

Organizational Info

Organization Name: Saipem

Organization URL: <https://www.saipem.com/en>

Saipem is a leading company in engineering and construction of major projects in the energy and infrastructure sectors. Saipem positions itself as a global solution provider. Listed on the Milan Stock Exchange, it is present in over 70 countries worldwide and has 32,000 employees of 120 different nationalities.

Innovation is one of the key pillars of Saipem's business model. Traditional strength in internal incremental innovation has been recently reinforced with specific efforts to leverage on disruptive and open innovation.

Challenge Synopsis: Solutions for the Green Hydrogen Value Chain

The Vision for this challenge is to identify deployable technologies and solutions, with a focus on Green Hydrogen that SAIPEM can leverage in its strategic effort to support a low-carbon economy, as it makes use of its strengths in engineering & construction of large-scale projects, onshore and offshore.

Challenge Statement & Context: Hydrogen is used nowadays only as an intermediate in chemical and refining industries.

What is missing to make it the fuel of the future?

- Hydrogen is not naturally available and is usually produced from fossil fuels with a significant carbon footprint (grey/blue hydrogen). Fully decarbonized (green) hydrogen is produced by electrolysis of water using renewable power as input. The production cost of green hydrogen is currently 3-4 times higher than grey/blue hydrogen. Therefore, cost reduction via efficiency and scale is necessary.
- Hydrogen has a much lower volumetric energy content than Natural Gas (about 1/4th), it is highly flammable and prone to leaking. Efficient re-use of existing infrastructure for natural gas transportation is problematic and its conversion to reliable and safe hydrogen transport would be needed.
- During the energy transition period, hydrogen would be produced by using renewable energy. This means intermittent production, so efficient and safe local storage would be needed.
- Where hydrogen is used as intermediate (e.g. ammonia/urea, refineries, methanol), solutions will be necessary to retrofit brownfield plants to green hydrogen.
- Several industrial processes used today (e.g. steel production) were conceptually developed based on cheap availability of fossil fuels. Shifting to hydrogen would require modification or re-design of key process steps.

SAIPEM is seeking solutions in the following categories

Green Hydrogen Production

- a. Improving electrolysis efficiency:
 - High efficiency electrolyzers, combined electrolyzer / fuel cell technology
 - Leading edge proton exchange membrane (PEM) technology
 - Novel alkaline ion-exchange membrane technology
 - Novel approaches, even at low TRL
- b. Footprint and harsh conditions:
 - Increasing size of a single unit, while maintaining small overall footprint
 - Design for offshore conditions
- c. Technologies beyond electrolysis (concepts and low TRL)

Hydrogen storage and transportation

- a. Improved materials for storage and transportation of hydrogen at compression / cryogenic temperatures
- b. Innovative Hydrogen storage tanks, pumps, valves, and other key functional elements
- c. Transportation of hydrogen by ships
- d. Innovative safety systems

Hydrogen utilization

- a. Ammonia/Urea, Refineries, Methanol
 - Solutions for cost- and time-effective retrofit of existing units to green H2

Injection into gas grids

- Blending with NG
- Producing Synthetic Methane
- Pure hydrogen grids

Adjoining sectors (where EPC capabilities are necessary)

- Steel production
- Power generation

Response Criteria:

- This Challenge is generally seeking technologies that are available commercially, or close to commercial availability; Technology Readiness Levels (TRL) of 7-9 are preferred
- Notwithstanding the above, truly disruptive concepts can be evaluated even with lower TRL.
- Given the specifics of Saipem's business, the focus is on mid- to large-scale solutions. This can be seen in terms of power input to electrolysis (from tens to hundreds of MW); or H2 production volumes (thousands of m3/hr).
- This challenge excludes solutions for localized domestic heating, automotive sector and blue hydrogen production (i.e. SMR with CCS)

Next Steps:

If interested in responding to this challenge and participating in this session, please contact Dylan Groven at the Foresight Cleantech Accelerator: dgroven@foresightcac.com.