SARAWAK: Building Up Hydrogen Ecosystem in Asia Pacific & Beyond
SDI Public Talk

October 29, 2024, Zoom

Dennis Harun Wong
Head of Strategy & Marketing

A wholly owned subsidiary of
Sarawak Economic Development Corporation

ABOUT US

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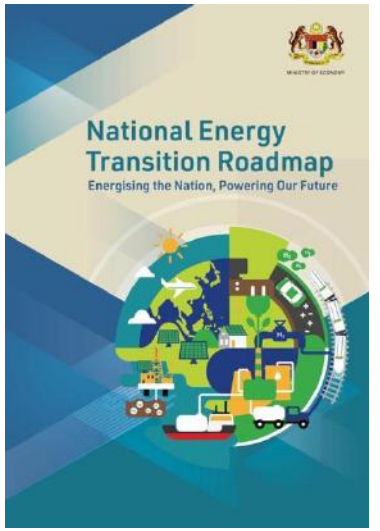
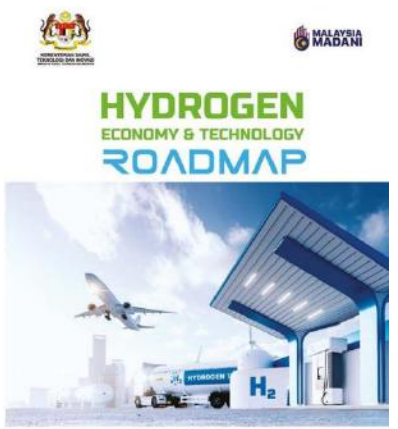
SEDC Energy (SEDCE) – is a wholly owned subsidiary of the Sarawak Economic Development Corporation, a statutory body of the Sarawak Government.

SEDCE is mandated by the Sarawak Government to develop the hydrogen economy value chain and other new energy initiatives together with the downstream petroleum businesses in Sarawak.

SEDCE is currently at the forefront of defining the future of sustainable and impactful energy landscape in Sarawak.

#SEDCENERGY #SEDCE

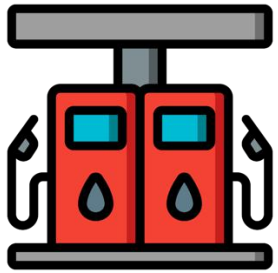




WHAT WE DO – NEW ENERGY

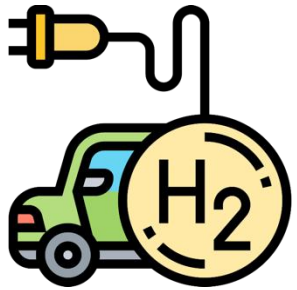
HYDROGEN PRODUCTION

HYDROGEN VALUE CHAIN



MULTIFUEL STATIONS

ALTERNATIVE LOW CARBON FUELS



MOBILITY

TOWARDS NET ZERO

TOWARDS NET ZERO 2050

Malaysia is one of the 196 countries who signed the Paris Agreement, which is a legally binding international treaty on climate change. The overarching goal of this is to hold the increase in the global average temperature to well below 2°C.

The years since its entry into force have already sparked low-carbon solutions and new markets. More and more countries, regions, cities and companies are establishing carbon neutrality targets. This trend is most noticeable in the **POWER** and **TRANSPORT SECTORS** and has created many new business opportunities for early movers.

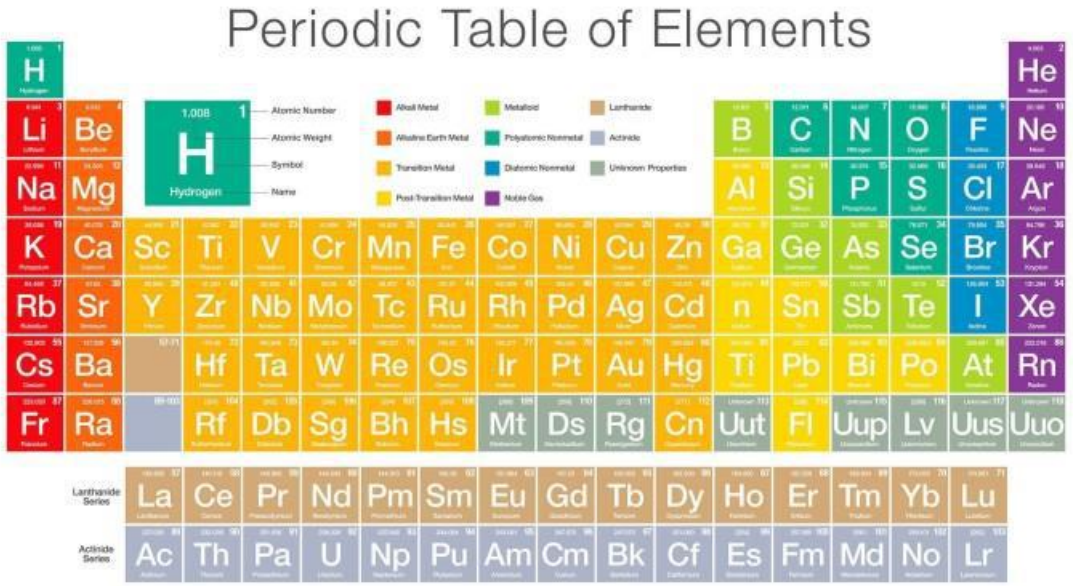
WHAT IS H2

WHAT IS H2?

H2 is a colourless, odourless, tasteless, flammable gaseous substance and is the simplest member of chemical elements.

H2 is not a primary energy but an energy carrier. Unlike fossil fuels it is a secondary energy without CO2 emissions.

In Oil & Gas, H2 is mainly used for petroleum refining and is produced by the reaction of hydrocarbons with steam in the presence of a catalyst.



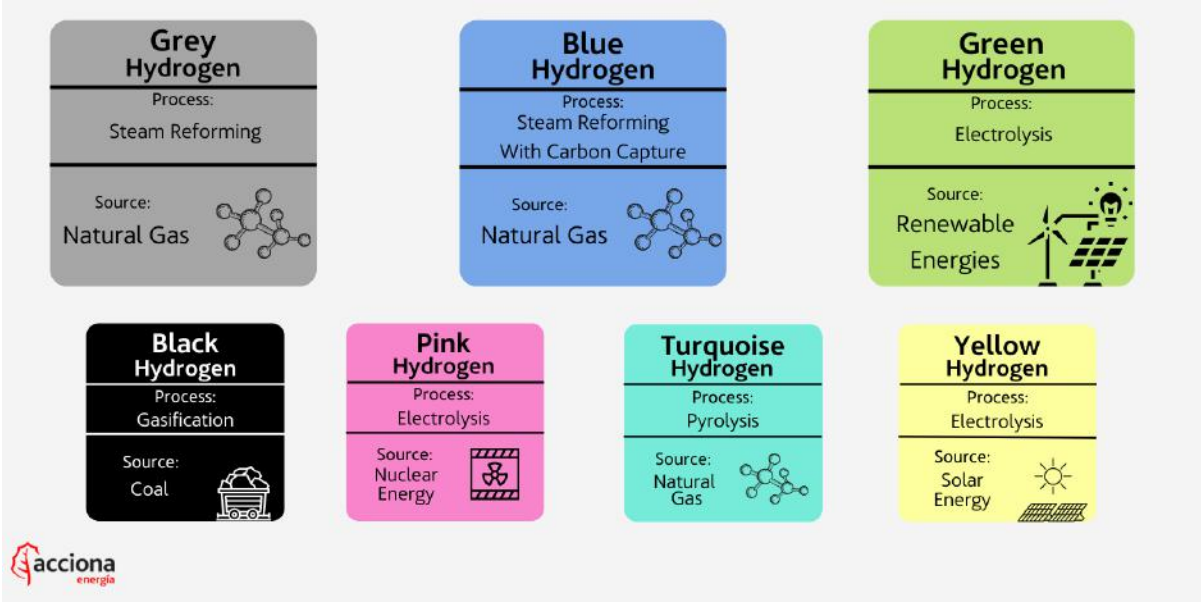
TYPES OF H2

Almost 99% of hydrogen produced in the the world is of fossil origin and it is mostly obtained from the steam reforming process of methane, the main component of natural gas. Each kg of H2 produced emits **12 kg** of **CO2**, and the price varies from 1 to 2.5€ per kg. Nearly 45% of world production comes from this technique.

Another method uses coal, burned at a very high temperature to separate H2 (1200 to 1500°C). About 30% of the total production, makes it possible to obtain H2 with pricing per kg varies between 1.5 and 3€, but releases **19kg** of **CO2** per kg of H2.

These are also known as **GREY** hydrogen.

Source: https://www.eo-dev.com/technologies/hydrogen



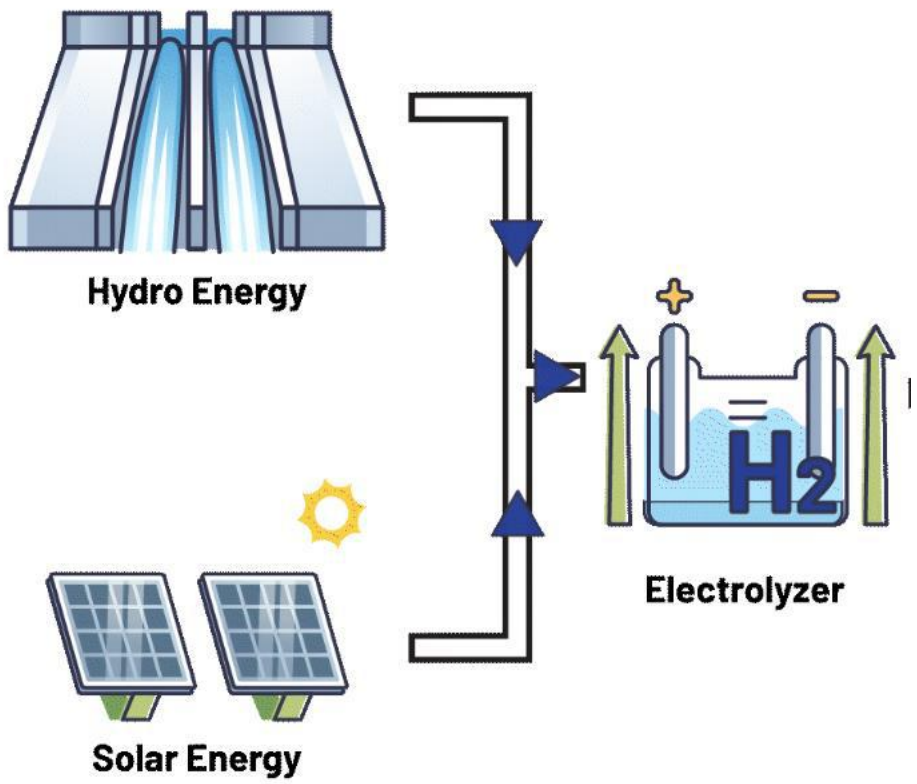
Source: https://www.acciona.com.au/updates/stories/what-are-the-colours-of-hydrogen-and-what-do-they-mean/

GREEN H2

"Green" hydrogen, contributes less than 1% of global production comes from the use of carbon-free or renewable energies (solar, wind, hydropower). Water electrolysis, allows a zero-carbon footprint, represented only 0.1% of global hydrogen production in 2019, due to its high production cost compared to other methods, one kg of hydrogen costing between €3 and €12 for its production alone (excluding the cost of transport, distribution, etc.).

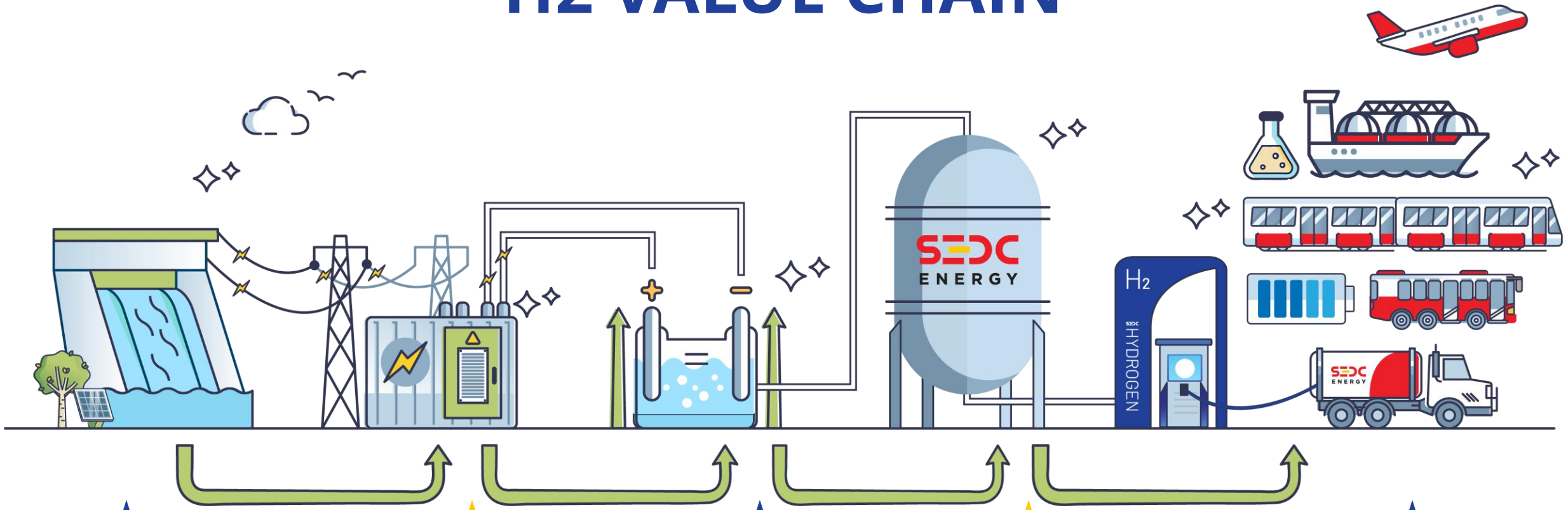
To enable the large-scale deployment of "green hydrogen" in the future, electrolysis from a renewable energy source is one of the paths, and it is clearly one of the options chosen in Sarawak.

Source: https://www.eo-dev.com/technologies/hydrogen



H2 VALUE CHAIN

H2 VALUE CHAIN



RENEWABLE ENERGY SOURCE

Hydropower and solar

ELECTRICITY PRODUCTION

Electricity supply from RE is carbon free

H_2 ELECTROLYSER

Water Electrolysis process allows for zero-carbon footprint

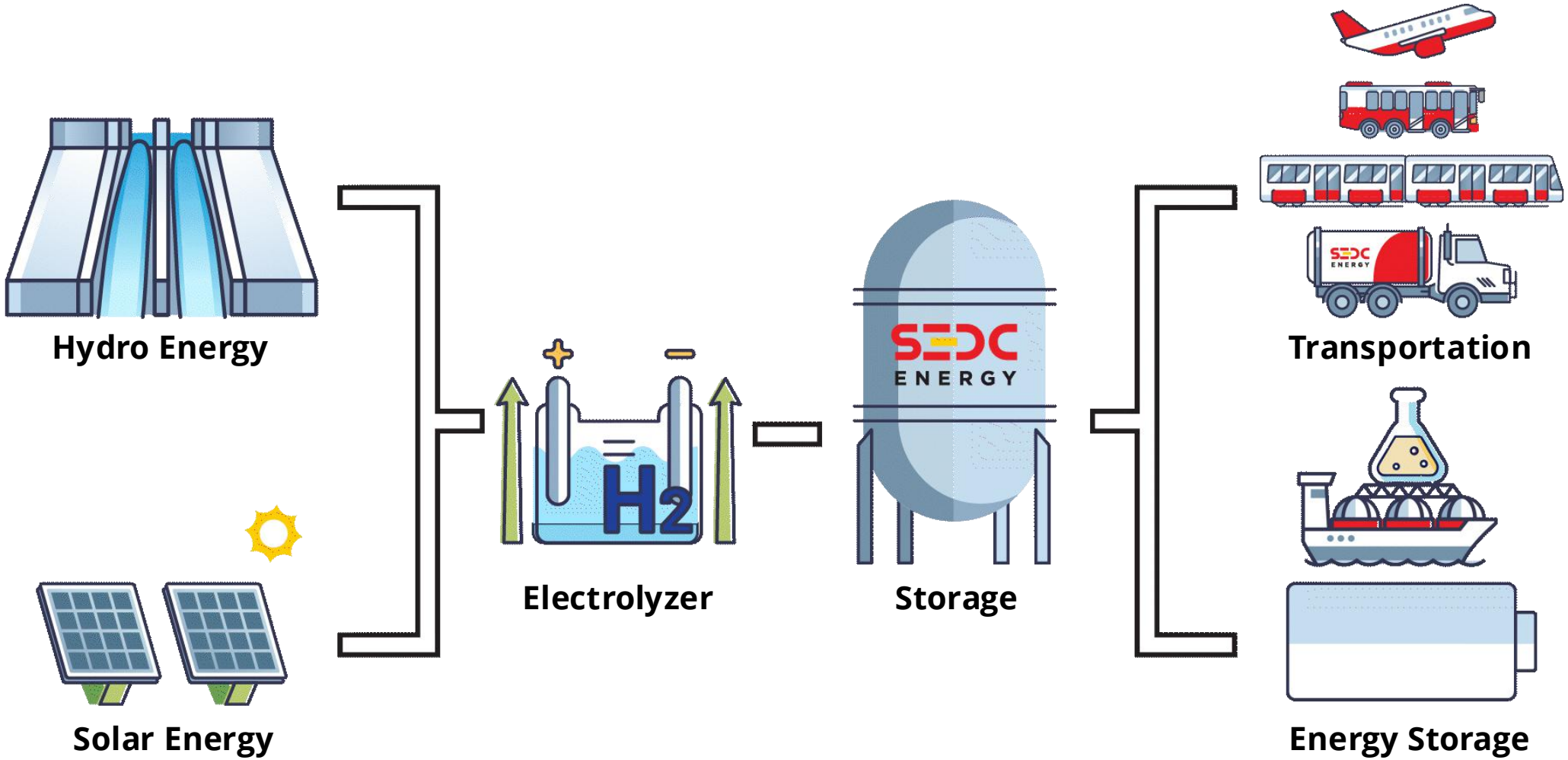
STORAGE

H2 Stored for usage distribution

USAGE

Transportation, chemical industries, energy storage, liquefication & export

VALUE CHAIN OVERVIEW



SARAWAK H2 HUB

Currently;

- Project **H2ornbill** -

Sumitomo Corporation ENEOS

- Methylcyclohexane (MCH) (for Japan)

- Project **H2biscus -**

SAMSUNG E&A LOTTE CHEMICAL

KNOC

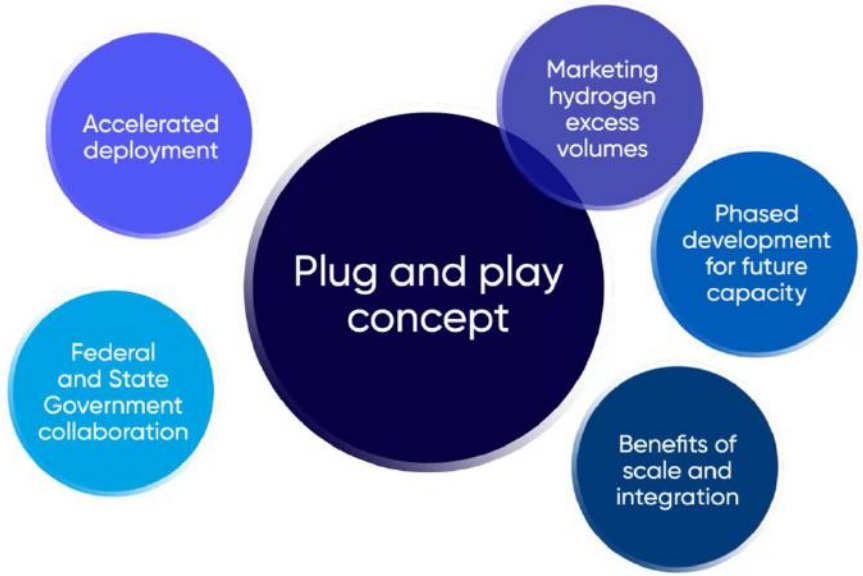
- Green ammonia (NH3) (for Korea)

Bintulu, Sarawak

SARAWAK H2 HUB

Reducing the building blocks, with opportunities to expand and scale up production via this concept

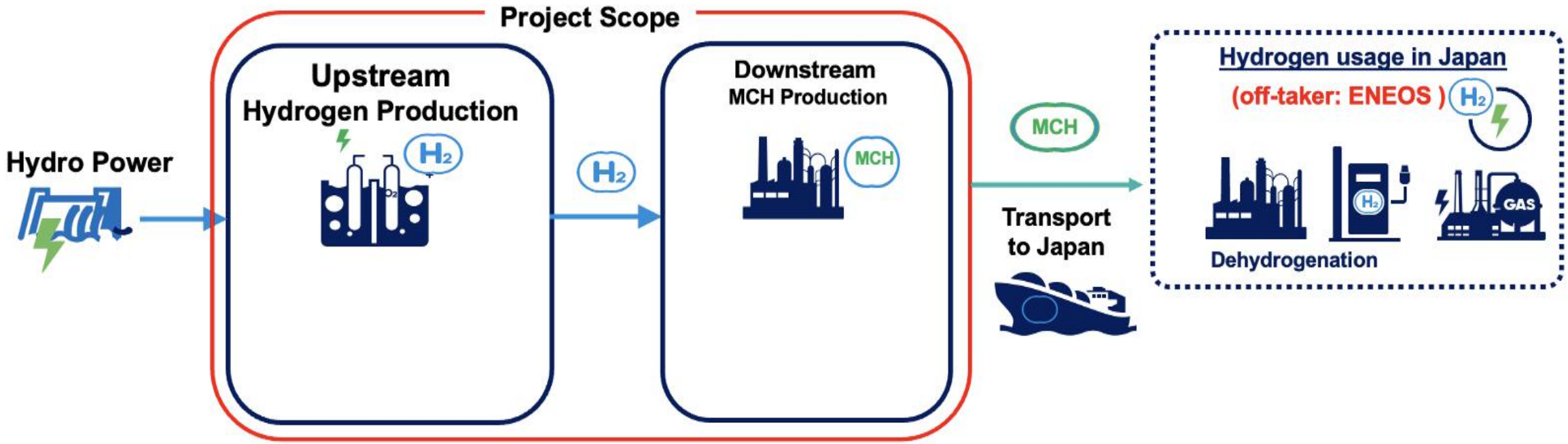
Unlock the value chain of H2 derivatives by targeted investments in the Petchem Industry. Clean H2 would provide investment opportunities for other future clean products.



PROJECT H2ORNBILL

Export to Japan as Methylcyclohexane (MCH)

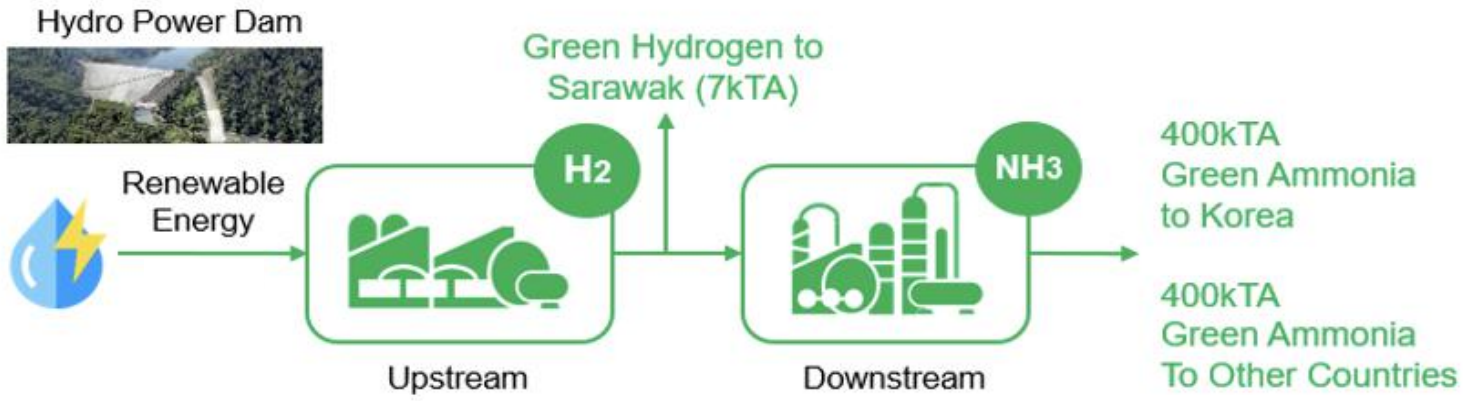
- Total Production Capacity: **88kTPA**



PROJECT H2BISCUS

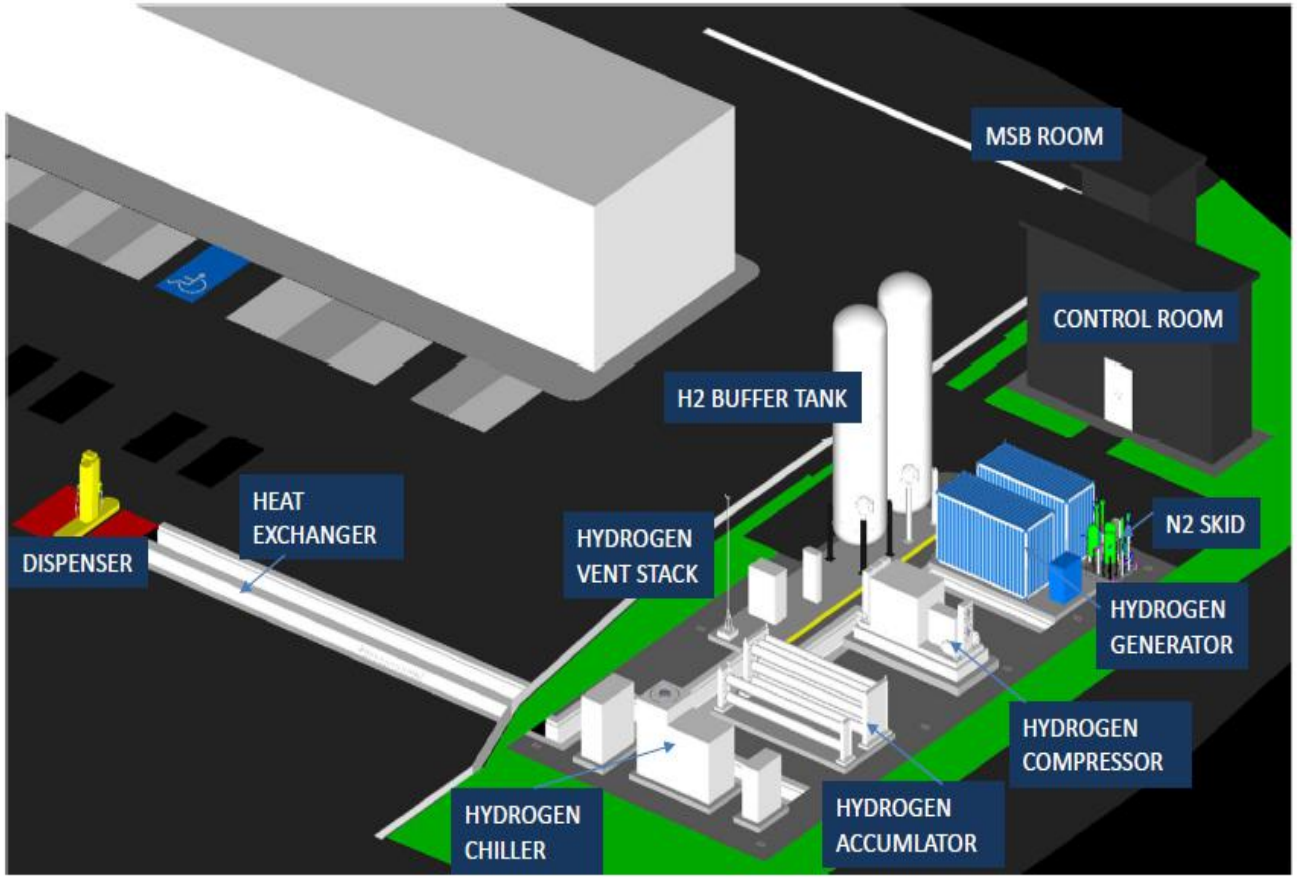
Exporting Hydrogen as Ammonia (NH3) to Korea

- Total Production Capacity: **150kTPA**



DARUL HANA H2 PLANT

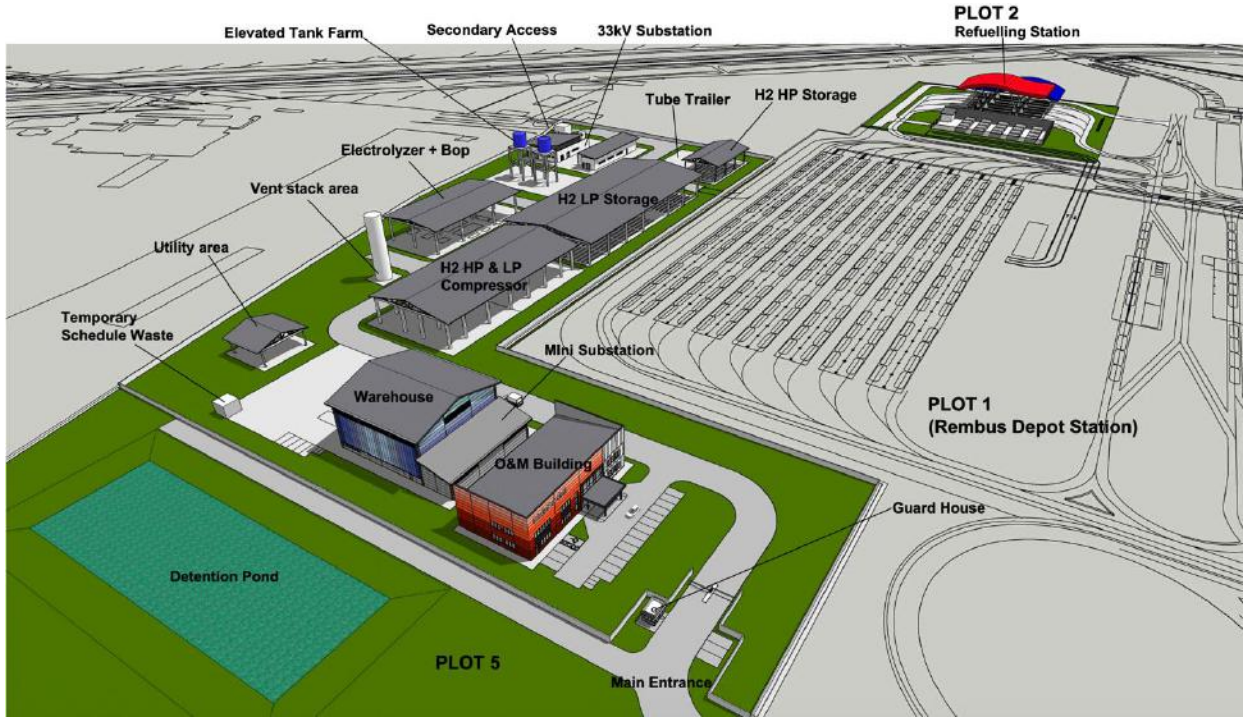
- Developing the first public hydrogen refueling station for hydrogen fuel cell vehicles in Sarawak, Malaysia.
- Total production capacity: **150 kg/daily**
- *Darul Hana H2 plant commissioning in progress.



Rembus Hydrogen Plant

Hydrogen to support Sarawak's public transportation system

- Kuching City Transportation System (KUTS)
- Automated Rapid Transit (ART)



- Location: Rembus, Samarahan
- Minimum **5 tonnes** of H2/day capacity at the Hydrogen plant

SARAWAK ELECTROLYSER ASSEMBLY & DISTRIBUTION FACILITY (SEA-DF)

- A collaboration between SEDCE & Lestari H2 Gaas.
- Malaysia's first electrolyser assembly facility.
- Industry standard electrolysers utilizes between 50-60kWh to produce 1kg of H2.
- The facility will deliver advanced electrolysers capable of utilising less than 40kWh to produce 1Kg of H2.

MULTIFUEL STATIONS

Six flagship multifuel stations powered by SEDC Energy, planned across Sarawak. Conventional Vehicle refueling, EV charging and Hydrogen refueling capabilities.

Developing the first public hydrogen refueling station for Hydrogen Fuel Cell Vehicles in Sarawak, Malaysia.

Smaller multifuel stations will be equipped with EV charging & conventional fuels, subject to local demand.

ULTRAFUEL97

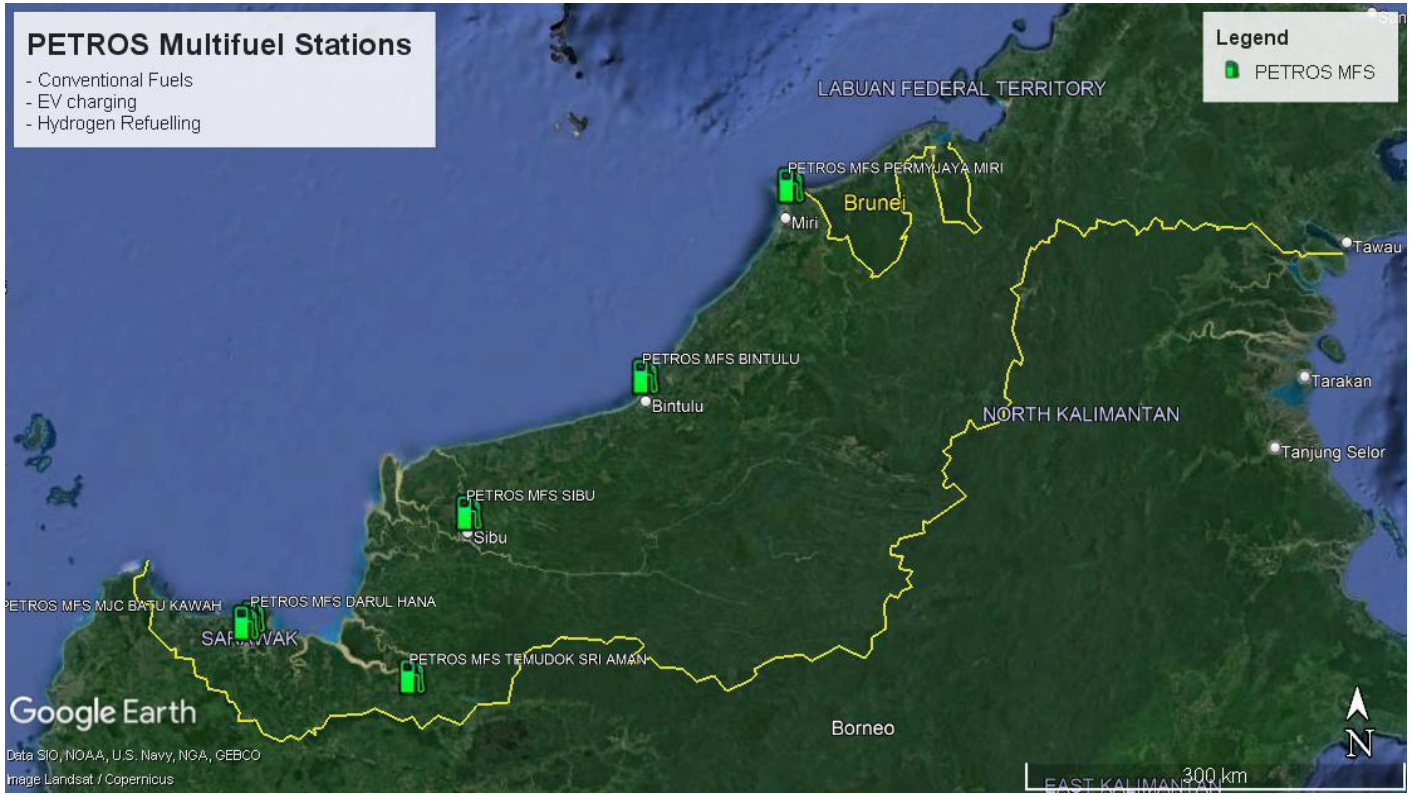
POWERFUEL95

DIESELMAX e5

DIESELGO e5

SEDC HYDROGEN

SEDC ELECTRIC



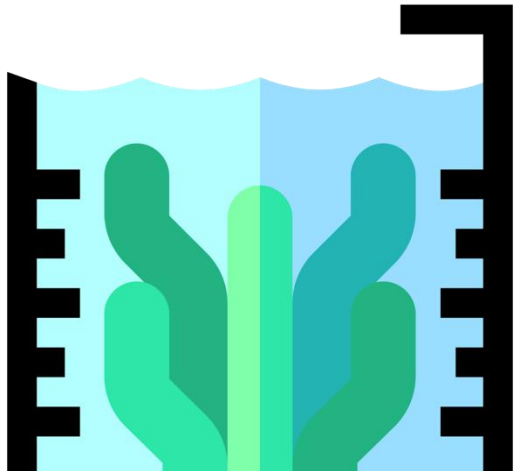
MULTIFUEL STATIONS

Flagship Station

- Darul Hana
- MJC Batu Kawa

Conversion Stations on going

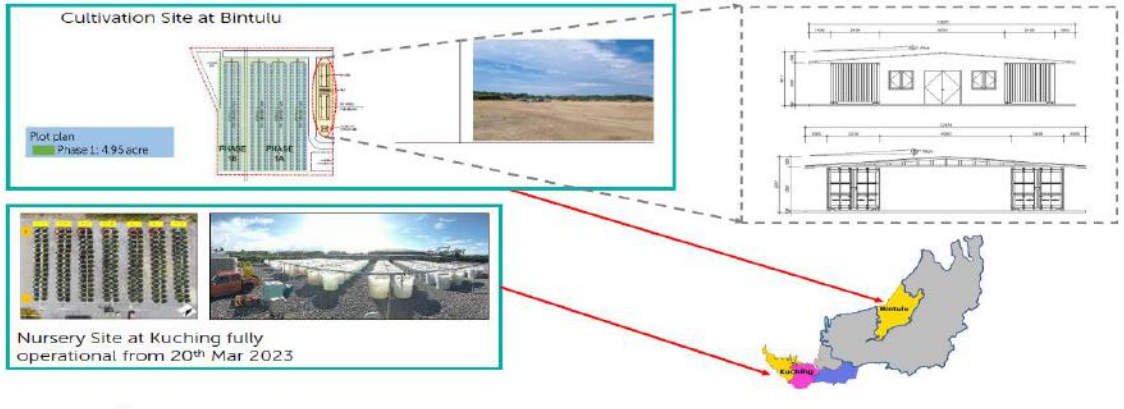
ALTERNATIVE LOW CARBON FUEL

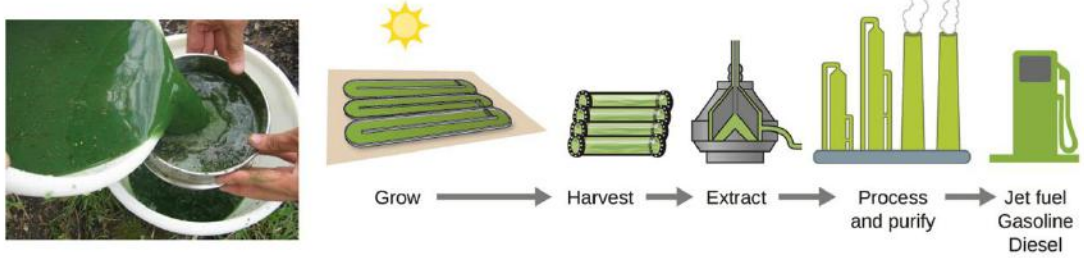


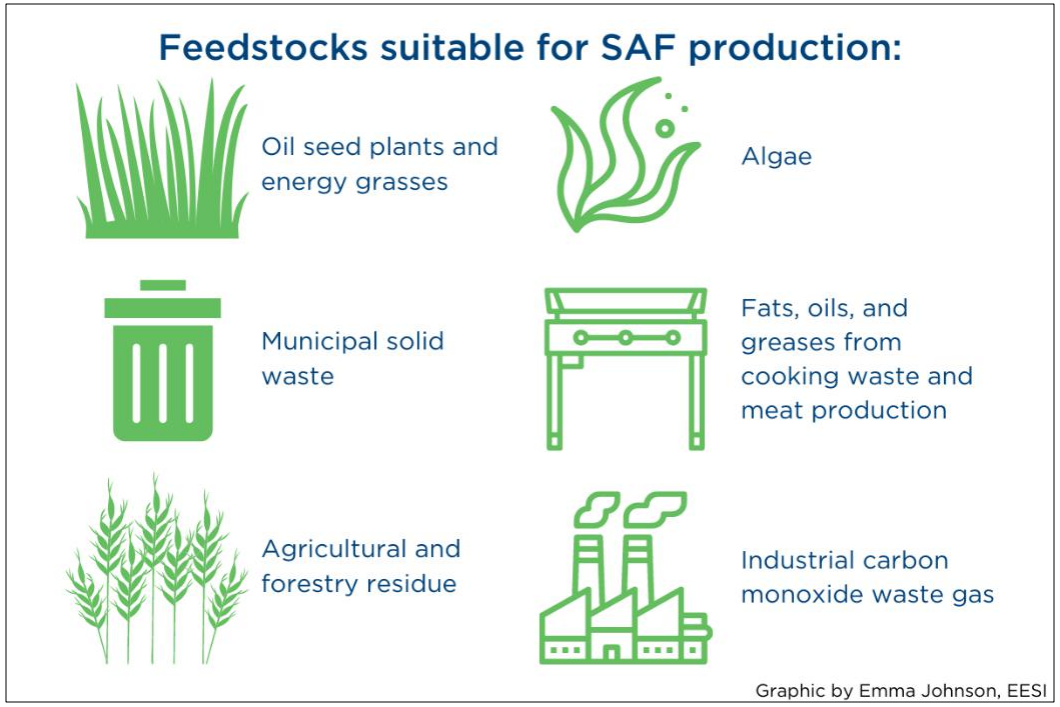
ALTERNATIVE LOW CARBON FUEL

Bio-Algae Initial Pilot Plant (IPP)

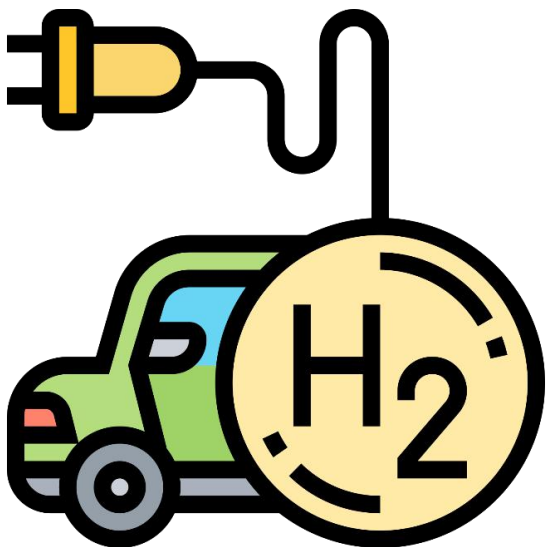
- More than 1000 tanks with more than 1 tonne Algae Seedlings on site
- ICP Extraction Unit installed and commissioned in December 2023







MOBILITY



EV CHARGER

Location: UTC Sarawak
Installed Equipment:
2 x 22kW AC Charger

Location: Darul Hana Multifuel Station
Installed Equipment:
1 x 80kW DC Charger
3 x 22kW AC Charger

Location: Damai Lagoon Resort
Installed Equipment:
1 x 22kW AC Charger

Location: Daro Multifuel Station
Installed Equipment:
1 x 7kW AC Charger

Location: Kanowit Multifuel Station
Installed Equipment:
1 x 7kW AC Charger

BEV vs FCEV

Lithium Ion Battery

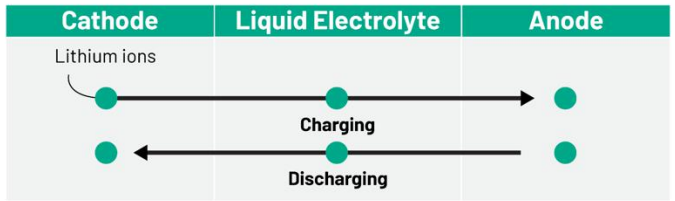
BEVs contain a large battery to store electricity.

Onboard charger
Converts AC electricity from power outlets into DC power.

Electric motor
Propels the car using energy from the battery.

Lithium-ion battery

Lithium ions create an electrical current by moving between the negative (anode) and positive (cathode) electrodes.



The longest-range BEV is the 2024 Renault ZOE, which has an EPA rating of **238 miles.**

The longest-range FCEV is the 2024 Toyota Mirai XLE, which has EPA rating of **402 miles.**

VS

Hydrogen Fuel Cell

FCEVs use a hydrogen fuel cell to create electricity. This required a tank to store hydrogen gas.

Fuel tank
Hydrogen gas is stored in a high-pressure tank. Liquid hydrogen can't be used because it requires cryogenic temperatures.

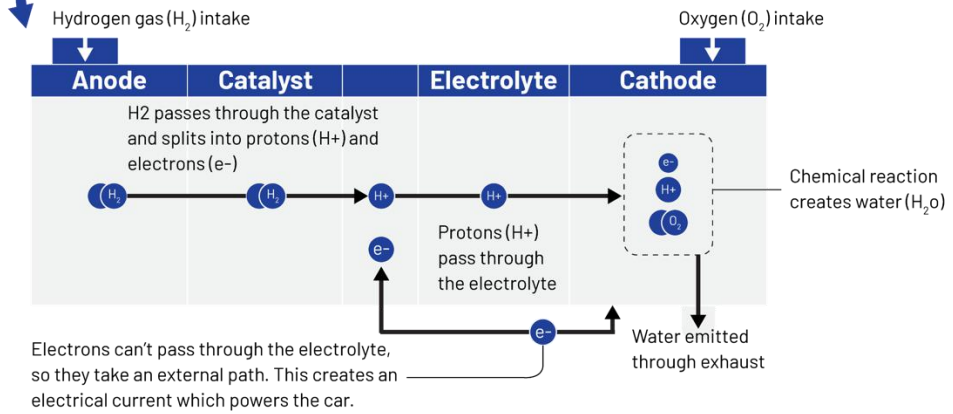
Exhaust
The only waste product of an FCEV is water.

Electric Motor
Propels the car using energy produced by the fuel cell stack.

Battery
Stores energy from regenerative braking.

Fuel cell stack

The fuel cell combines hydrogen and oxygen to generate electricity.



THANK YOU

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