



Mostly green, always secured

Smart Ways for In-situ Totally Integrated and Continuous Multisource  
Generation of Hydrogen



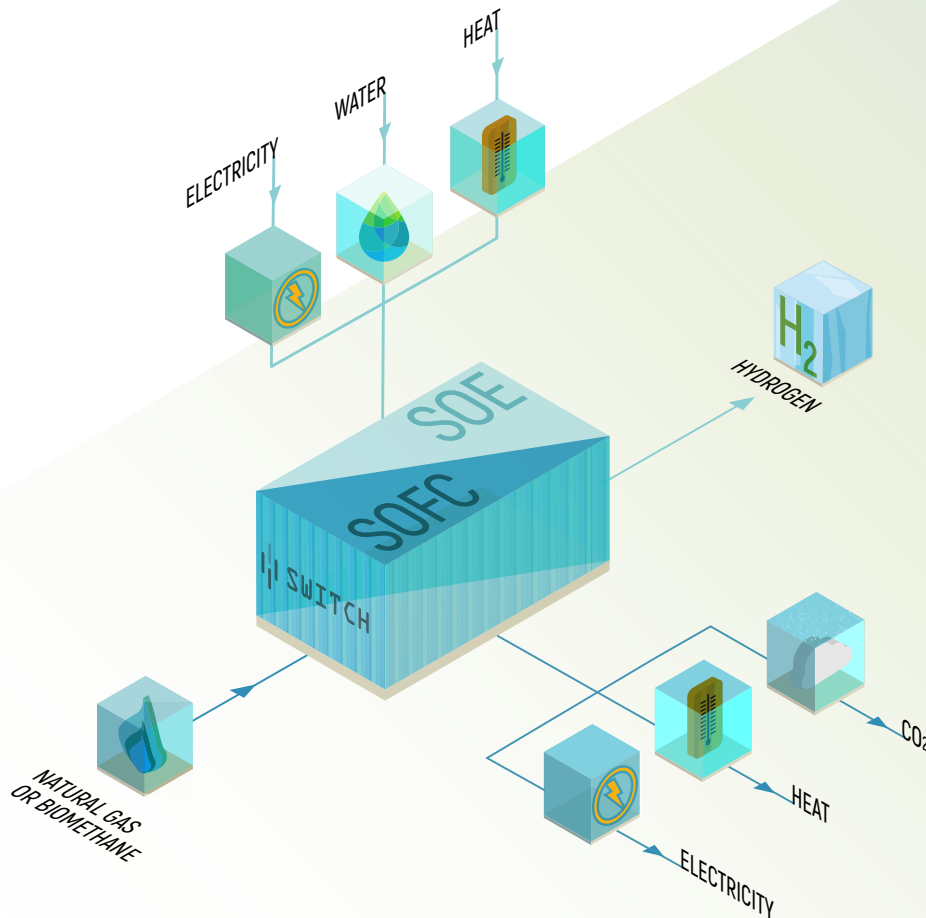
FUEL CELLS AND HYDROGEN  
JOINT UNDERTAKING

## PROJECT DESCRIPTION

SWITCH is an Horizon 2020 **European Project** that aims at designing, building and testing a novel system prototype for producing hydrogen, heat and electricity.

The SWITCH system will be a stationary, modular and continuous multisource **hydrogen production technology** designed for hydrogen refuelling stations (HRS).

The core of the system will be a reversible Solid Oxide Cell (SOC) operating in two modes:



### 1 electrolysis - SOE mode

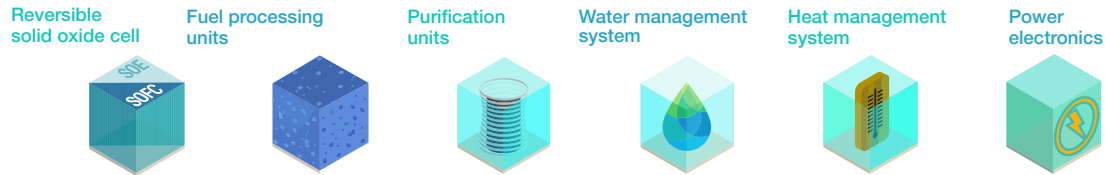
using renewable electricity, water and heat to produce green hydrogen.

**2 fuel cell - SOFC mode** using natural gas or bio-methane to produce grey or green hydrogen, electricity and heat when renewable electricity will not be available.

The integration of the two modes will allow the **continuous and guaranteed production of hydrogen** for contracted end users.

## KEY COMPONENTS

The SWITCH system will be realized with the **strong integration among the components**, in particular in term of fuel and thermal management. The key components will be:



**Reversible solid oxide cell** based on anode supported electrolyte, leading the electro-chemical reaction for  $H_2$  production;

**Fuel processing units**, able to manage steam generation and methane reforming reactions at high efficiency;

**Purification units**, to guarantee highly pure hydrogen in compliance with the main industrial and automotive standards;

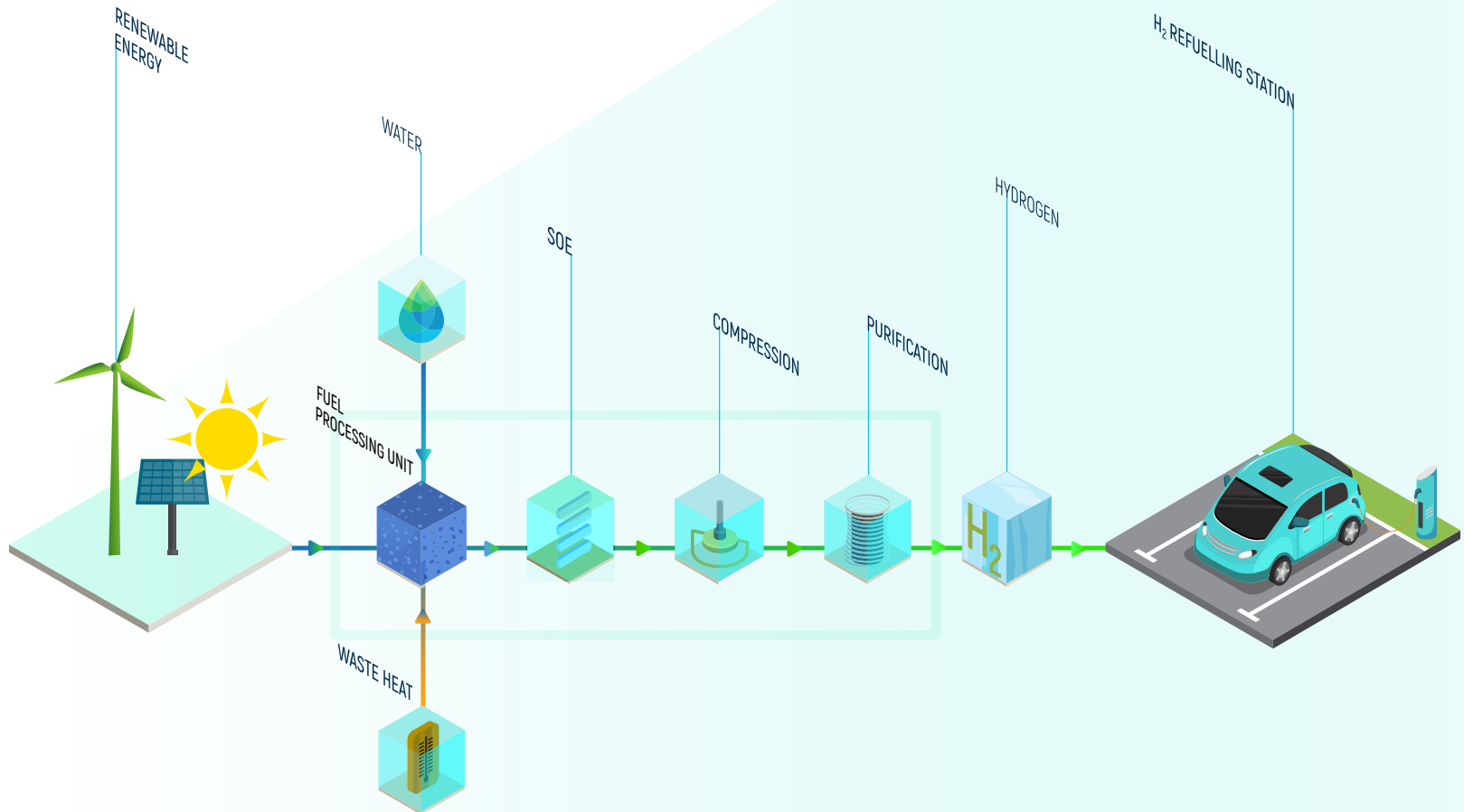
**Water management system** for recycling high purity water from purification unit and for treating feed water;

**Heat management system** based on a heat exchanger network for optimizing heat recovery, minimizing the amount of makeup gas used to achieve the thermal balance of the system;

**Power electronics** capable of supplying electric power to the system in electrolysis mode and exporting power to the grid in SOFC mode.

## SOE MODE

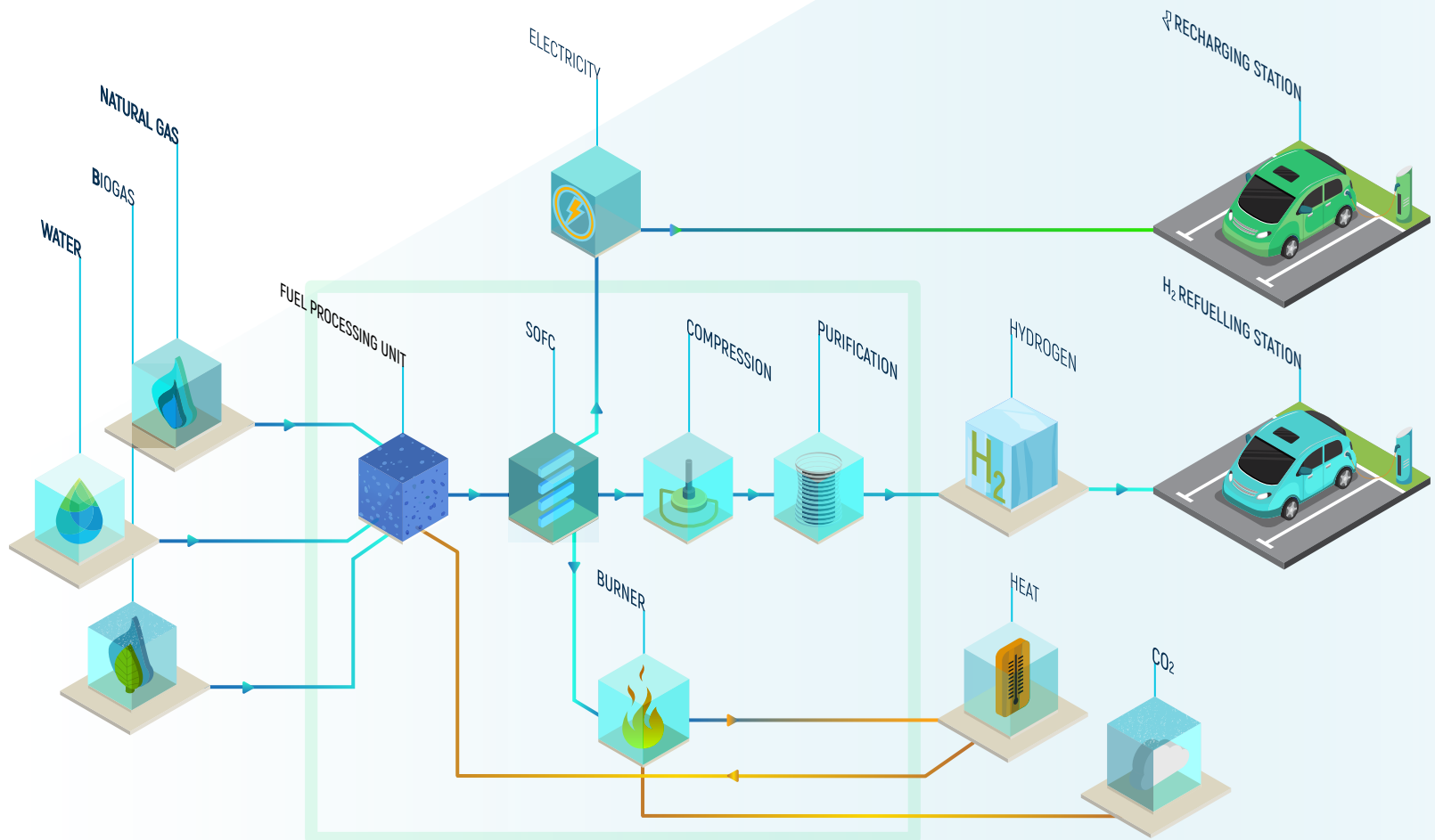
In the **Solid Oxide Electrolysis Mode** - **SOE Mode** - the SWITCH system will use the electricity produced from renewable sources to produce **green hydrogen**. Through electrolysis, **renewable electricity** will be used to split water molecules into hydrogen and oxygen.



## SOFC MODE

The SWITCH system aims at extending the operations of the electrolysis mode by allowing the Solid Oxide Cell to operate in **Fuel Cell Mode - SOFC Mode** - at partial fuel conversion to allow the simultaneous production of **hydrogen and electricity**.

Owing to the reversible SOC, the SWITCH system will operate in electrolysis mode when renewable electricity is available and in fuel cell mode the rest of the time.



## USE CASES

The SWITCH system will be designed for integration at hydrogen refuelling stations (HRS). The ambition is to target multiple use cases by considering different demand profiles for supplying "mostly green, always secured" hydrogen and power.



## EXCELLENCE

SWITCH aims at becoming a key technology for the transition to a **zero-carbon mobility in Europe**.

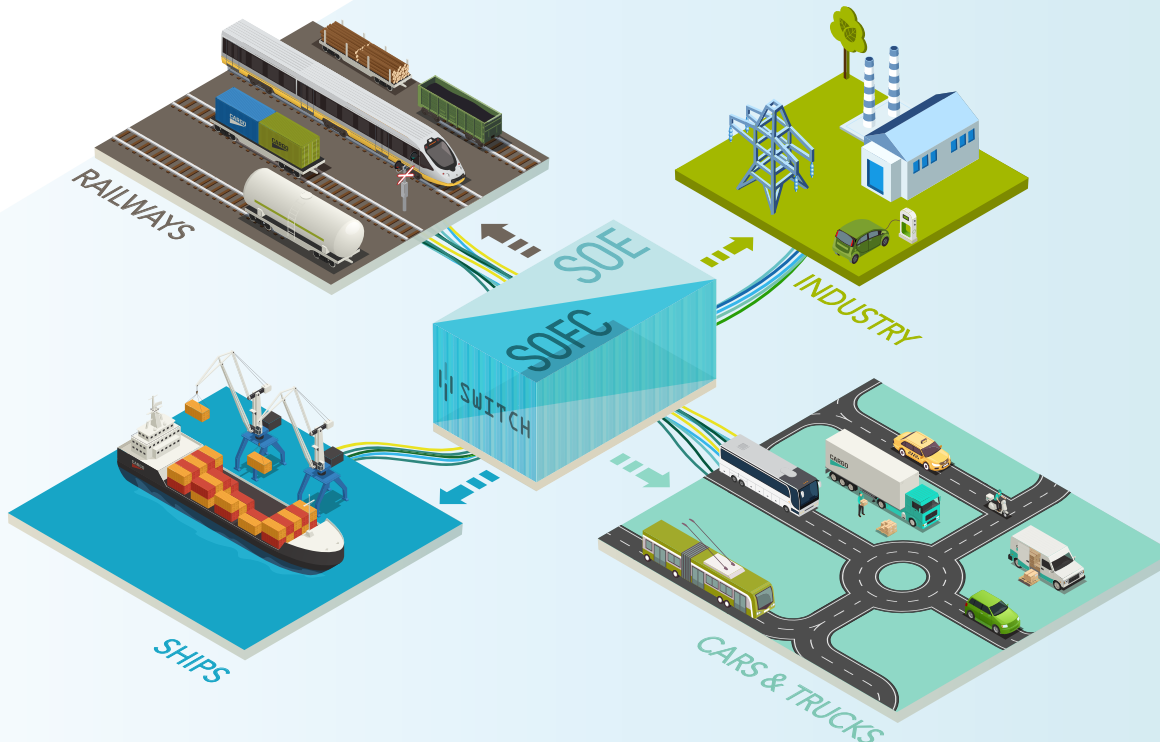
The SWITCH project will demonstrate the core building block of an innovative system for producing hydrogen and electricity at hydrogen refuelling stations.

Offering both economic and continuous supply of hydrogen, it will open the door for the **mobility** and **energy transition**.

By generating "Mostly green, always secured" hydrogen, the SWITCH system will have two main advantages:

Sustainability by producing mostly green H<sub>2</sub> in a flexible and reversible way

Security of H<sub>2</sub> supply





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## Large Enterprises



## Small & Medium Enterprises



## Research institutes



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