# H<sub>2</sub> APEC Energy Statistics 2023

# Development of Hydrogen & Ammonia in the Energy Sector in Malaysia

12th September 2023



# Outline

#### Introduction

### Hydrogen in Malaysia

**Targets & Policies** 

Developments of Hydrogen and Ammonia in Malaysia





#### Population : 32.65 million (2022)\*



# GDP : 1,510,939.004 RM million (2022)\*



#### Land area: 330,803 km2

Constitutes of thirteen states and three federal territories, separated by the South China Sea into two regions: Peninsular Malaysia and East Malaysia (Sabah and Sarawak)



#### \*Source: Department of Statistics Malaysia (DOSM)



### **HYDROGEN IN MALAYSIA**

- The potential of hydrogen technology to combat climate change has been making waves worldwide, and Malaysia is no exception
- Hydrogen was first introduced in Malaysia in early 2000s where R&D funds were allocated in the field of hydrogen fuel cells.
  - The production and consumption of hydrogen in Malaysia is still on smaller scale, whereby most are pilot.
- Our pioneers of hydrogen in Malaysia are:
  - PETRONAS
  - Sarawak Energy Berhad





#### **NET ZERO GHG AS EARLY AS 2050**

#### **NDC-REVISED IN JULY 2021**

45% REDUCTION IN GHG EMISSION INTENSITY AGAINST GDP BELOW 2005 LEVEL, TO BE ACHIEVED IN 2030

#### LONG TERM LOW EMISSION DEVELOPMENT STRATEGY (LT-LEDS)

Work in progress, target to be launched in 2024

**NDC** roadmap

Work in progress, target to be launched in 2024





#### THE HYDROGEN ECONOMY & TECHNOLOGY ROADMAP (HETR)

1- Increasing revenue and productivity in exports, mobility, power generation, industrial heating and non-energy;

2- Promoting green growth aspirations in transportation sector;

**3- Cementing Malaysia's position as the key hydrogen player in Asia Pacific;** 

4- Creating job opportunities from the hydrogen economy; and

5- Enhancing national intellectual capabilities and capacities in hydrogen technologies.







### NATIONAL ENERGY POLICY, 2022-2040



**B8** Unlock opportunities and long-term competitive advantage in the emerging hydrogen economy

#### **KEY OBJECTIVES**

- Unlock new value pools, GDP contribution and job creation from hydrogen economy, keeping pace with technology development in various end uses.
- Enhance export income, which contributes to socioeconomic development from hydrogen production for exports.
- Support carbon emission reduction efforts with hydrogen, in line with increasing commercial viability of hydrogen relative to substitutes.

#### DESCRIPTION OF INITIATIVES

- Nominate a lead government entity to spearhead and oversee the end-to-end development of hydrogen economy roadmap for Malaysia.
- Develop long-term hydrogen roadmap which optimises hydrogen production pathways across green, blue and grey hydrogen.
- Determine national strategy to optimise hydrogen production locations for optimised competitive advantage, such as positioning Sarawak as a green hydrogen production hub targeted for export markets.
- Build up a domestic hydrogen ecosystem supported by research and development (R&D), technology deployment and commercialisation capabilities across targeted areas along the hydrogen value chain of production, distribution and end-use application.
- Develop regulation to ensure safe, secure and equitable roll-out of hydrogen production, transport and end-use applications.

#### Stakeholders

Lead Entity: MOSTI, UPEN (Sarawak), UPEN (Sabah)

Core Stakeholders: EPU, MITI, PETRONAS, SEB, MGTC, SEDC Energy, SB, NanoMalaysia, Department of Standards

Implementation Timeline	Initiative Type
2022-2040	New



NATIONAL ENERGY TRANSITION ROADMAP (NETR)





Identify flagship catalyst projects and initiatives

6 Energy Transition Levers	10 Flagship Catalyst Projects
Energy Efficiency (EE)	Efficient Switch
Renewable Energy (RE)	Renewable Energy Zone (RE Zone)
	Energy Storage
	Energy Secure
Hydrogen	Green Hydrogen
	Hydrogen for Power
Bioenergy	Biomass Demand Creation
Green Mobility	Future Mobility
	Future Fuel
Carbon Capture, Utilisation and Storage (CCUS)	CCS for Industry



### PETRONAS HYDROGEN



Source: https://www.petronas.com/flow/technology/hydrogen-game-changer

Blue hydrogen was a co-product at PETRONAS gas facilities. PETRONAS is currently exploring the commercial production of green hydrogen..

PETRONAS research team from the Hydrogen Technology Programme collaborated with Universiti Kebangsaan Malaysia (UKM) and looked into hydrogen production from water through electrolysis technology, covering five areas – bipolar plate design, membrane electrode assembly, coating materials, construction materials and economy of scale.

The collaboration has resulted in the PETRONAS proprietary electrolyser design enabling higher efficiency through increased hydrogen yield per power consumption (kWh)



### PETRONAS HYDROGEN



Source: https://www.petronas.com/flow/technology/hydrogen-game-changer

Picture on the left is the green hydrogen production testing facility at the PETRONAS Research Sdn Bhd (PRSB) compound in Bangi.

PETRONAS also collaborated with Japan's ENEOS Corporation (ENEOS) on a technical-commercial jointstudy of a hydrogen supply chain.

PETRONAS and ENEOS will also explore low-carbon hydrogen production from PETRONAS petrochemical facilities, as well as green hydrogen produced using renewable energy sources.





Sarawak's ample water supply and affordable renewable power give us an advantage in advancing green hydrogen as a source of clean energy.

The Sarawak Government embarked on hydrogen fuel cell application research in 2017.

In 2019, Southeast Asia's first Integrated Hydrogen Production Plant and Refuelling Station was built and commissioned in 2019 (picture on the left)

# HYDROGEN IN SARAWAK

The station now serves as a refueling station for Sarawak's first hydrogen fuel cell electric buses under the ownership and management of Sarawak Economic Development Corporation (SEDC) In 2020, Sarawak Energy and Petroliam Nasional Berhad (PETRONAS) signed a Memorandum of Understanding (MoU) for a collaboration to explore the commercial production of green hydrogen and its value supply chain in Asia.

Two major hydrogen manufacturing projects, H2biscus and H2ornbill, are expected to be operational in Bintulu Petchem Industrial Park in 2027.

Other than producing green hydrogen, the plants will also create new hydrogen-based industries such as the manufacturing of electrolysers, fuel cells and the green chemical industry

Source: https://www.thestar.com.my/business/business-news/2023/06/19/sarawak-ventures-into-green-hydrogen-economy

# HYDROGEN IN SARAWAK

This is one of Sarawak Energy's hydrogen-powered Hyundai NEXOs.



# AMMONIA CO-FIRING IN POWER PLANTS

- IHI Corporation, in collaboration with PETRONAS and TNB Genco have successfully conducted an ammonia co-combustion study as part of a joint initiative to decarbonise the country's power sector.
- The main objective of the study is to determine the impact of co-firing ammonia as carbon-free fuel together with coal in a coal-fired power generation system. Theoretically, ammonia co-firing could significantly reduce carbon dioxide (CO2) emissions, which suppresses nitrogen oxide while stabilising combustion.
- This initiative includes assessing technology for co-firing ammonia at coal power stations in Malaysia and evaluating technologies and economics across the entire supply chain.
- The study would demonstrate diverse ammonia usage models in Malaysia and build a fuel ammonia supply chain to accommodate future demand increases. It will thereby help accelerate the adoption of fuel ammonia and shrink environmental impacts by providing top-quality infrastructure.



Malaysia Energy Information Hub
<u>https://meih.st.gov.my/</u>

