



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

Energy

**Topics in the 2019
call**

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Energy Pillar Overview

Electrolysers and Hydrogen injection in gas grid

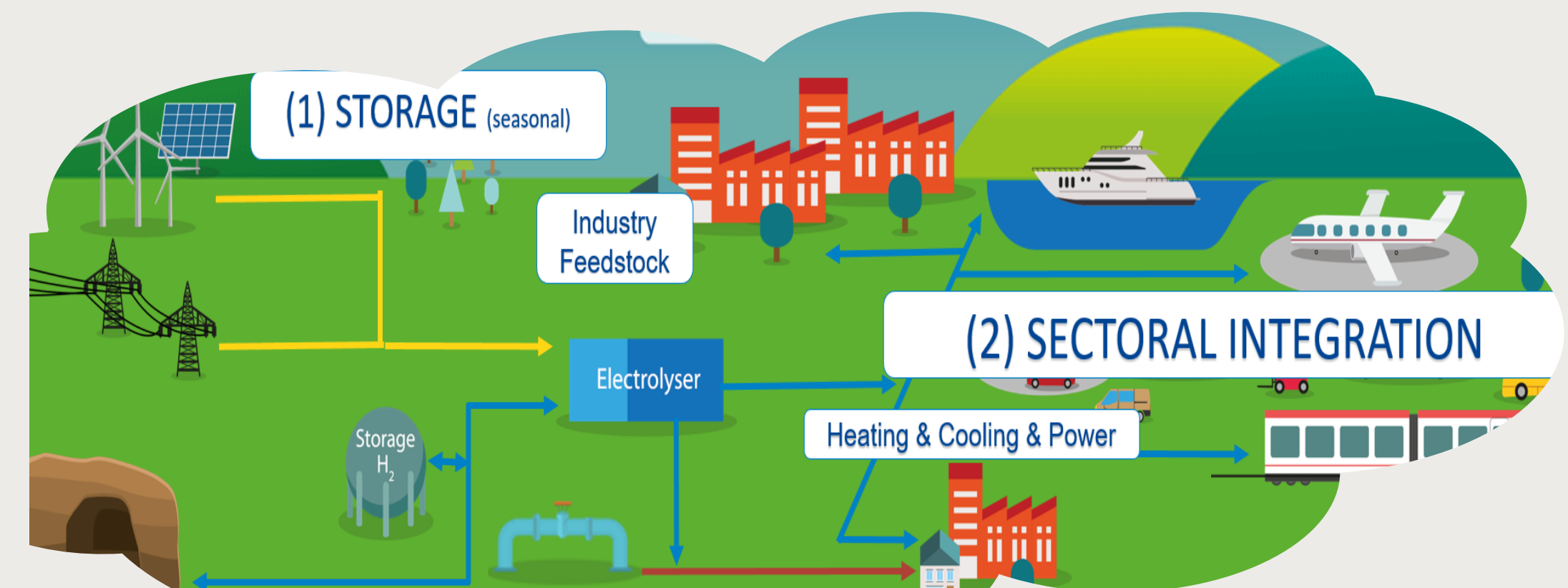


Main Focus

- Greening of NG grid through **injection of electrolytic H₂** @ transmission and distribution NG grids
- Efficient electrolysers

What is new

- Injection of H₂ @ transmission and distribution lines of NG, facilitating HRS
- **Largest SOC** electrolyser (1.5t/d)
- Anion exchange electrolyser



Energy Pillar

Electrolysers and Hydrogen injection in gas grid



<i>Topic</i>	<i>Type of Action</i>	<i>Ind. Budget (MEUR)</i>
<i>FCH-2-1-2019: Combined electrolyser-HRS and Power-to-Gas system</i>	<i>IA</i>	<i>5*,**</i>
<i>FCH-2-2-2019: Multi megawatt high-temperature electrolyser for valorisation as energy vector in energy intensive industry</i>	<i>IA</i>	<i>7*,**</i>
<i>FCH-2-4-2019: New Anion Exchange Membrane Electrolysers</i>	<i>RIA</i>	<i>2</i>
<i>FCH-2-5-2019: Systematic validation of the ability to inject hydrogen at various admixture level into high-pressure gas networks in operational conditions</i>	<i>RIA</i>	<i>2**</i>

** Eligibility criteria: maximum funding*

***Maximum 1 project to be funded*



Energy Pillar Overview

Innovation Actions



FCH-02-1-2019: Combined electrolyser-HRS and Power-to-Gas system



Reduce financial risk of HRS through NG injection and grid services



- Any transport client; Flexible electrolyser >600kg/d; **Injection @ low pressure** NG distribution grid
- **Co-location of HRS with gas distribution network**, ensuring downstream compatibility of devices with level of admixture
- Liaise with topics 02-5 and 04-3

TRL 6 to 8

FCH-02-2-2019: Multi megawatt high-temperature electrolyser for valorisation as energy vector in Energy Intensive Industry (EII)



Scale HTE to a level that has relevance to EII, demonstrating targets on η , durability & cost



- Focus not only on HTE but also on auxiliary equipment (steam supply, H₂ purification, compression)
- **2 separate stacks to be benchmarked @ 10kW** before upscaling
- 1.4t/d operated for 3 years with η degradation < 0.5%/1000h and stack production loss < 1.2%/1000h
- Strategies for addressing constant demand with intermittent production based on renewables

TRL 7 to 8



Energy Pillar Overview

Research and Innovation actions



FCH-02-4-2019: New Anion Exchange Membrane Electrolysers

Material and design breakthroughs needed for AEME to fulfil their potential

- Develop new components (membranes, ionomers, PGM-free electrodes)
- **1kW stack** with > 5 cells, 2V @ 1 A/cm²
- Include industrial partner capable of scaling-up; International Collaboration encouraged.

TRL 2 to 4

FCH-02-5-2019: Systematic validation of the ability to inject hydrogen at various admixture level into high-pressure gas networks in operational conditions

Develop a platform for testing components of a **high pressure network (40-80 bar)** for various H₂/CH₄ mixtures (0-100%, >5kg/h)

- Test gas network equipment, appliances and coatings
- Test separation systems for cases where H₂ < 15%
- Legal, regulatory aspects; Safety; Gas metering; Leakage detection

TRL 4 to 6



Energy Pillar Overview

Fuel cells for Energy

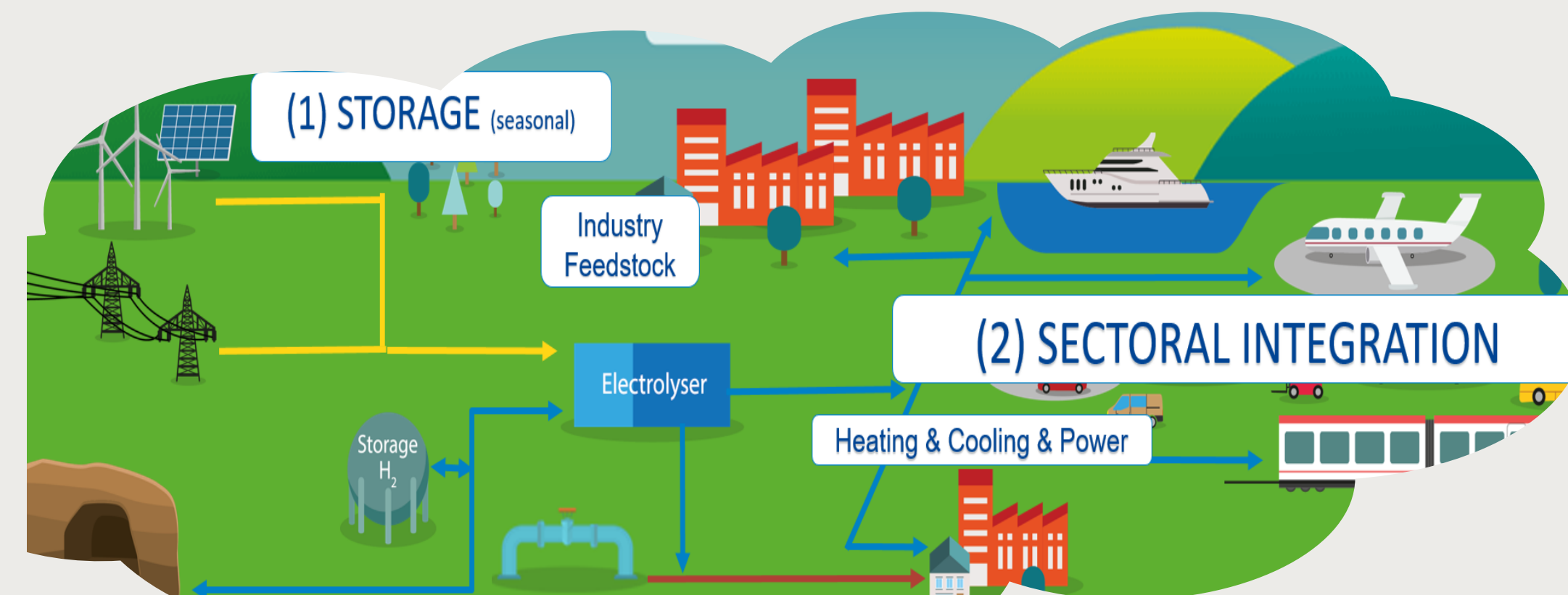


Main Focus

- **Consolidating European leadership** on Solid Oxide based technologies and opening-up of new markets
- **Setting the basis for the commercialisation** of results emerging from research projects

What is new

- Innovative **poly-generation** systems using rSOCs
- **Optimised materials** and manufacturing process for SOCs under different operating modes
- Validation of **HTPEMFCs** for ~5kWe applications
- Demonstration of **advanced diagnostic and controls** tools for stationary FCs



Energy Pillar

Fuel Cells for Energy



<i>Topic</i>	<i>Type of Action</i>	<i>Ind. Budget (M€)</i>
<i>FCH-02-3-2019: Continuous supply of green or low carbon H2 and CHP via Solid Oxide Cell based Polygeneration</i>	<i>IA</i>	<i>3*</i>
<i>FCH-02-6-2019: New materials, architectures and manufacturing processes for Solid Oxide Cells</i> <i>Maximum 1 project to be funded</i>	<i>RIA</i>	<i>5*</i>
<i>FCH-02-7-2019: Development of highly efficient and flexible mini CHP fuel cell system based on HTPEMFCs</i>	<i>RIA</i>	<i>1.5*</i>
<i>FCH-02-8-2019: Enhancement of durability and reliability of stationary PEM and SOFC systems by implementation and integration of advanced diagnostic and control tools</i>	<i>RIA</i>	<i>3</i>

* Eligibility criteria: maximum funding

For all topics: Maximum 1 project to be funded



FCH-02-3-2019: Continuous supply of green or low carbon H₂ and CHP via Solid Oxide Cell based Polygeneration



Develop, engineer, **build** a SOC based **polygeneration** system :

- Electricity to hydrogen mode or
- Methane to hydrogen, electricity and heat mode



- Electrolysis **output** > 20 kg H₂/day
- 5,000 hours **tests in real** industrial or mobility **environment**
- **Performance** criteria included in the AWP
- **New** operational and business **models**
- “CertifHy Green H₂” **guarantees of origin** should be used

TRL 4-5 to 6

Energy Pillar Overview

Research and Innovation actions



FCH-02-6-2019: New materials, architectures and manufacturing processes for SOCs



Optimisation of materials historically used for SOFCs for SOE, co-SOE and rSOC applications



- **Next generation** of cells and stacks for SOC applications
- **New materials**, architectures and **related manufacturing processes**
- Cell development -> short stack testing -> 5,000 hours **tests at stack level**
- At least **3 cell or stack manufacturers** involved in SOE, co-SOE or rSOC + research institutions / academic groups

TRL 2 to 4

FCH-02-7-2019: Development of highly efficient and flexible mini-CHP HTPEMFCs system



Develop, manufacture and validate a mini-CHP device using HTPEMFCs technology at 5 kWe



- **Specific KPIs should be addressed** at proposal stage, e.g system elc eff of 50-55%
- **Validation** in relevant environment
- **At least two fuel cell system-core component suppliers and a system integrator** with clear perspectives and commitment to exploit results commercially

TRL 3 to 5-6



Energy Pillar Overview

Research and Innovation actions



FCH-02-8-2019: Enhancement of durability and reliability of stationary PEM and SOFC systems by implementation and integration of advanced diagnostic and control tools



Enhancement of durability and reliability of stationary PEMFC and SOFC systems



- Develop and demonstrate a **new generation of robust, general and cost-effective prognostic and control tools**
- Consider integration of **available monitoring and diagnostic** techniques
- At least **1 year testing** of MDPC tool (**prototype**) in **operational environment** for at least two PEM and two SOFC systems.
- **Cost** of the **FC systems** for the testing are **not in scope** of the topic
- Extended **lifetime , availability and reliability** / Specific KPIs in AWP 2019



TRL 4 to 7