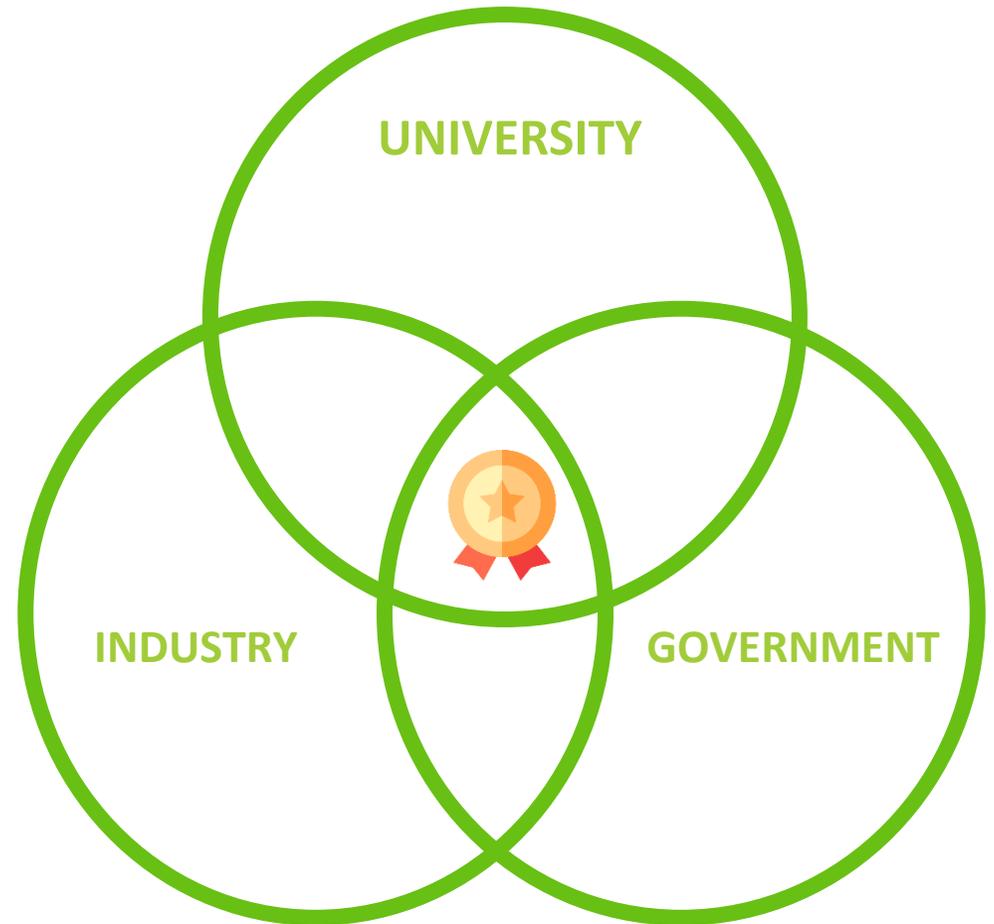


Research Centre for
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Triple Helix Strategic Interactions

NEW PRODUCTS IDEAS
INNOVATIONS

FUNDING AND
STRATEGIC DEMANDS



Founder Sponsors:



Sponsors:



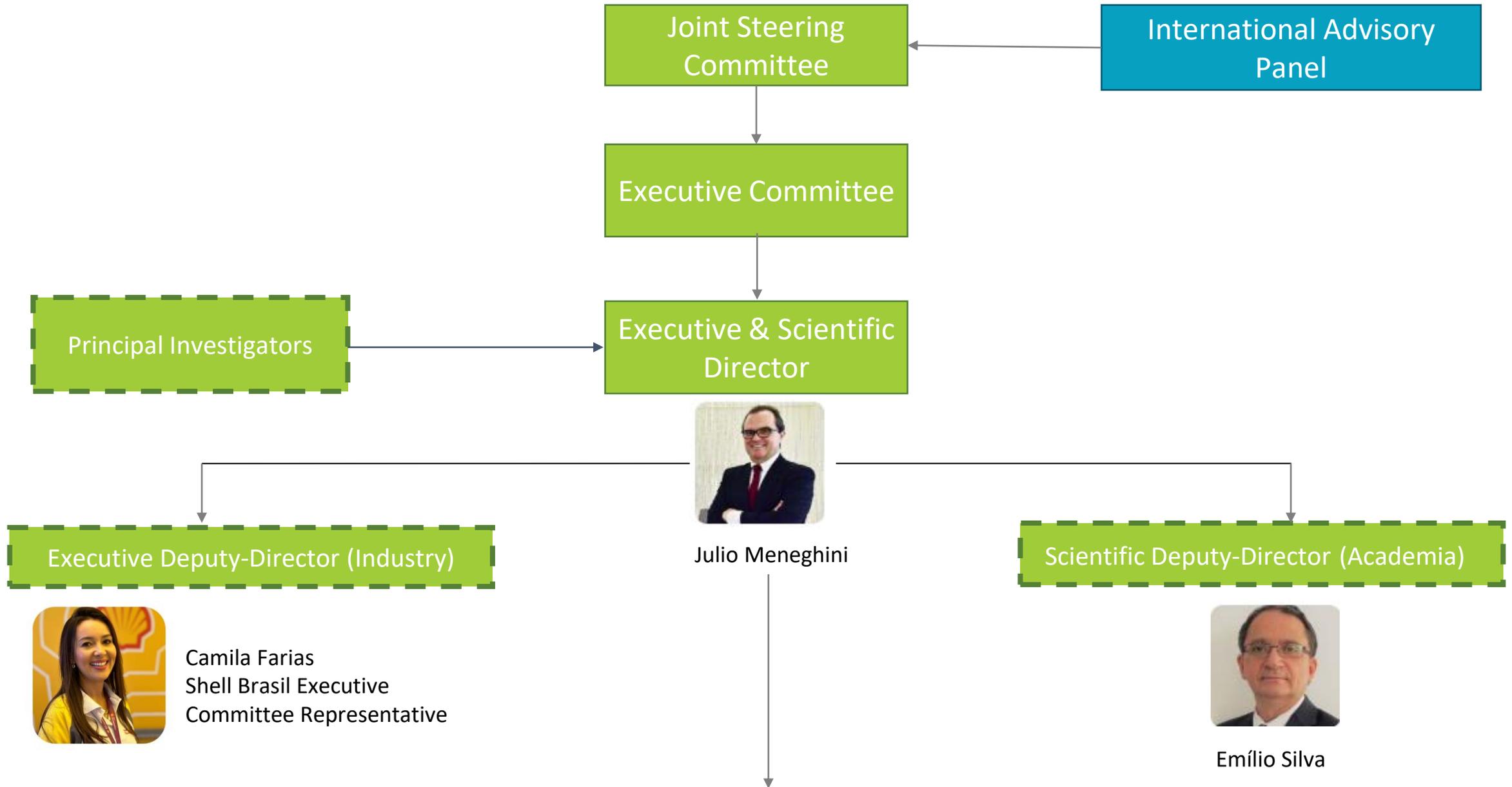
Partner Institutions:

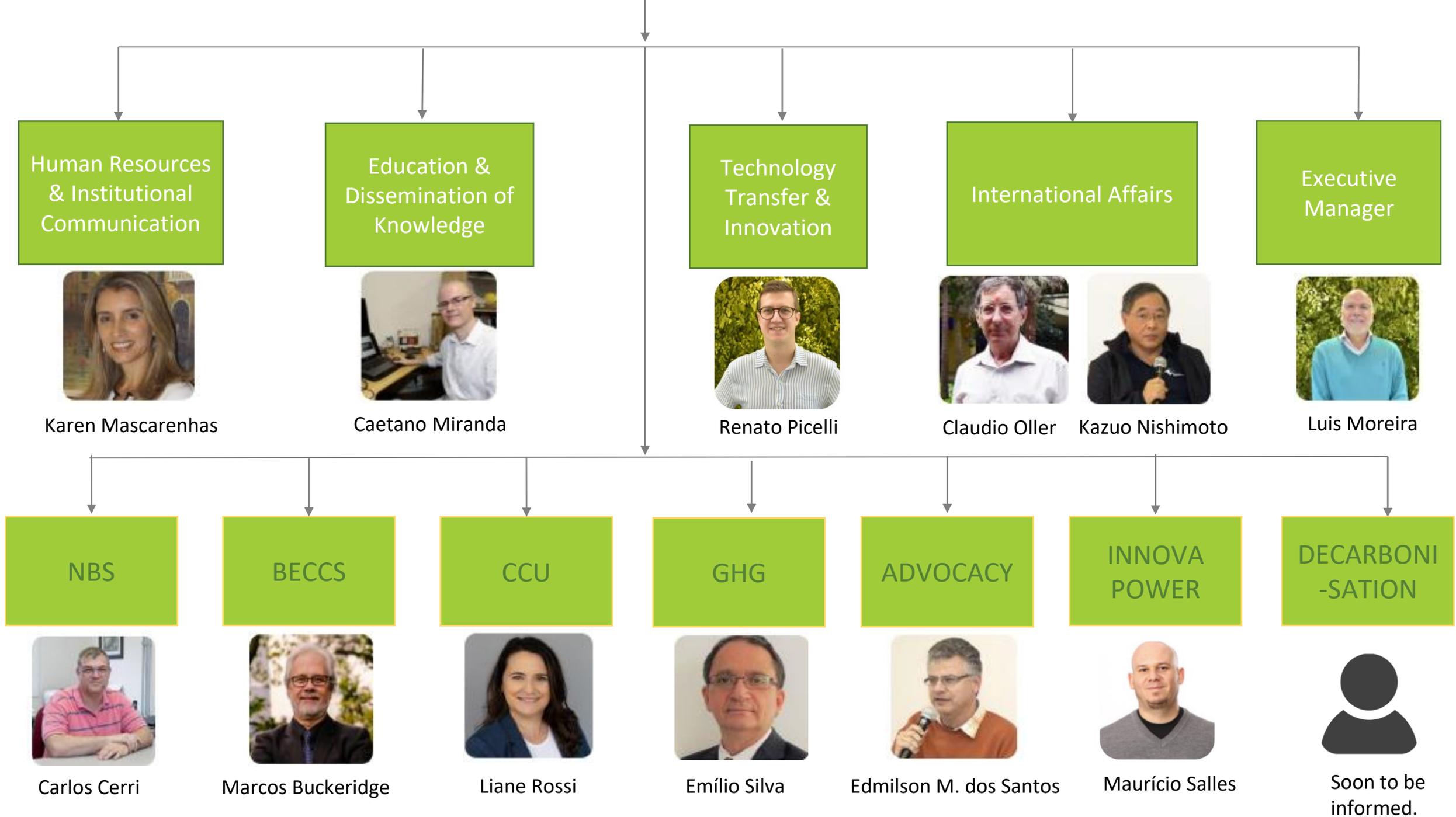


ETCA



RCGI GOVERNANCE STRUCTURE (FROM Q2/2023)





RCGI IN NUMBERS



657 Actives Researchers



6 Startups



30 Laboratories

5 Startups under development



5 Awards received



40 National Partners



10 Patent filing

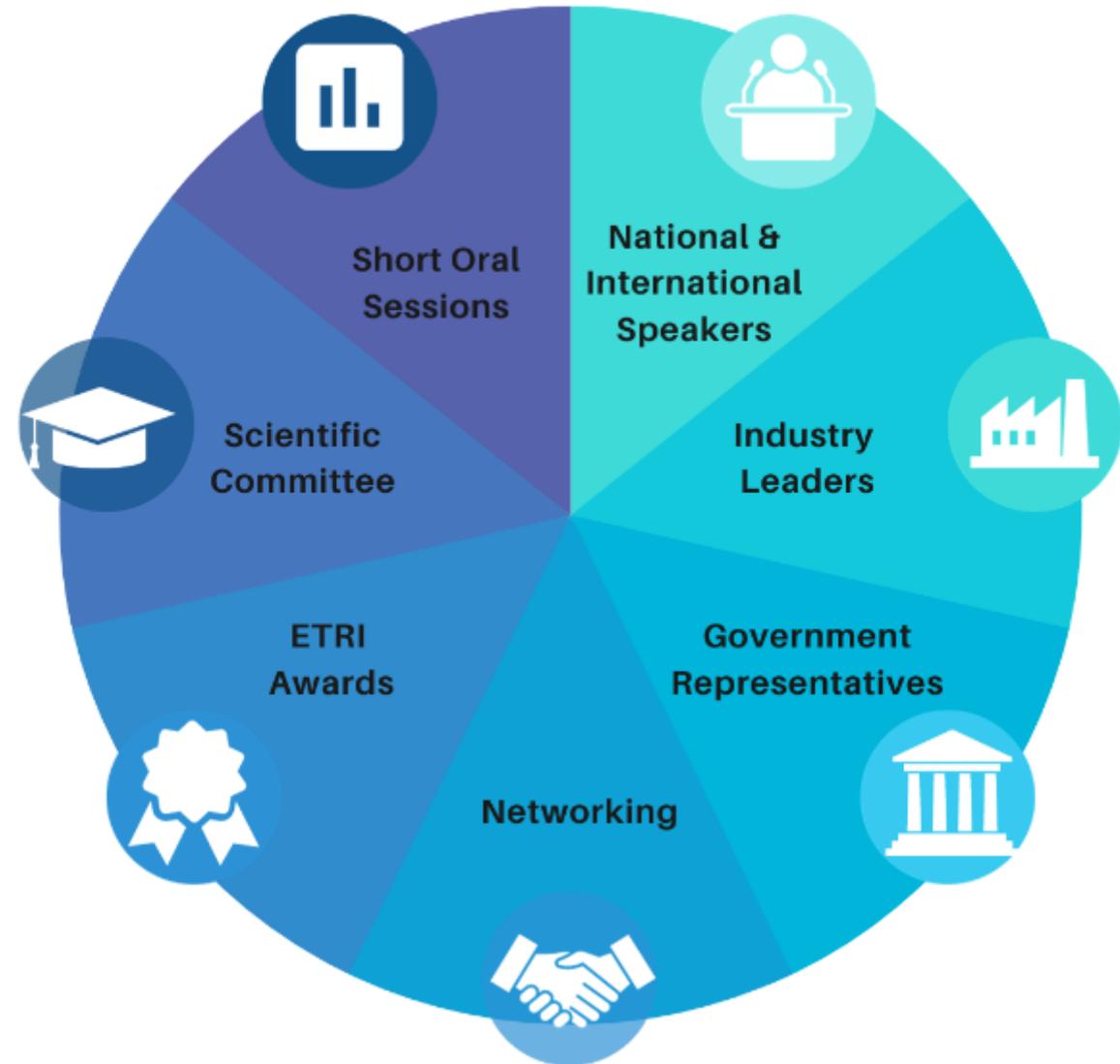


57 International Partners

Energy Transition Research & Innovation Conference (ETRI)

The Energy Transition Research & Innovation Conference (ETRI) is a consolidated event that had its sixth edition in 2023 with the goal of examining the main challenges and solutions that encourage greenhouse gas mitigation.

The three-day conference, organized by the Research Centre for Greenhouse Gas Innovation (RCGI – USP), brought together academia, stakeholders and society to share knowledge, exchange ideas, acquire insights, and form partnerships for the oil, gas, and energy industries sustainable transition.



Energy Transition
RESEARCH & INNOVATION



RCGI Programmes



NBS

How to **incorporate** Nature Based Solutions to abate CO₂?



BECCS

How to **achieve** negative carbon intensity biofuels?



CCU

How to **create and deploy** value chains that unlock novel carbon products?



GHG

How to **develop** new technologies to reduce greenhouse gas emissions?



Advocacy

How to **unlock** CO₂ abatement technologies with the support of standardization, regulation and social acceptance?



InnovaPower

How to **construct** long-term solutions centered on the decarbonization of electrical power systems?



Decarbonization

How to **contribute** with technologies that focus on a decarbonized future?



Centre 2 Centre

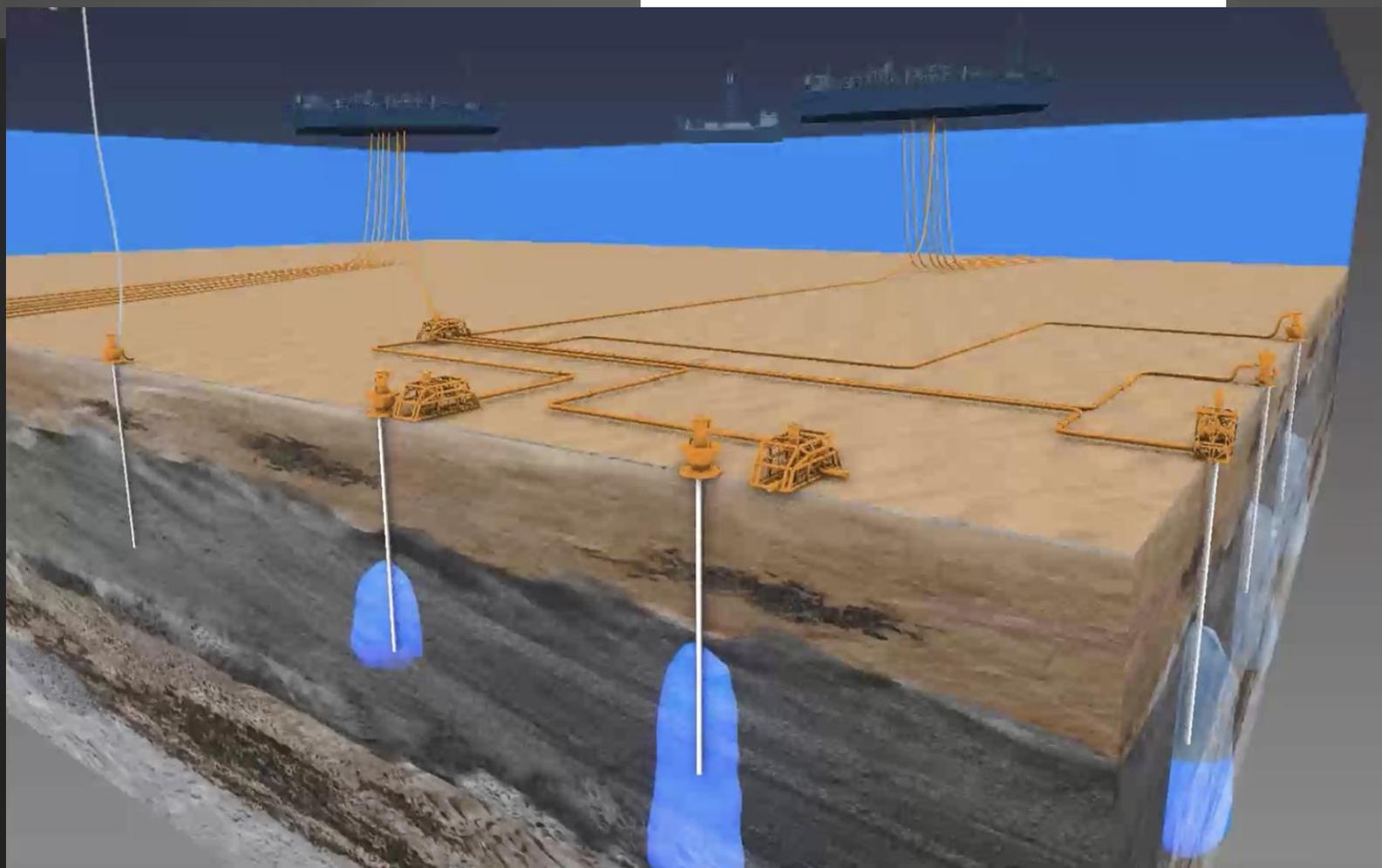
How to **establish partnerships** between centres around the world concerned with solutions to improve our environment?



Research Centre for
Greenhouse Gas Innovation

NET
ZERO

RESEARCH &
INNOVATION
FOR CARBON
NEUTRALITY



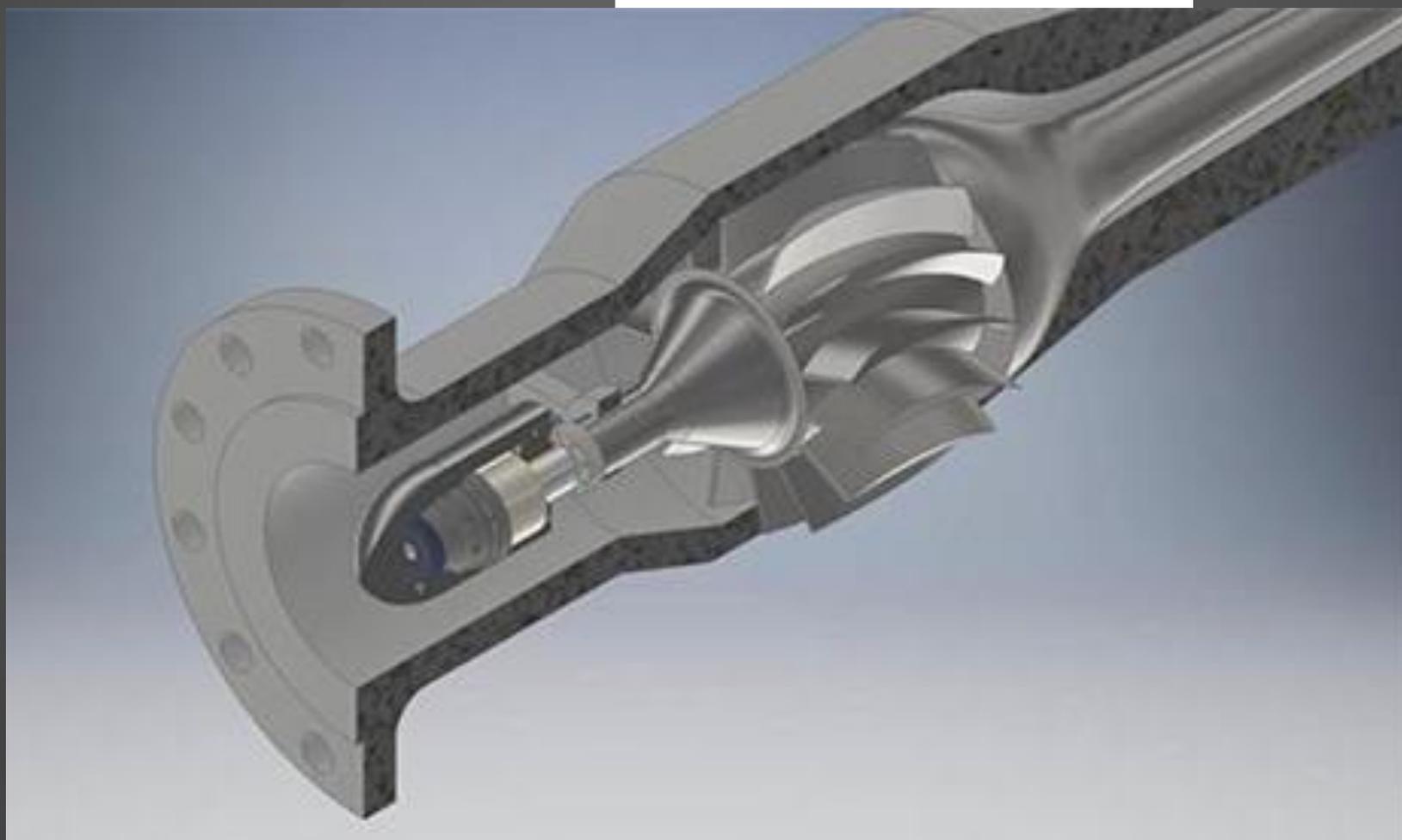
USP



Research Centre for
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RESEARCH &
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USP



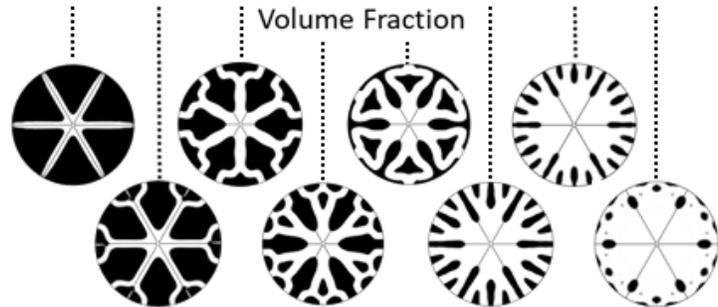
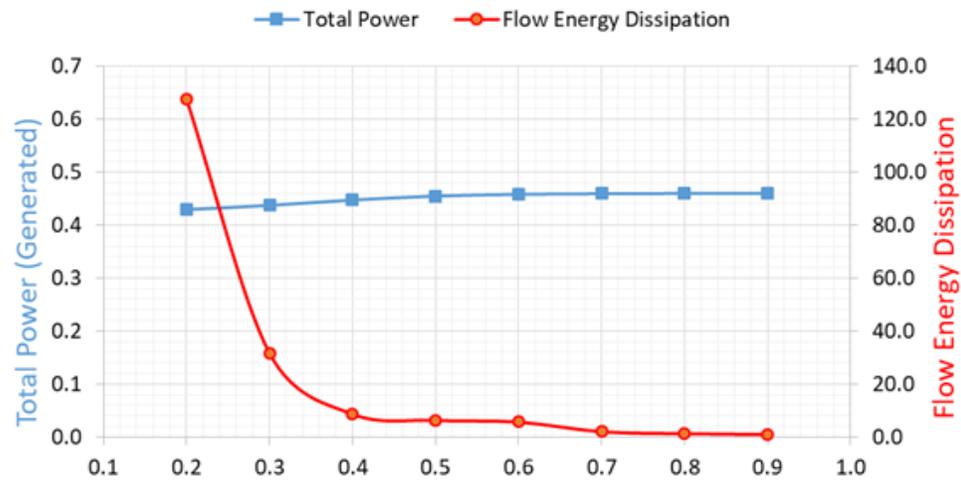
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Solid Oxide Fuel Cells

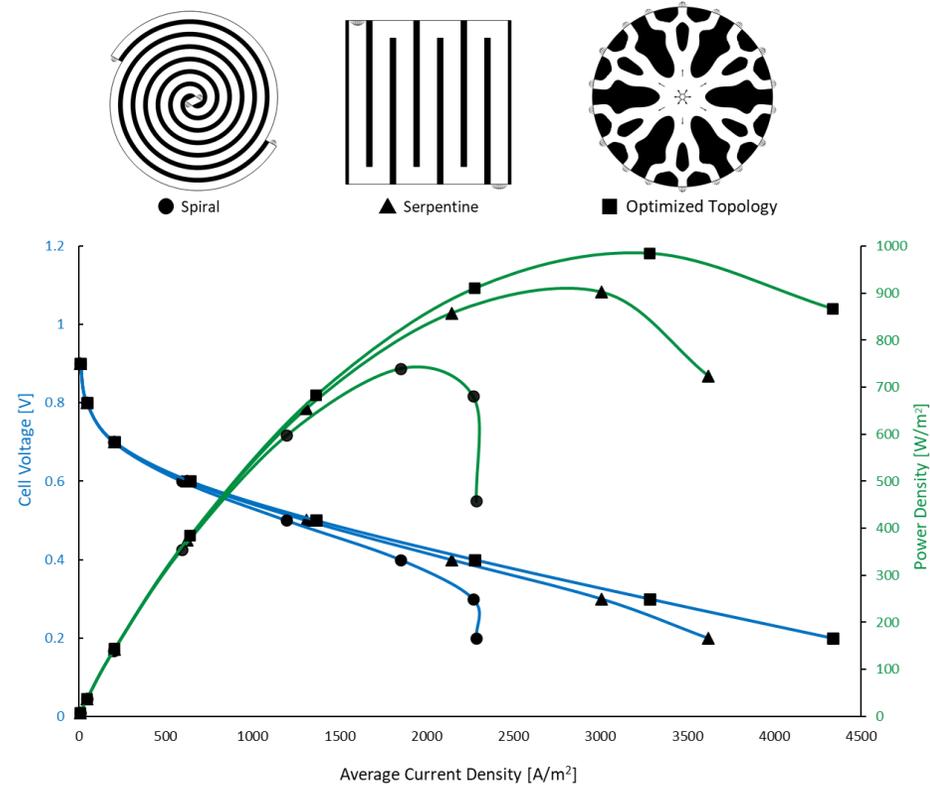
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RESEARCH &
INNOVATION
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Cell Total Power and Energy Dissipation vs Volume Fraction



Polarization Curves and Power Density Curves of Different Flow Fields

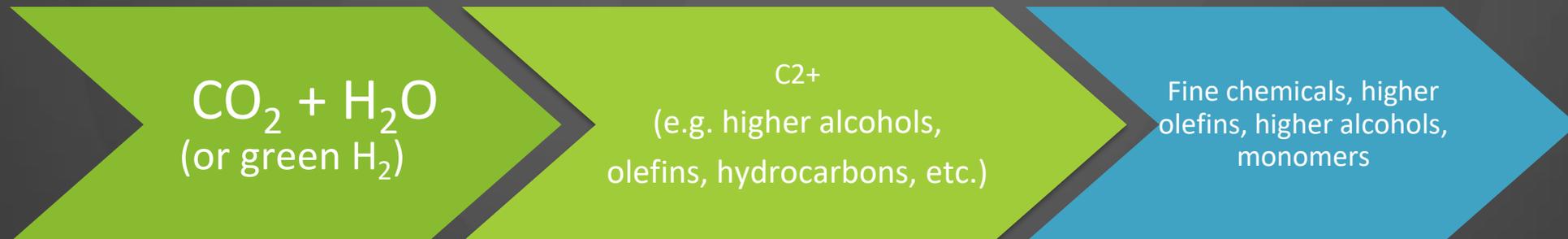


Carbon Capture and Utilization Program

The CCU program goal is to *create value from CO₂ emissions* through the design of integrated processes for carbon capture and conversion to tackle climate change. In this circular carbon economy concept, **CO₂ is considered a valuable C1 building block to CO₂-derived chemicals**, such as intermediates, monomers, building materials and fuels.

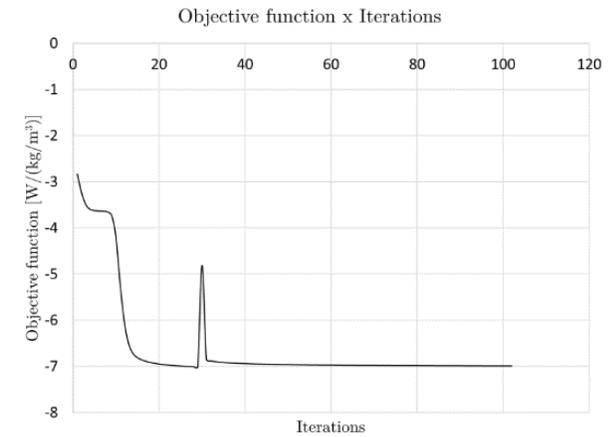
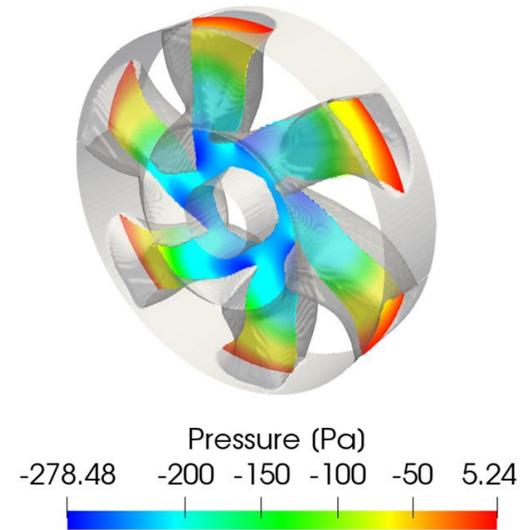
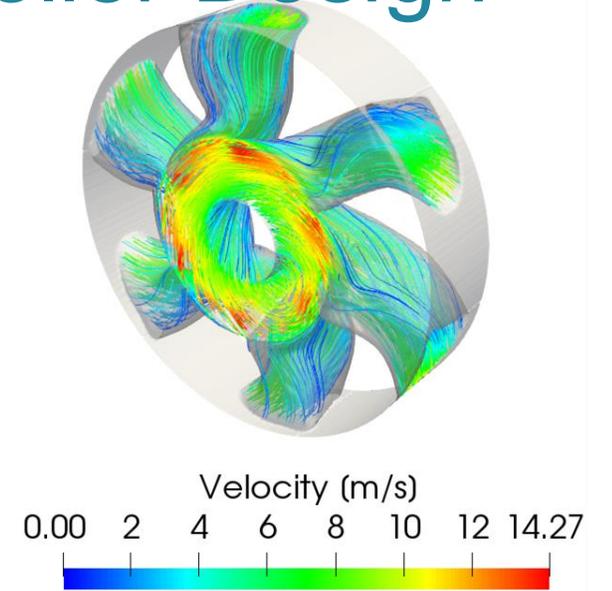
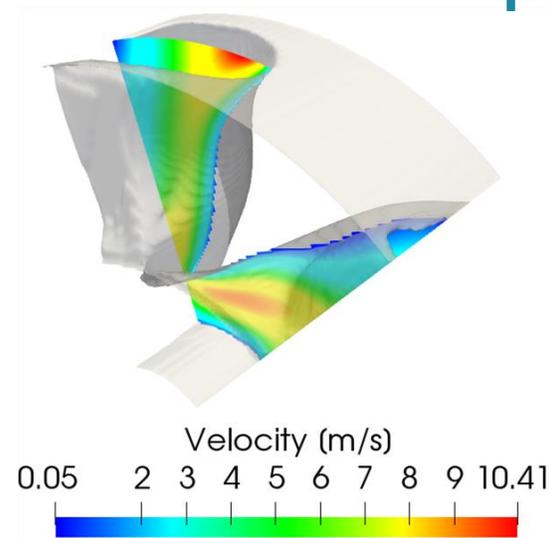
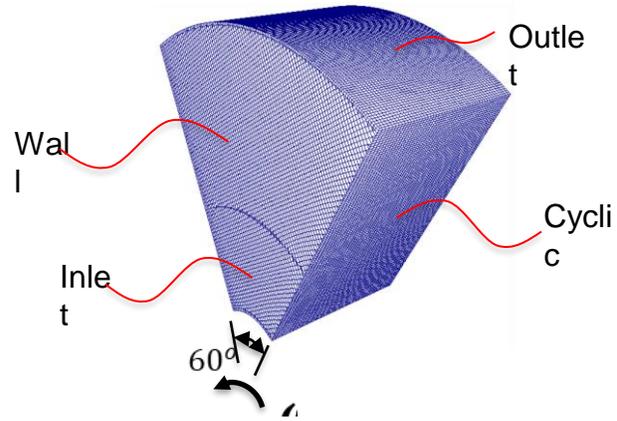


Areas of expertise: Photocatalysis and/or electrocatalysis and/or bioconversion and/or chemical catalysis



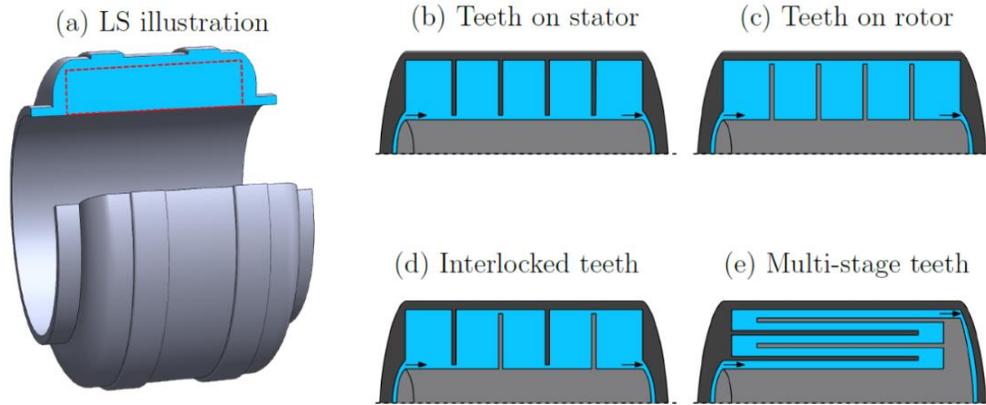
Topology Optimization for Fluids – Impeller Design

Numerical examples: 60° sector + 50% volume constraint + 1000 rpm

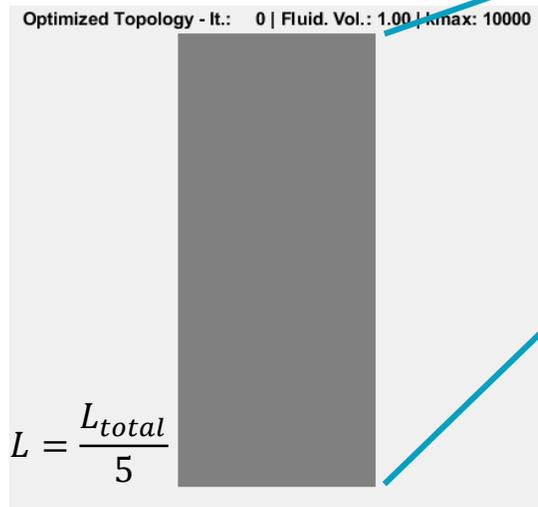


LABYRINTH SEAL DESIGN

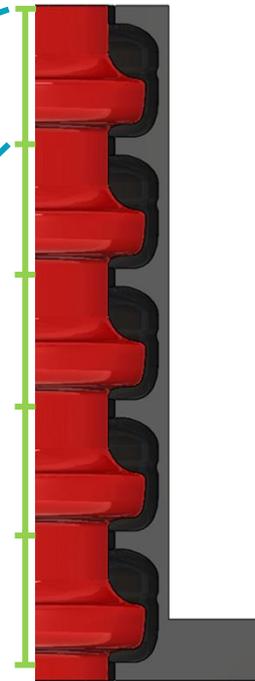
Traditional Labyrinth Seals



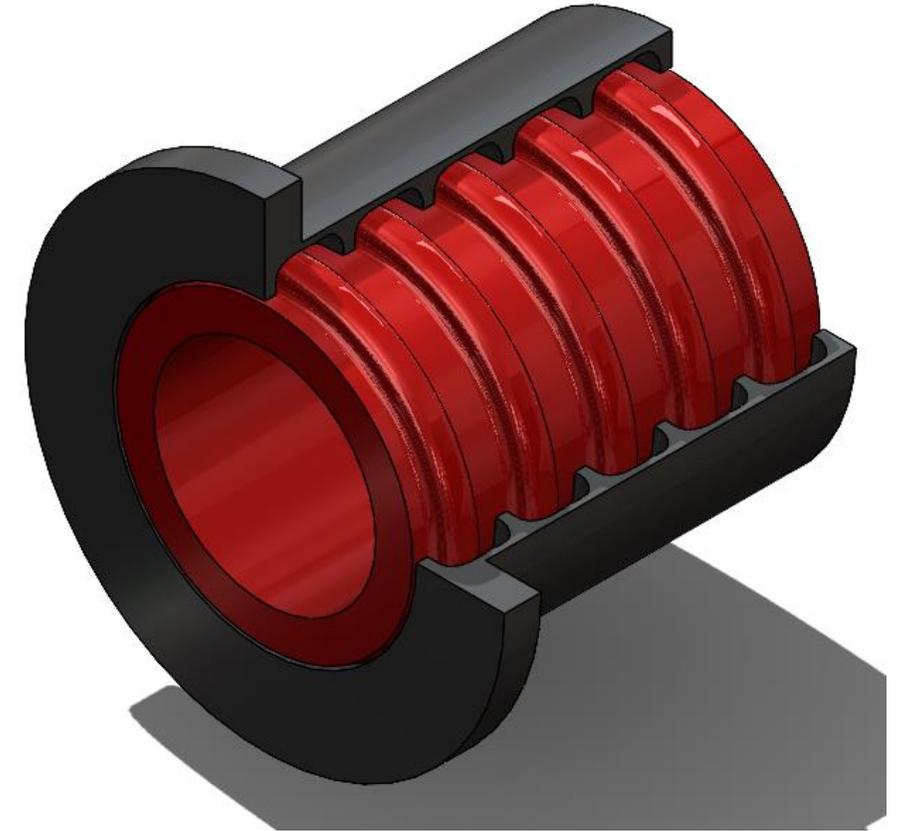
Topology Optimization



x5



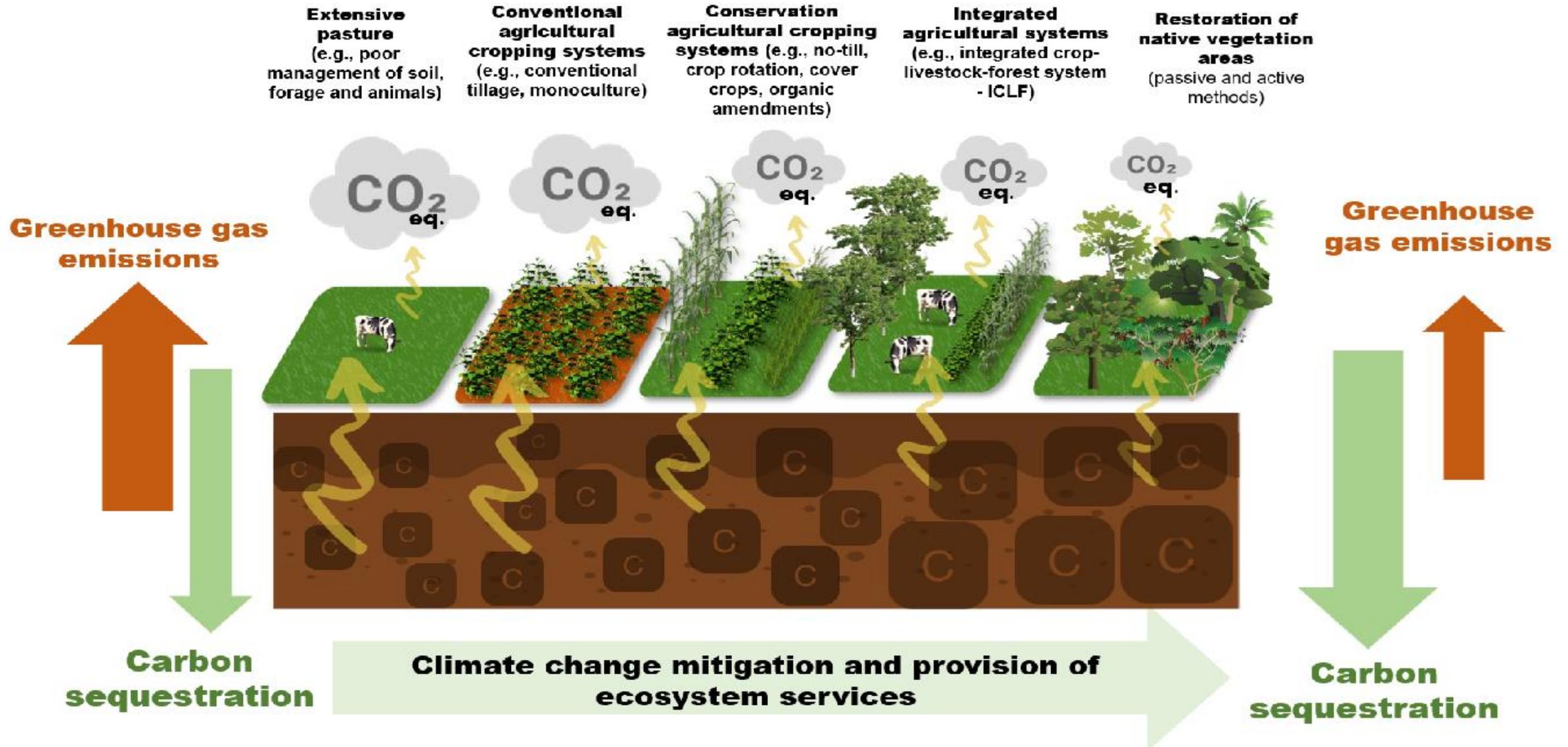
Optimized Seal



Prototypes

Nature Based Solutions

Pathways for intensification and diversification of agricultural systems and restore native ecosystems in Brazil

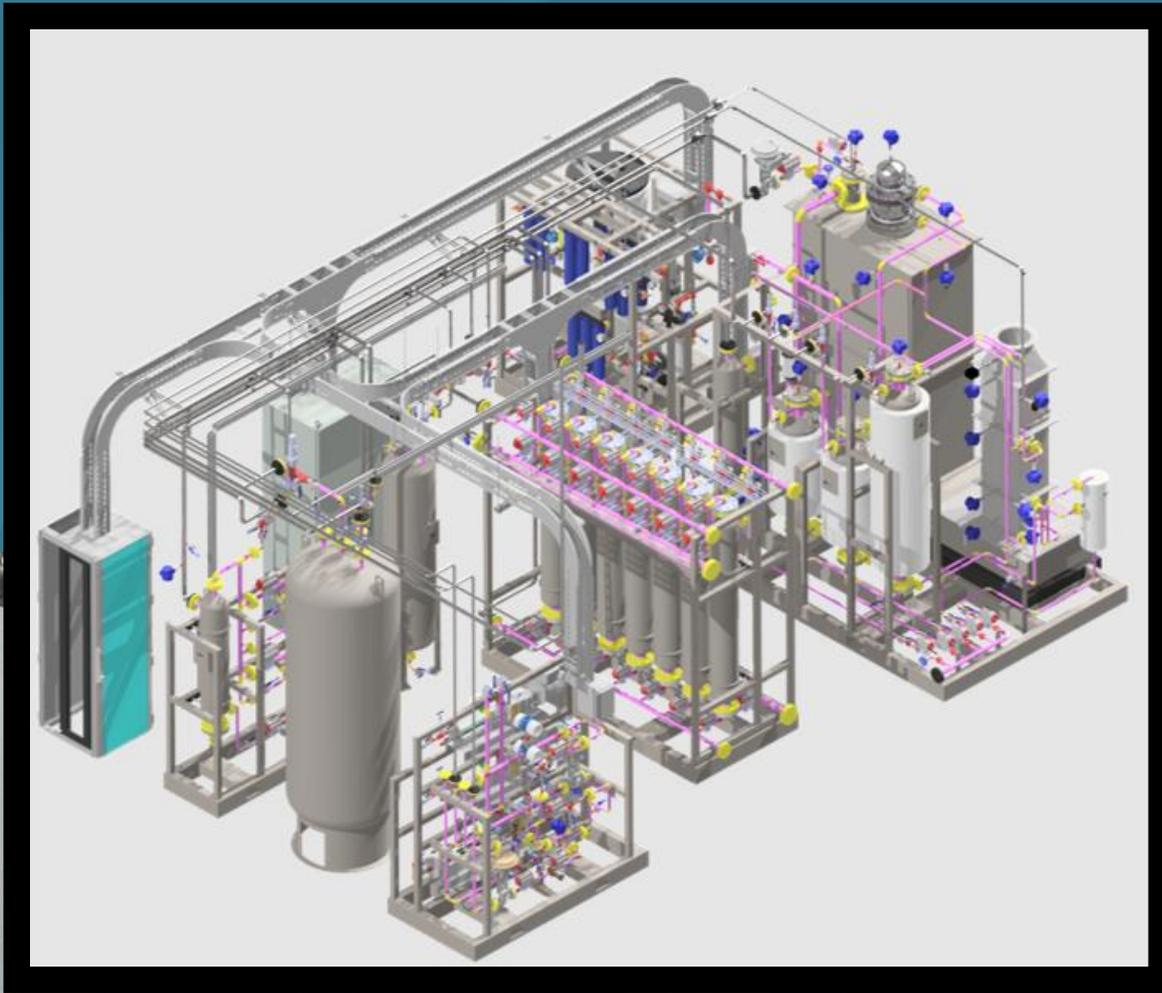


Ethanol to Hydrogen: USP Pilot Plant

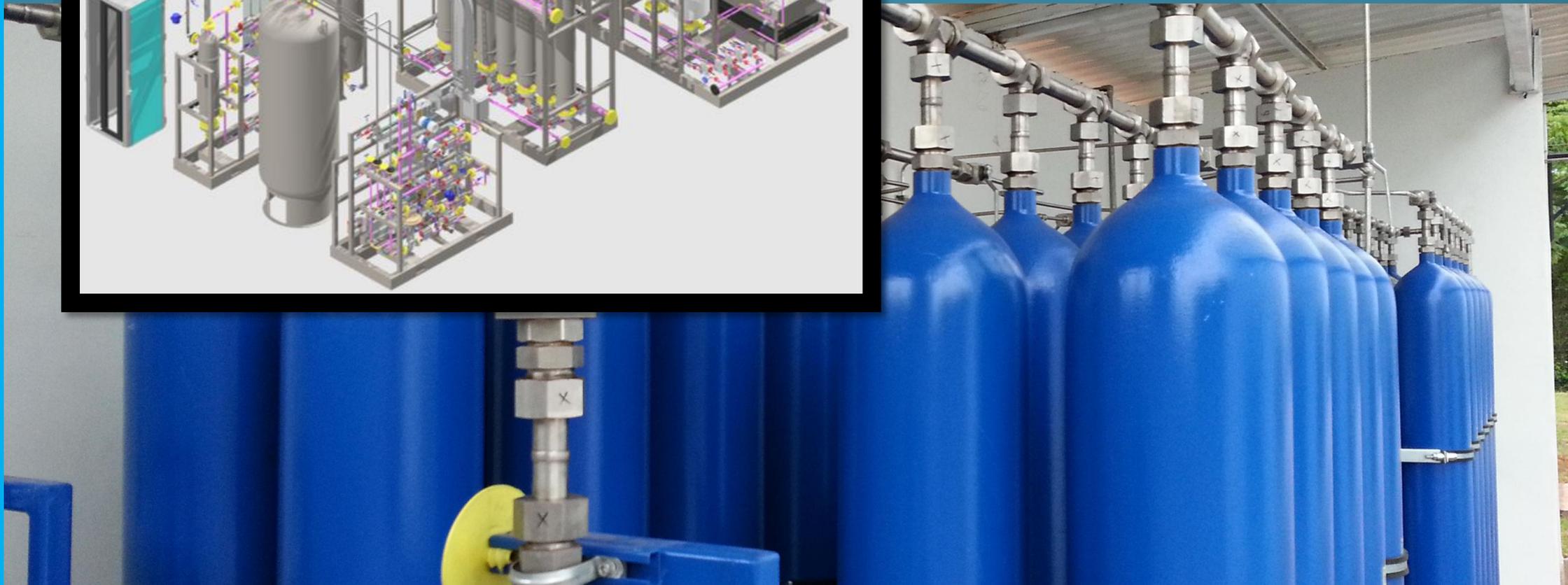


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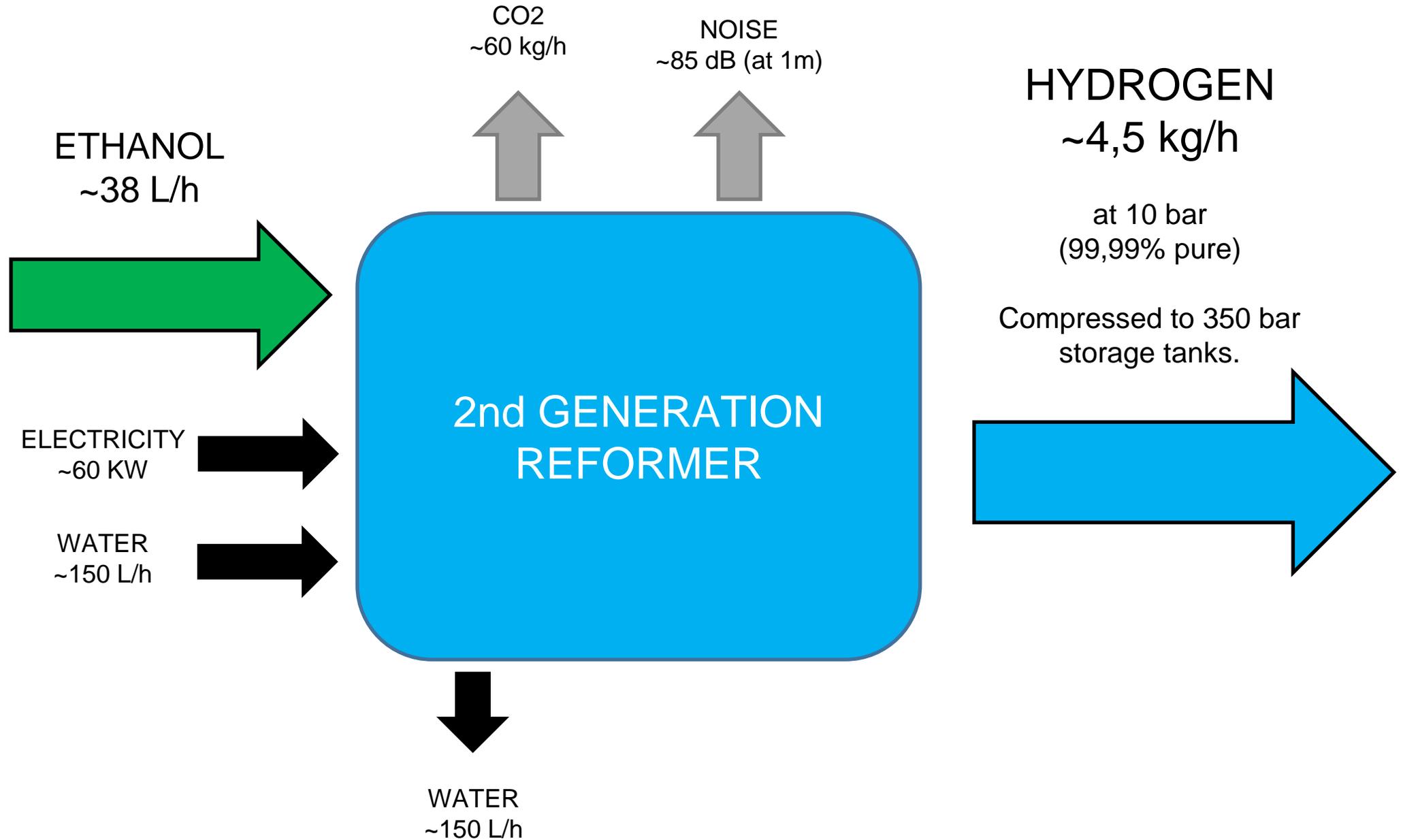
TECHNOLOGY



2nd Generation Ethanol Reformer



TECHNOLOGY



Ethanol to Hydrogen



Thank you!

www.usp.br/rcgi

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