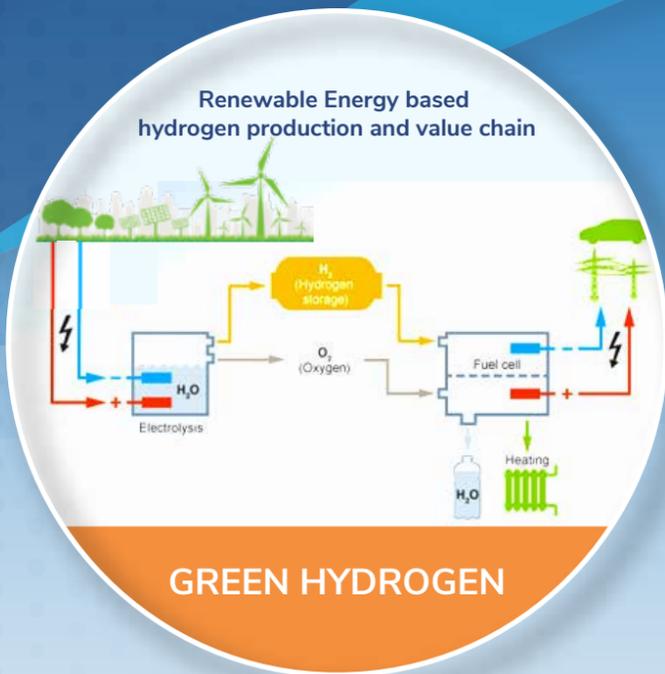




## Technology Overview

# GREEN HYDROGEN

Hydrogen gas systems can be effectively used to store excess power generated from Saudi Arabia's proposed projects in the renewable energy space



Hydrogen gas is a versatile fuel that can be burned to produce heat, or utilized in an electrochemical fuel cell to produce electricity.

Hydrogen gas is considered to be a clean alternative to the use of gasoline, diesel fuel, methane, and other energy sources derived from fossil fuel sources. The production of hydrogen gas has been considered as a possible solution for storing excess generation from renewable energy sources, such as solar and wind. Instead of curtailing excess renewable generation, the energy can be used to produce, compress, store, and distribute hydrogen gas, which can then be used as a fuel or electricity source upon demand.

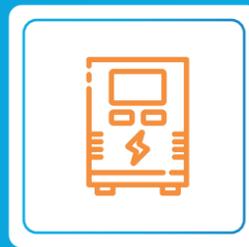
## THE BENEFITS



Clean alternative fuel to the use of gasoline, diesel fuel and methane



Zero greenhouse gas emissions



Source of stationary backup power for uninterrupted supply of electricity



Renewable energy integration and energy storage capabilities

## WHAT IS DRIVING ADOPTION?



Demand for clean transportation like hydrogen fuel cell electric vehicles (FCEV)



Growing penetration of renewable energy and the subsequent need for energy storage

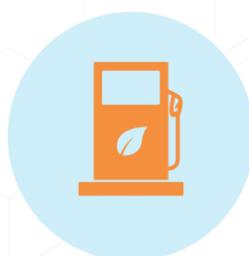
## KEY APPLICATION AREAS



Electricity generation and storage



Back-up power and demand response



Transportation fuel



Hot water generation



Industrial process heat

## OPPORTUNITIES FOR KSA LOCALIZATION

Manufacturing of the following technology components:



Heat Exchangers



Storage Tanks



Piping, valves and flanges



Solar Panel Assembly



Wind Nacelles



Pumps and Pumping Systems

## CHALLENGES TO SCALING IN KSA

1

Subsidized energy costs hampering penetration of technologies such as fuel cells in transportation

2

Absence of clear policy on energy storage and its integration with renewable energy for grid management

3

Lack of assessment on viability of hydrogen gas for effective and economical application across KSA