

Reactions to German and European perspectives and insights from Southeast Asia:  
**Hydrogen in ASEAN**

Agora Energiewende

Surfing the Hydrogen Wave in Southeast Asia – Insights from Europe & Germany

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**One Community  
for Sustainable  
Energy**



# Introduction

Established on 1 January 1999, the ASEAN Centre for Energy (ACE) is an intergovernmental organisation within the Association of Southeast Asian Nations' (ASEAN) structure that represents the 10 ASEAN Member States' (AMS) interests in the energy sector.



ACE shall accelerate the integration of **energy strategies** within ASEAN by providing relevant information and expertise to ensure the necessary energy policies and programmes are in **harmony** with the **economic growth** and the **environmental sustainability** for the region.



## Catalyst

To unify and strengthen ASEAN Energy Cooperation by providing:

- Platform for Sharing
- Policy Advisory
- Best Practices
- Capacity Building



## Knowledge Hub

To provide a knowledge repository for ASEAN Member States (AMS) and services through:

- Data Management
- Publication
- Dissemination



## Think tank

To assist AMS on research and identifying practical & specific solution on:

- Policies
- Legal & Regulatory Frameworks
- Technologies
- Innovative Solutions

# Regional blueprint for the energy cooperation in the ASEAN

## ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025 Phase 2: 2021-2025

- Theme: “Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All”.
- Sub-theme: “Accelerating Energy Transition and Strengthening Energy Resilience through Greater Innovation and Cooperation.”

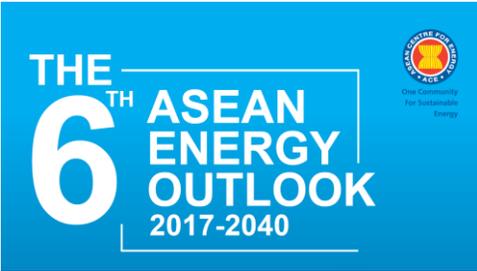


ASEAN PLAN OF ACTION FOR ENERGY COOPERATION (APAEC) 2016-2025 PHASE II: 2021-2025

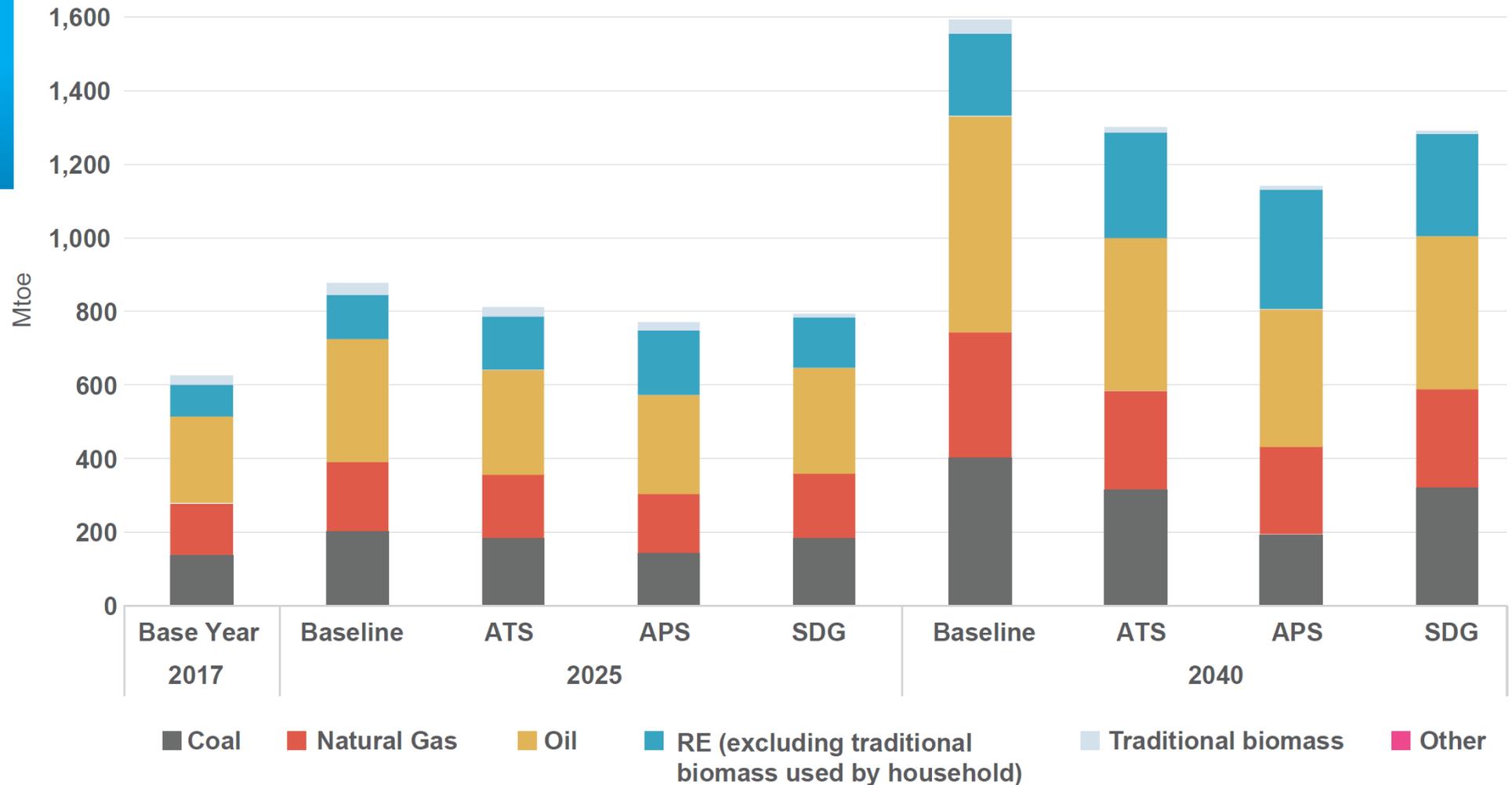


 <b>ASEAN Power Grid</b>	<p>To expand regional multilateral electricity trading, strengthen grid resilience and modernisation, and promote clean and renewable energy integration.</p>	 <b>Energy Efficiency and Conservation</b>	<p>To reduce energy intensity by 32% in 2025 based on 2005 levels and encourage further energy efficiency and conservation efforts, especially in transport and industry sectors.</p>
 <b>Trans-ASEAN Gas Pipeline</b>	<p>To pursue the development of a common gas market for ASEAN by enhancing gas and LNG connectivity and accessibility.</p>	 <b>Renewable Energy</b>	<p>To achieve aspirational target for increasing the component of renewable energy to 23% by 2025 in the ASEAN energy mix, including through increasing the share of RE in installed power capacity to 35% by 2025.</p>
 <b>Coal and Clean Coal Technology</b>	<p>To optimise the role of clean coal technology in facilitating the transition towards sustainable and lower emission development.</p>	 <b>Regional Energy Policy and Planning</b>	<p>To advance energy policy and planning to accelerate the region’s energy transition and resilience.</p>
		 <b>Civilian Nuclear Energy</b>	<p>To build human resource capabilities on nuclear science and technology for power generation.</p>

# Key choices will determine the size and makeup of future energy



ASEAN Total Primary Energy Supply across Scenarios



# Hydrogen in ASEAN

## : Economic Prospects, Development, and Applications



The report can be accessed at <https://aseanenergy.org/hydrogen-in-asean-economic-prospects-development-and-applications/>

Or

Scan the QR code below to access:

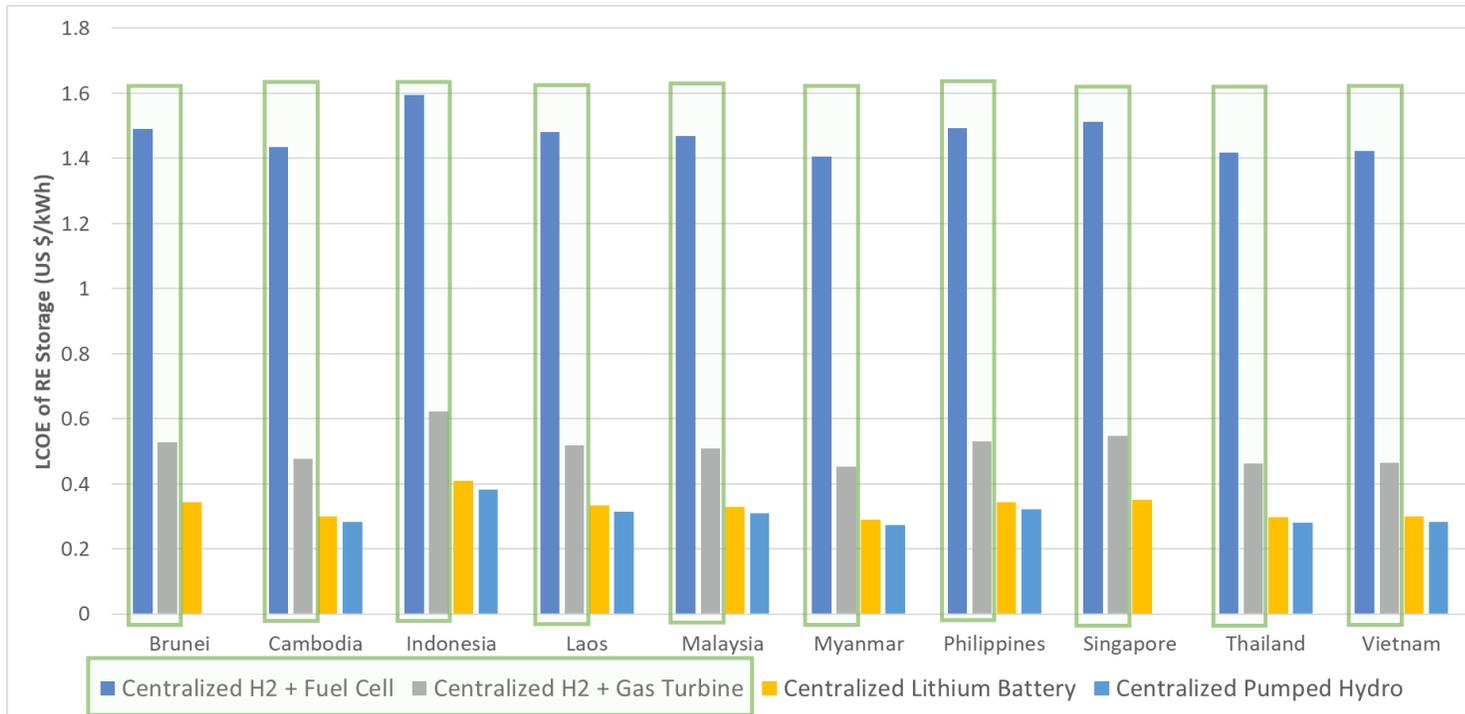


*The 39<sup>th</sup> ASEAN Ministers on Energy Meeting (AMEM) on 15 September 2021 acknowledged ACE's study and this report as stated in the Joint Ministerial Statement of the 39<sup>th</sup> AMEM*

# Findings: Hydrogen for Power Storage



Figure: LCOE of RE Storage Comparison in ASEAN Context



- The cost of hydrogen for power storage is way higher compared to lithium Battery and Pump Hydro in all ASEAN countries under current condition.
- In average, Hydrogen + fuel cell will cost around **\$ 1.47/kWh** and **\$ 0.51/kWh** for hydrogen as gas turbine fuel where Lithium battery costs **\$ 0.42 /kWh** and pump hydro **\$ 0.32 /kWh**.
- The technology for utility scale fuel cell and 100% H<sub>2</sub> gas turbine is not commercially available yet.

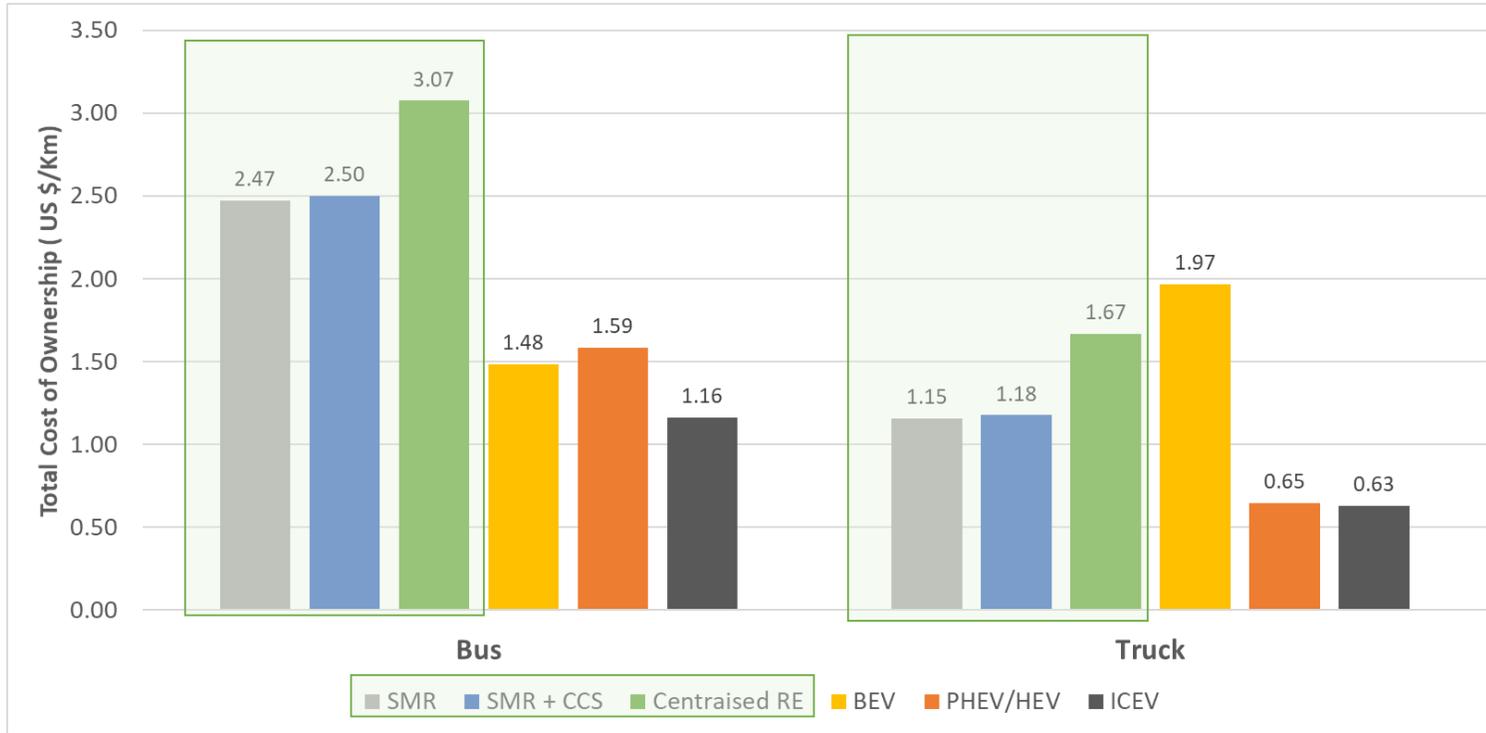
### Key system assumptions

- Renewable capacity: 1,000 MW
- Curtailment rate: 30%
- Distance of transport/transmission: 100 km
- Transport mode: CH<sub>2</sub> truck
- Duration of storage: 30
- H<sub>2</sub> storage means: gaseous geological
- Large-scale fuel cell

# Findings: Hydrogen for Transportation



Figure: TCO of Busses and Trucks - Average in ASEAN



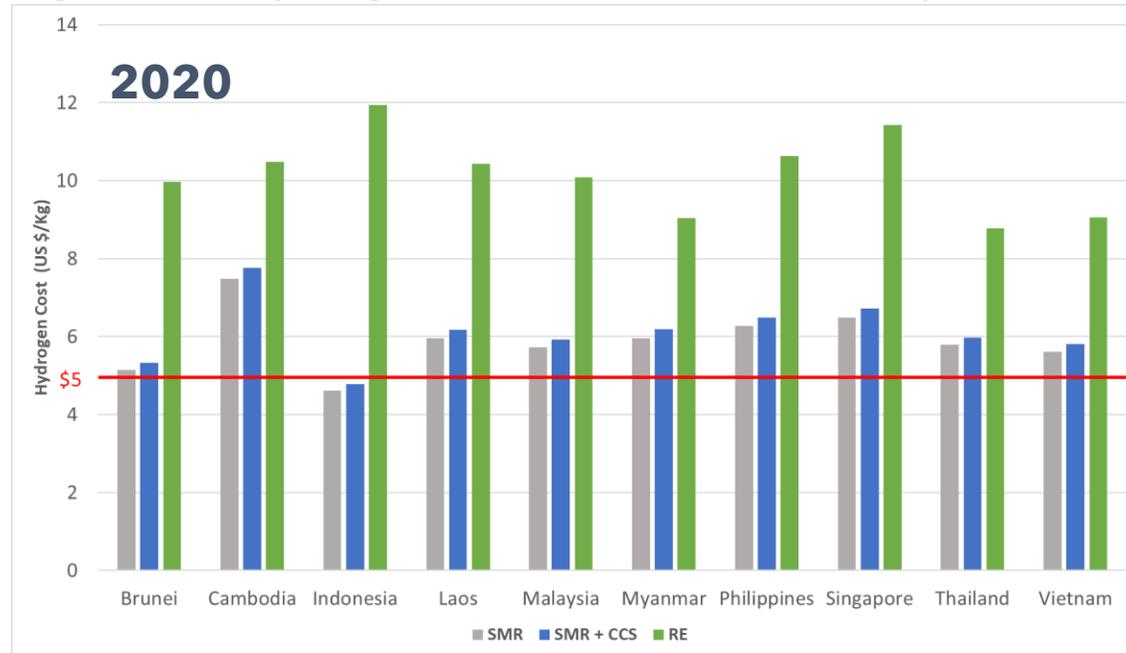
*“Hydrogen application for busses and trucks is not economically attractive; 3x higher of the hydrogen vehicle price than the current diesel bus/truck makes it less competitive.”*



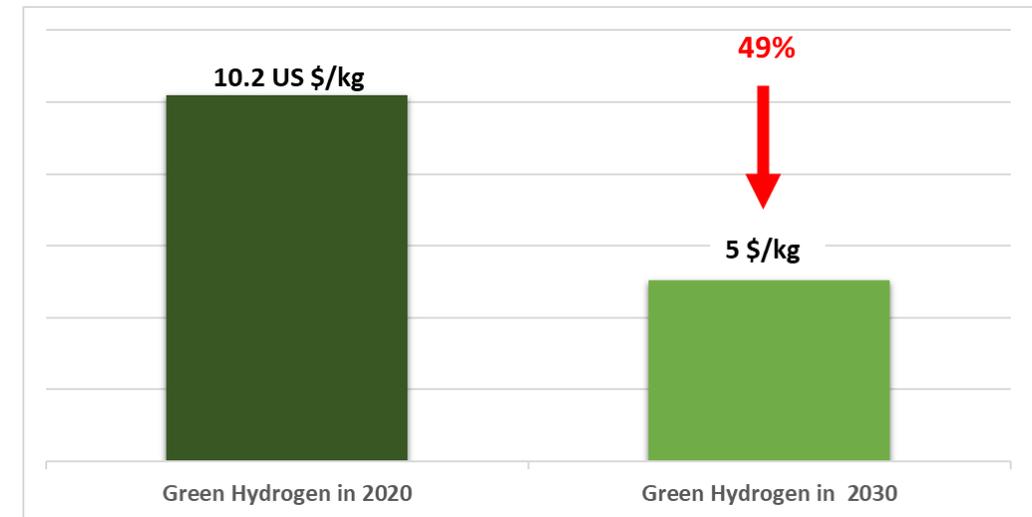
# Findings: Hydrogen for Export Market



Figure: The Hydrogen Cost from All AMS for Export Market



2030



- Brunei Darussalam and Indonesia could produce the **grey hydrogen** at the lowest cost (around \$ 5/kg) among other AMS due to the abundant resources of fossil fuel, especially natural gas.
- This cost is considered quite attractive for Japan market as the gasoline price per gallon is around \$ 6.2 and \$ 5.3 diesel (after tax)
- In addition, considering if the cost of RE electricity in 2030 decreasing by roughly 70% and CAPEX of 50%, the **green hydrogen** price could be reduced by 49% from average \$10.2/kg to \$ 5/Kg in ASEAN region.

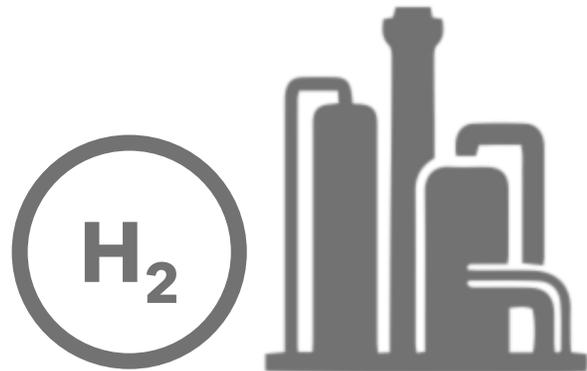
# Takeaways

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- The application of hydrogen for electricity storage and transportation **is still not economically competitive yet** to the current alternatives.
- The **grey hydrogen produced from countries such as Brunei Darussalam and Indonesia could already be competitive** for export market, in the current situation. In future, as the costs of hydrogen storage and transportation fall, grey hydrogen production could be upgraded to blue hydrogen production coupled with CCS, while still maintain a competitive level of supply costs to the overseas markets.
- In view of both the expected decreases in the CAPEX of hydrogen production and transportation and LCOE of renewables in the coming decade, and the formation of hydrogen energy market overseas, such as in China, Japan, and South Korea, **hydrogen produced in ASEAN countries and supplied to these overseas markets could become competitive** against fossil fuel.

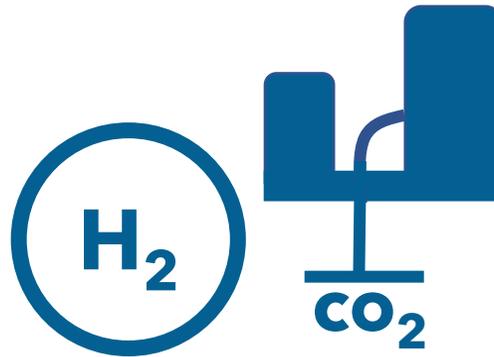
# Recommendation : Regional Policy Roadmap



2021 -2025

## Phase I

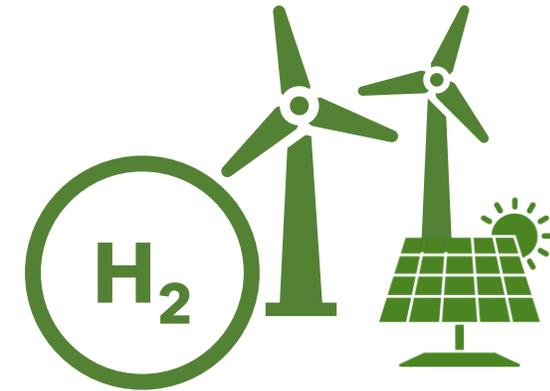
Countries with advantages in terms of fossil fuel resource and scale of existing infrastructure such as gas pipeline and LNG liquefaction plants could consider developing capacities in producing and exporting **grey hydrogen**.



2025 -2030

## Phase II

On top of the capacity and infrastructure built for grey hydrogen production, shift to **blue hydrogen** production and exports, to mitigate the emission using CCS or CCUS technology



2030

## Phase III

With expected significant decline on RE in the ASEAN countries, **green hydrogen from electrolysis** could be deployed as energy storage for intermittent renewables to provide auxiliary grid services and for export market.

To know more about the latest ACE Publications,  
those are available for download from:

[aseanenergy.org/category/publications/](https://aseanenergy.org/category/publications/)



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