



**VIETNAM OIL AND GAS GROUP**

**VIETNAM PETROLEUM INSTITUTE**

# **CURRENT STATUS OF PVN's HYDROGEN PRODUCTION AND USES**

Ho Chi Minh City, 6-8/7/2021





# CONTENTS

01

**ENERGY TRANSITION AND  
VIETNAM ENERGY OUTLOOK**

02

**PVN'S DEMAND ON HYDROGEN**

03

**CURRENT FEEDSTOCK AND  
TECHNOLOGIES FOR HYDROGEN  
PRODUCTION AT PVN'S PLANTS**

04

**SUSTAINABLE DEVELOPMENT  
IN HYDROGEN FOR PVN**

05

**CONCLUSIONS AND  
RECOMMENDATIONS**



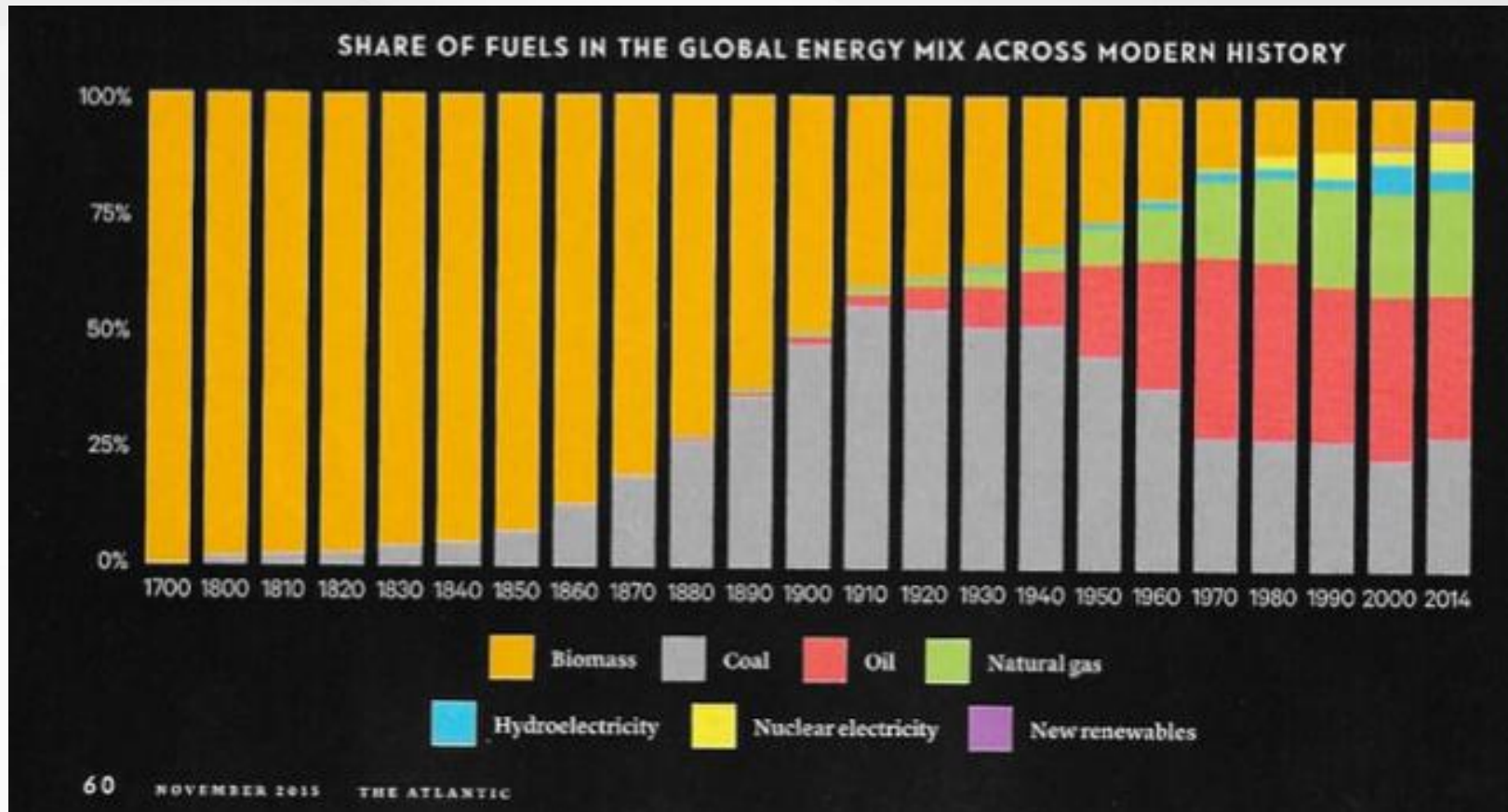


01

# **ENERGY TRANSITION AND VIETNAM ENERGY OUTLOOK**



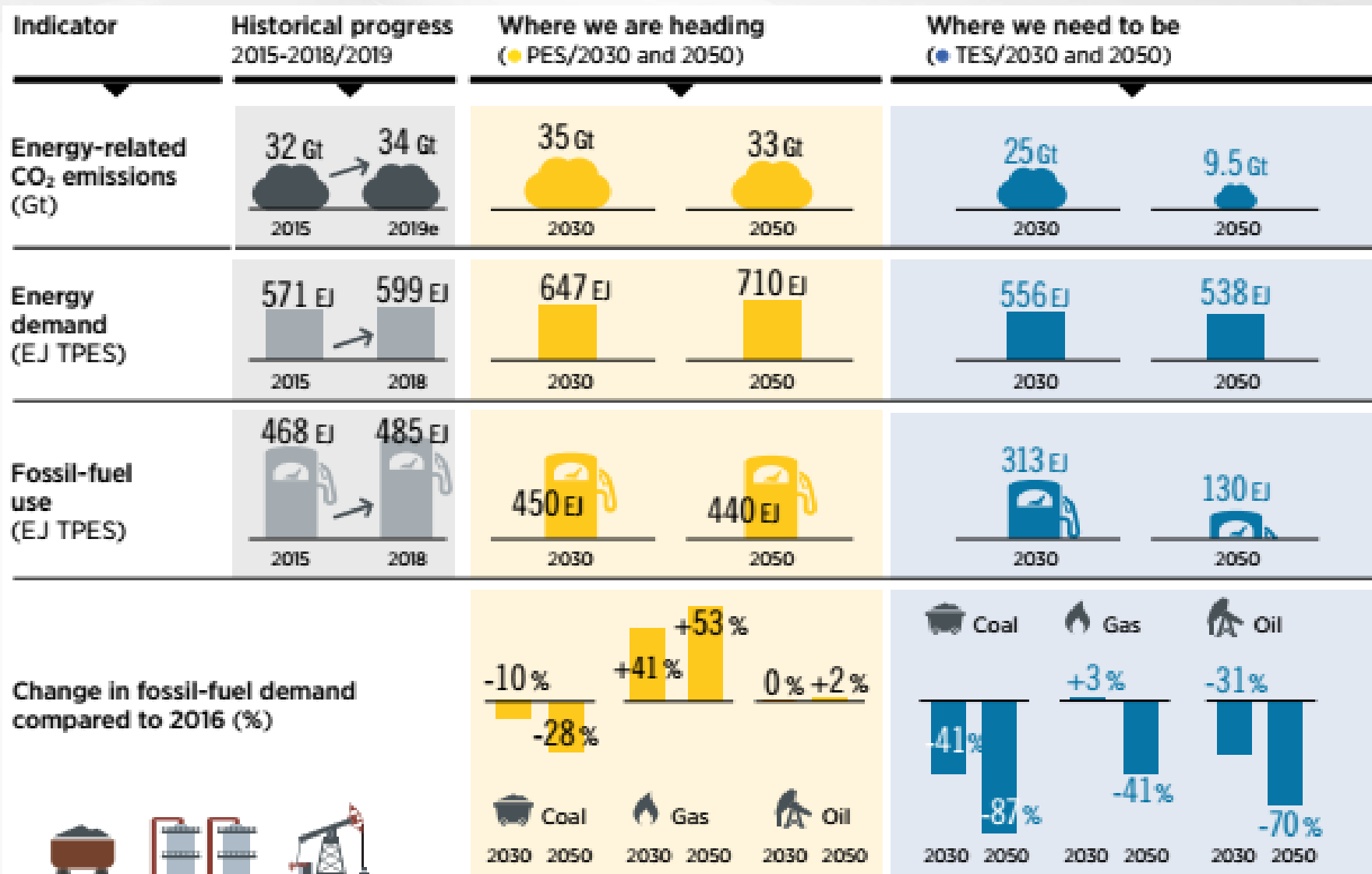
# MOTIVATION FOR ENERGY TRANSITION



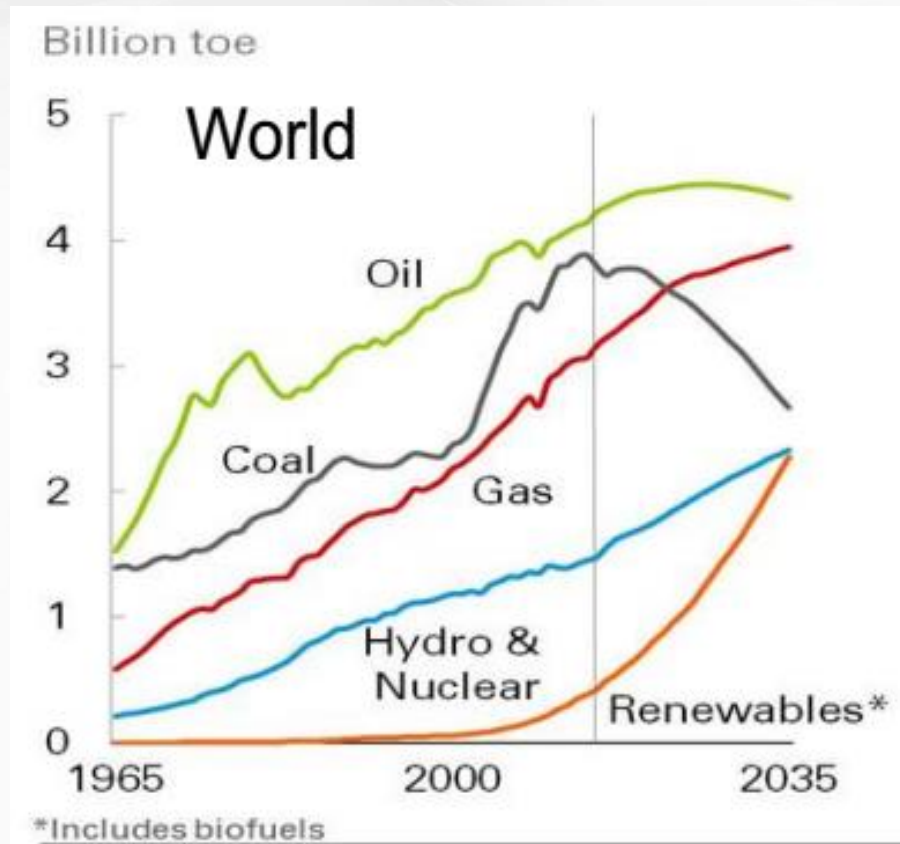
- Past transition driven by market forces, new option(s) being more convenient and economic;
- The new transition driven by environment factors, government leadership more important.



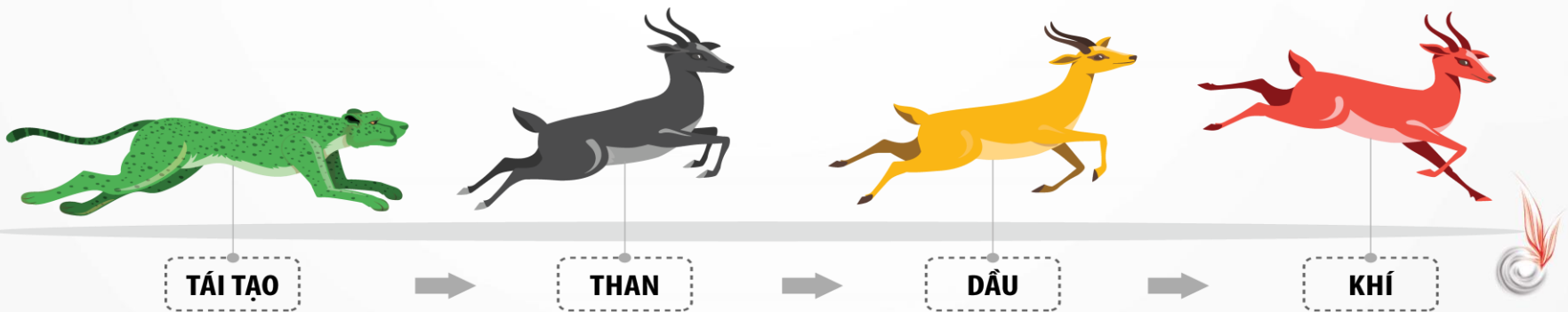
# TARGET ON CO<sub>2</sub> REDUCTION



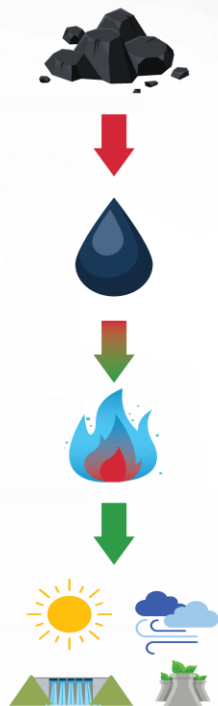
# CHANGES IN THE WAY TO USE ENERGY



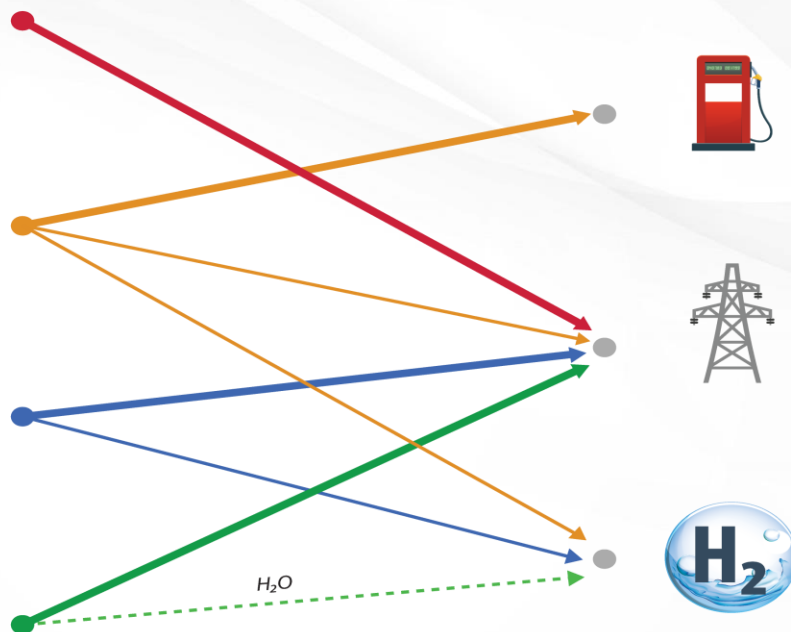
Energy transition is energy increase as all energy types increased in spite of the percentage variation.



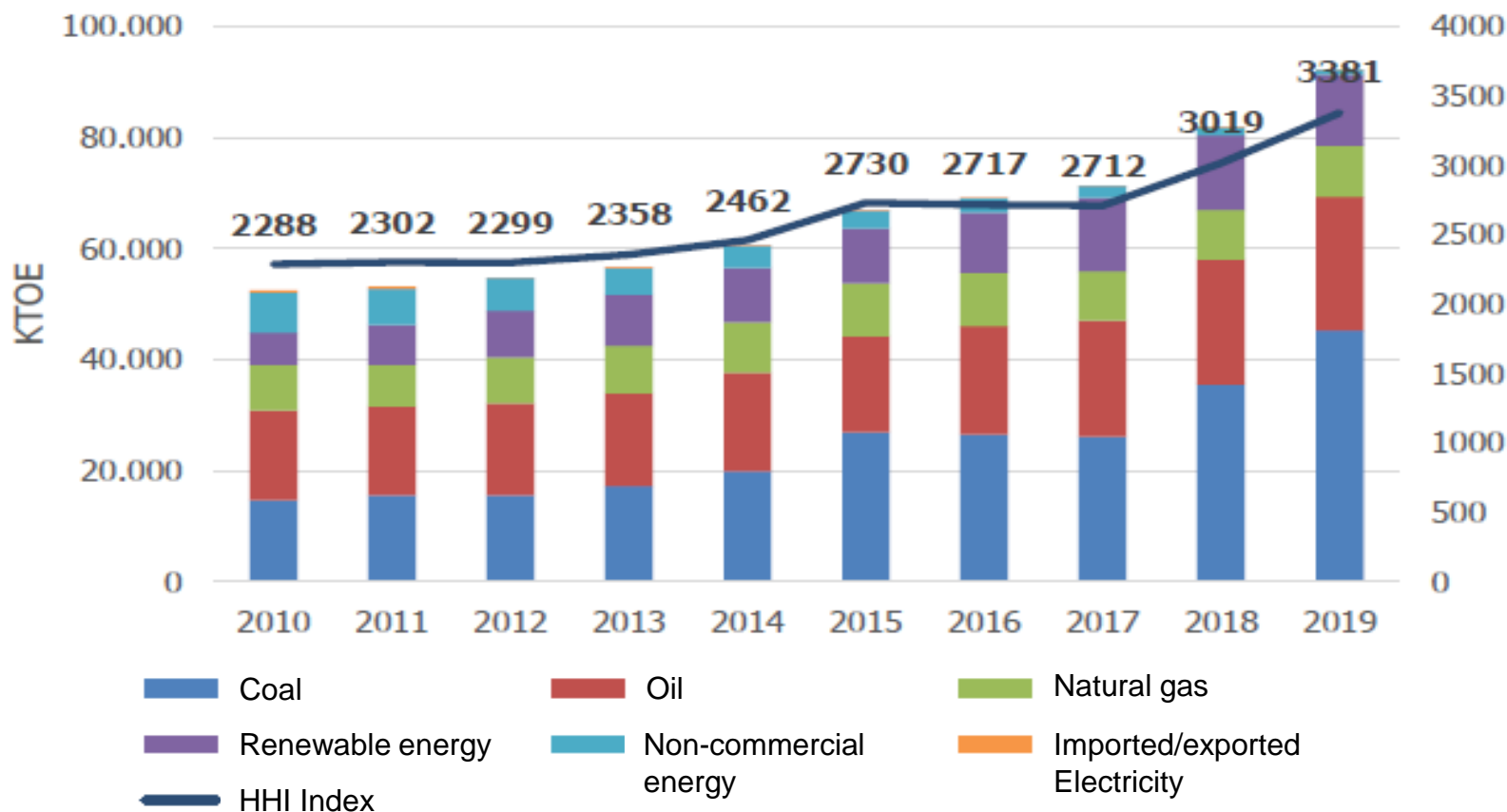
## PRIMARY ENERGY



## SECONDARY ENERGY



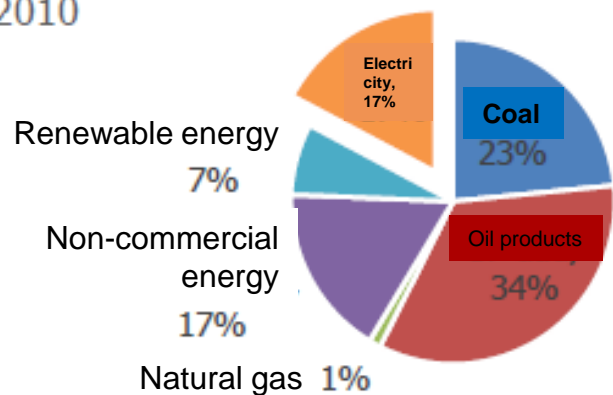
# SHARE OF TOTAL PRIMARY ENERGY SUPPLY IN VIETNAM



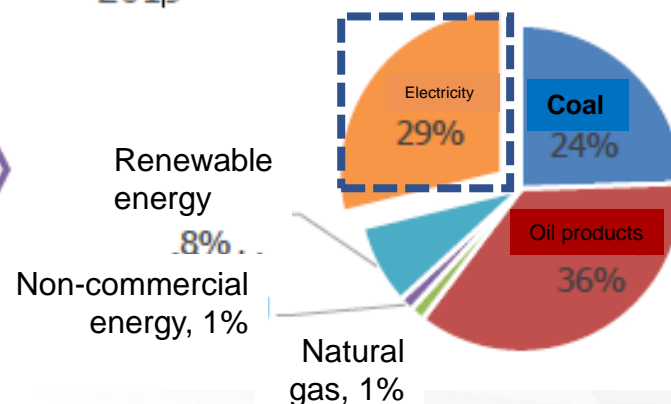
- Coal & oil as major resources of primary energy supply;
- Stable gas supply for power generation (82%) & fertilizer production (10%);
- Fast development of renewable energy.



2010

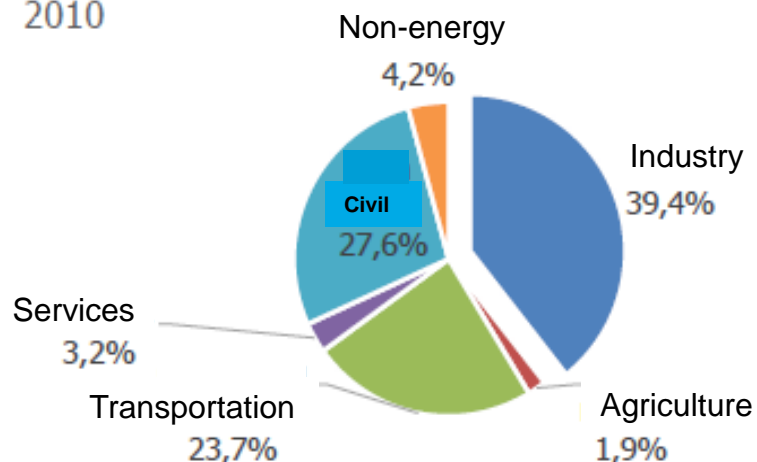


2019

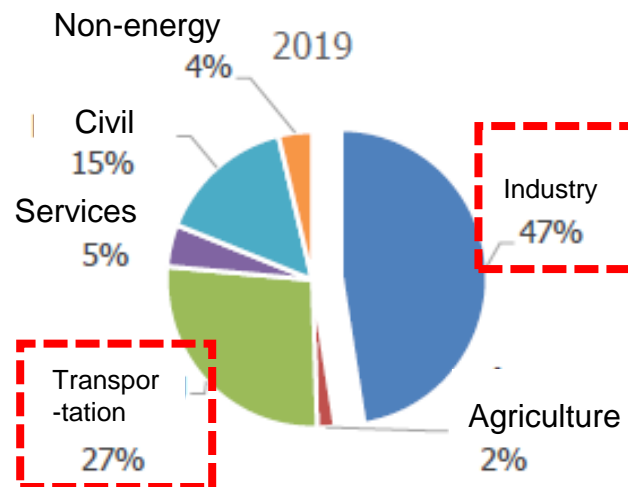


## CHANGES IN ENERGY CONSUMPTION AS FUELS BETWEEN 2010 & 2019

2010

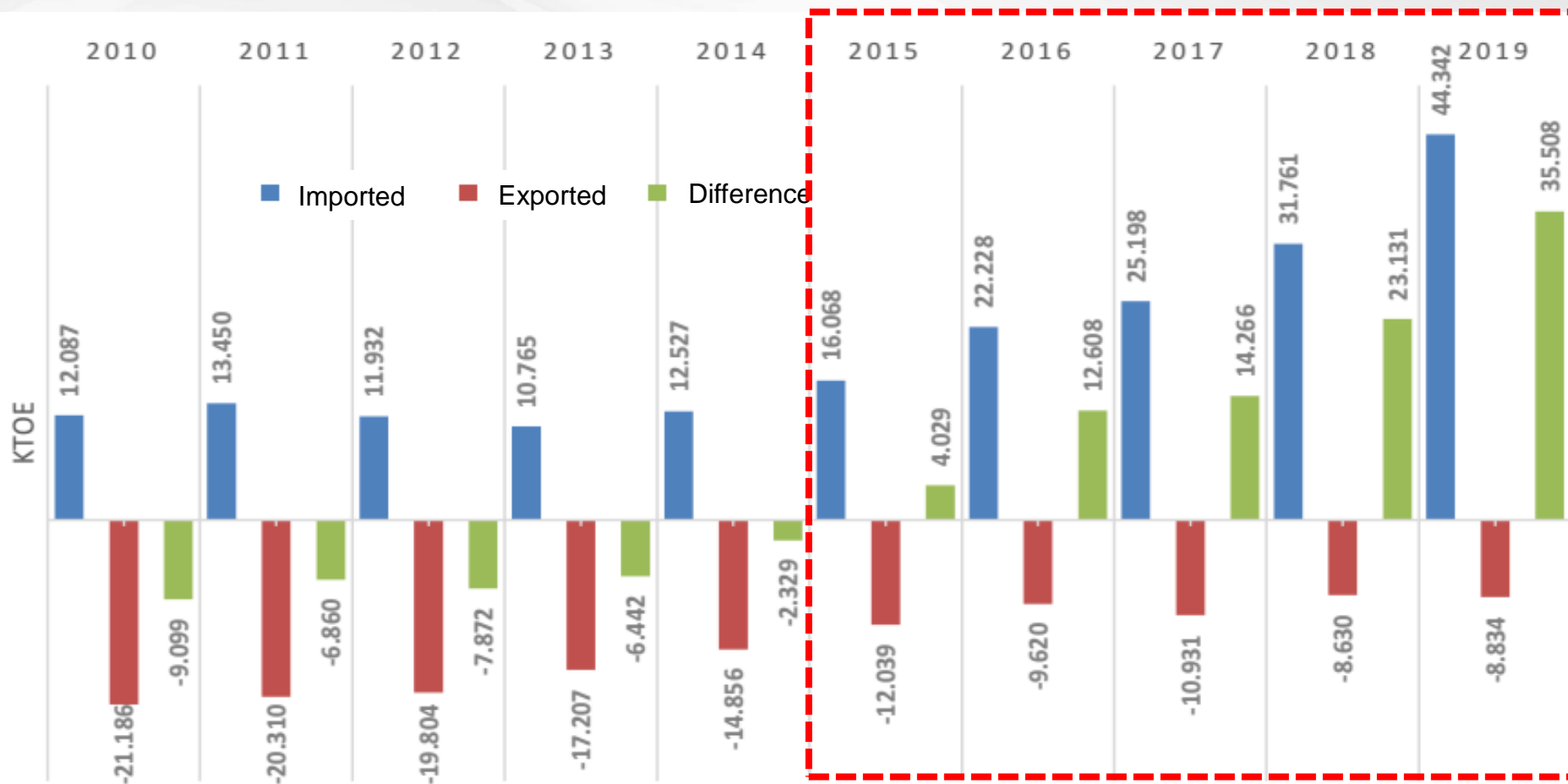


2019



## CHANGES IN ENERGY CONSUMPTION IN AREAS BETWEEN 2010 & 2019





**Imported & exported of energy in Vietnam**



- Coal and oil are major supplies of primary energy during 2010-2019;
- Natural gas used as fuel for gas power plants and feedstock for fertilizer production;
- Fast development of renewable energy due to high potentials in renewable resources in Vietnam and government policies;
- Fast growth of electricity consumption, especially in transportation and industry sectors;
- Vietnam became an energy importing country since 2015.



- ✓ **Energy plays a key role in development of Vietnam;**
- ✓ **Energy transition has been occurring in Vietnam.**





02

## **PVN'S DEMAND ON HYDROGEN**





PVN

Exploration  
& Production

Gas Industry

Power  
GenerationRefinery -  
PetrochemicalPetroleum  
Services

**Exploration &  
Production**



**On behalf of Government to exploit oil  
& gas resources**

**Gas Industry**



**Gas transport & distributing**

**Power Generation**



**Power generation from coal, natural gas & hydro  
100% of gas power market (18% of total capacity)**

**Refinery-  
Petrochemical**



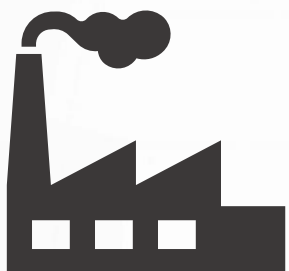
**02 Refineries + 02 Fertilizer Plants + 01 Polyester Plant  
Meet 70% of fuel, 70% of urea, 20% of petrochemical demand  
& Distribute 20% of fuel market**

**Petroleum Services**



**Provide services to oil & gas activities**





## Refinery - Petrochemical



Dung Quat Refinery (BSR)  
6.5 million tons of crude oil/year  
Dung Quat, Quang Ngai



Nghi Son Refinery-Petrochemical  
10 million tons of crude oil/year  
Nghi Son, Thanh Hoa



Phu My Fertilizer Plant (PVFCCo)  
800,000 tons of urea/year  
Phu My, Ba Ria-Vung Tau



Ca Mau Fertilizer Plant (PVCFC)  
800,000 tons of urea/year  
Ca Mau



Dinh Vu Polyester Plant (VinaPoly)  
170,000 tons of polyester fiber/year  
Dinh Vu, Hai Phong



Refinery/Plant	Hydrogen uses	H <sub>2</sub> capacity (ton/h)
Dung Quat Refinery (after upgrading & expansion)	Sulfur removal	0.47
Nghi Son Refinery & Petrochemical	Sulfur removal	17.43
Phu My Fertilizer Plant	Additional hydrogen required as feedstock contains 30% of CO <sub>2</sub>	2.05
	100% of hydrogen as feedstock	12.31
Ca Mau Fertilizer Plant	Additional hydrogen required as feedstock contains 30% of CO <sub>2</sub>	1.89
	100% of hydrogen as feedstock	11.33

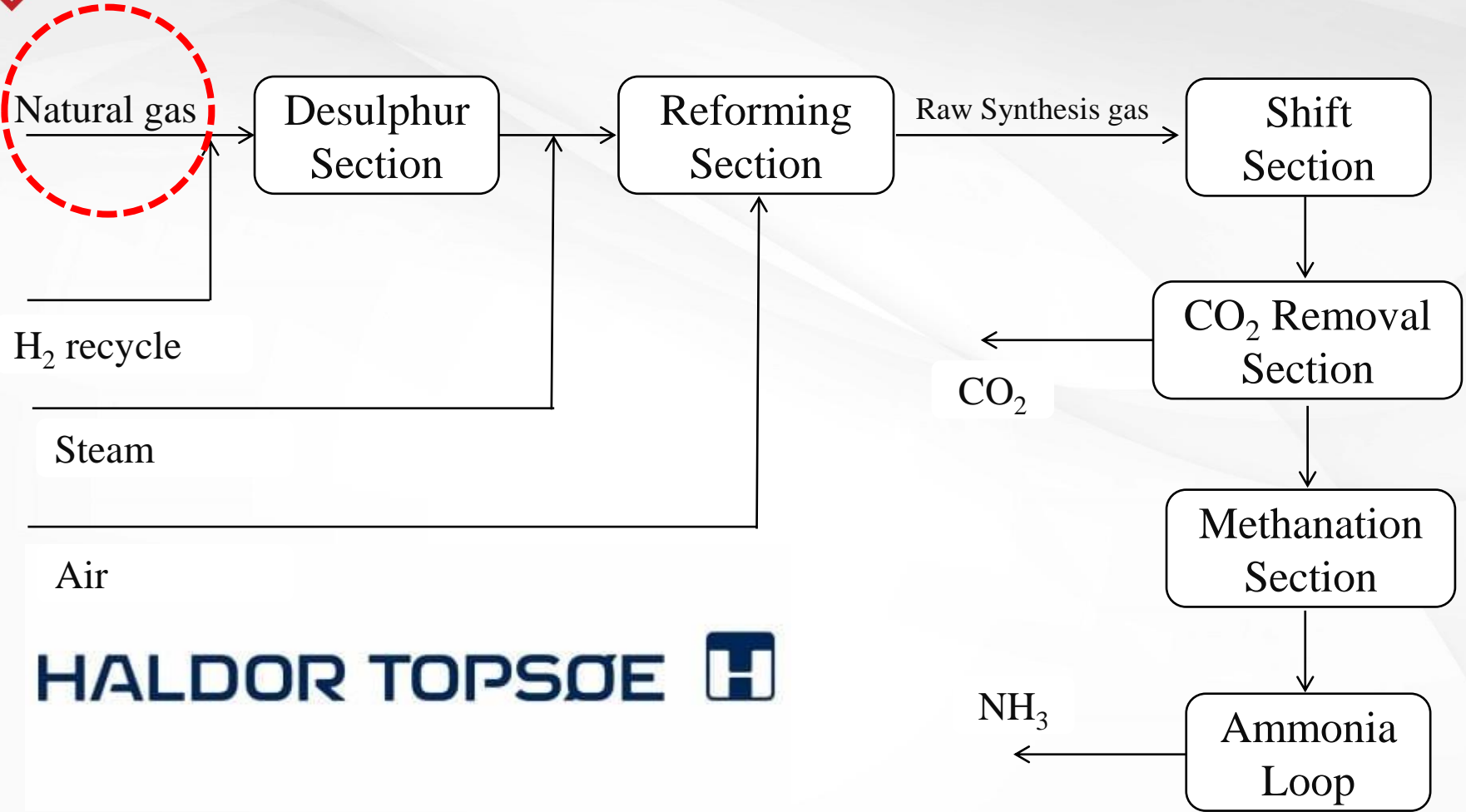




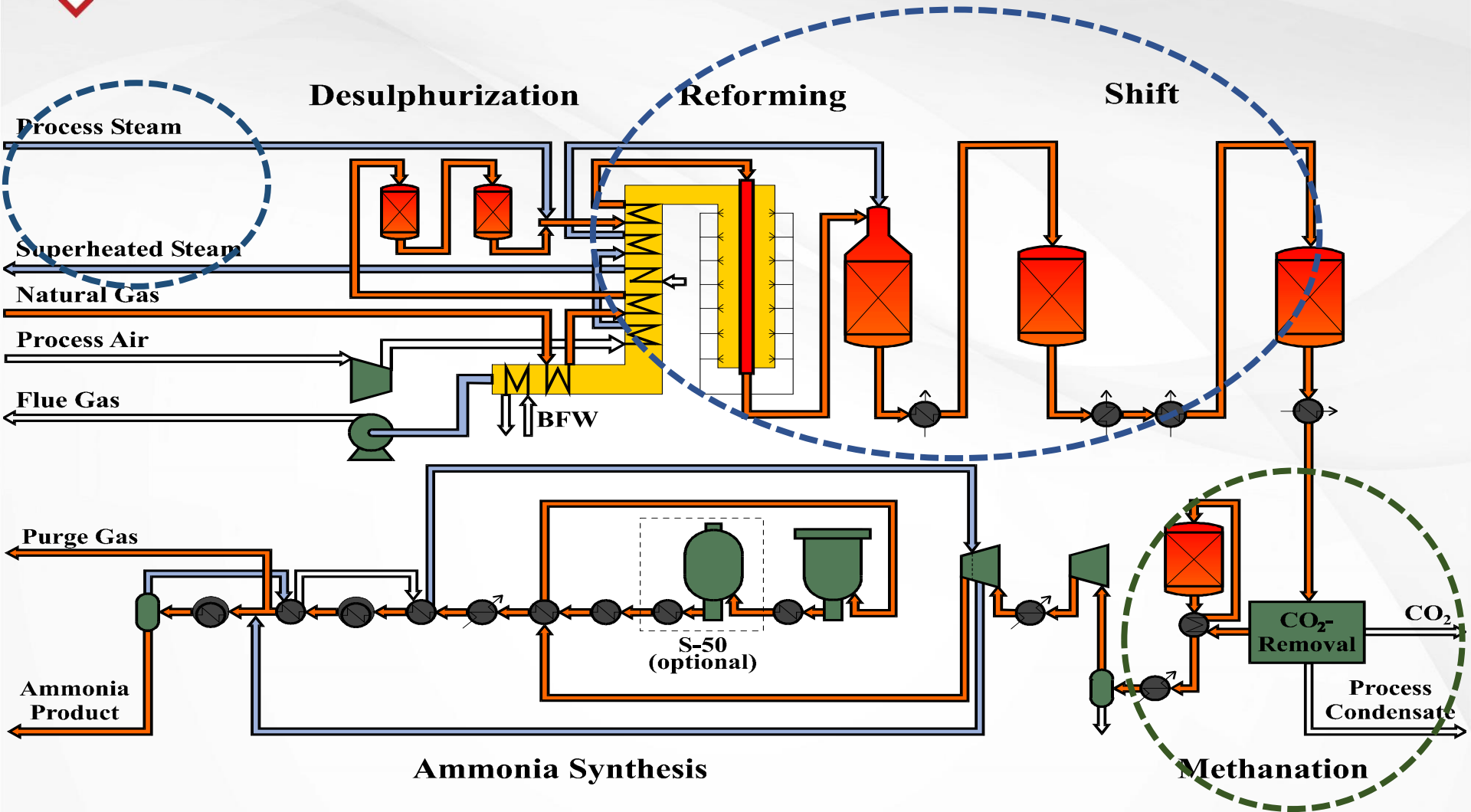
03

**CURRENT FEEDSTOCK AND  
TECHNOLOGIES FOR HYDROGEN  
PRODUCTION AT PVN'S PLANTS**

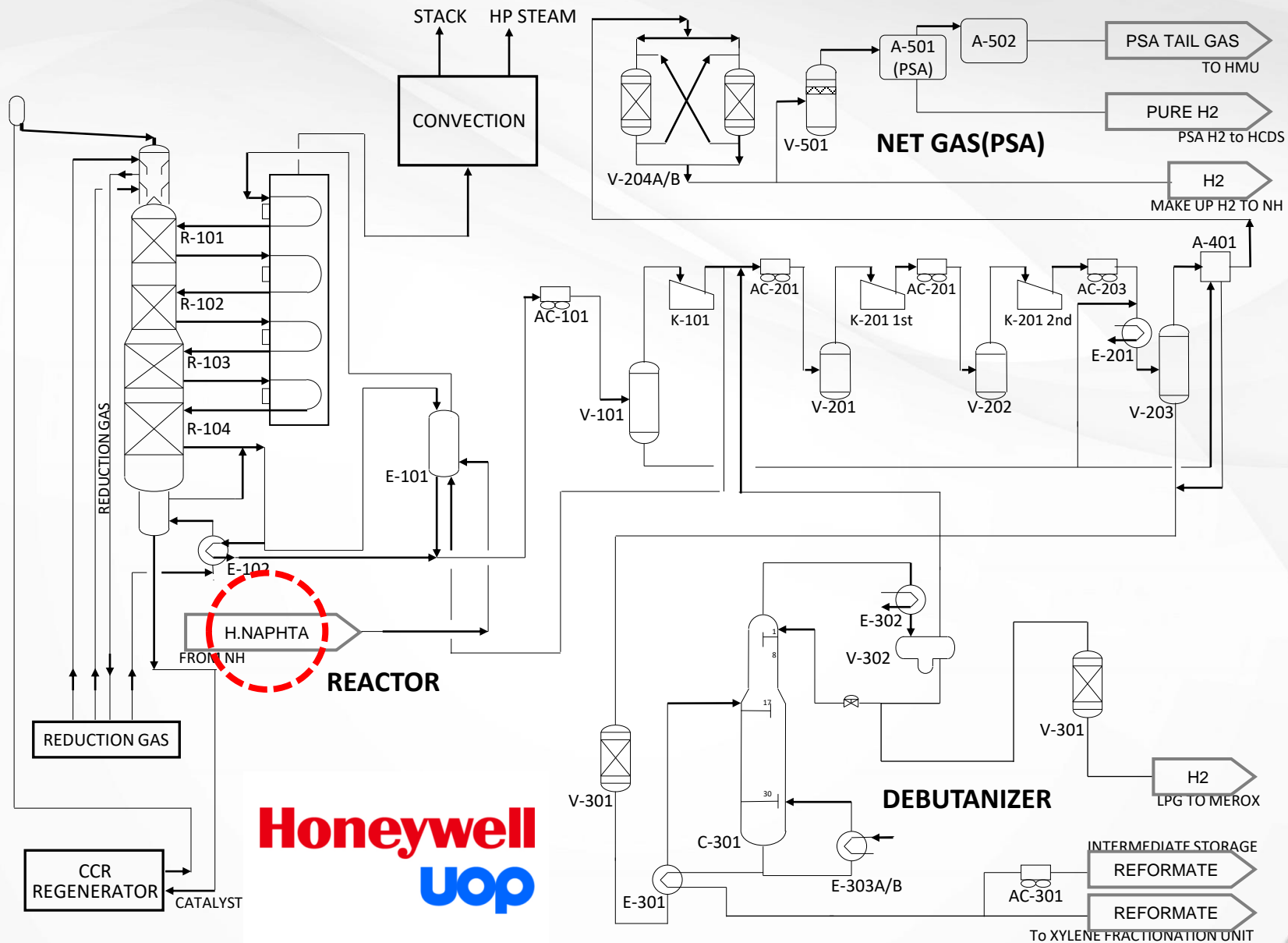


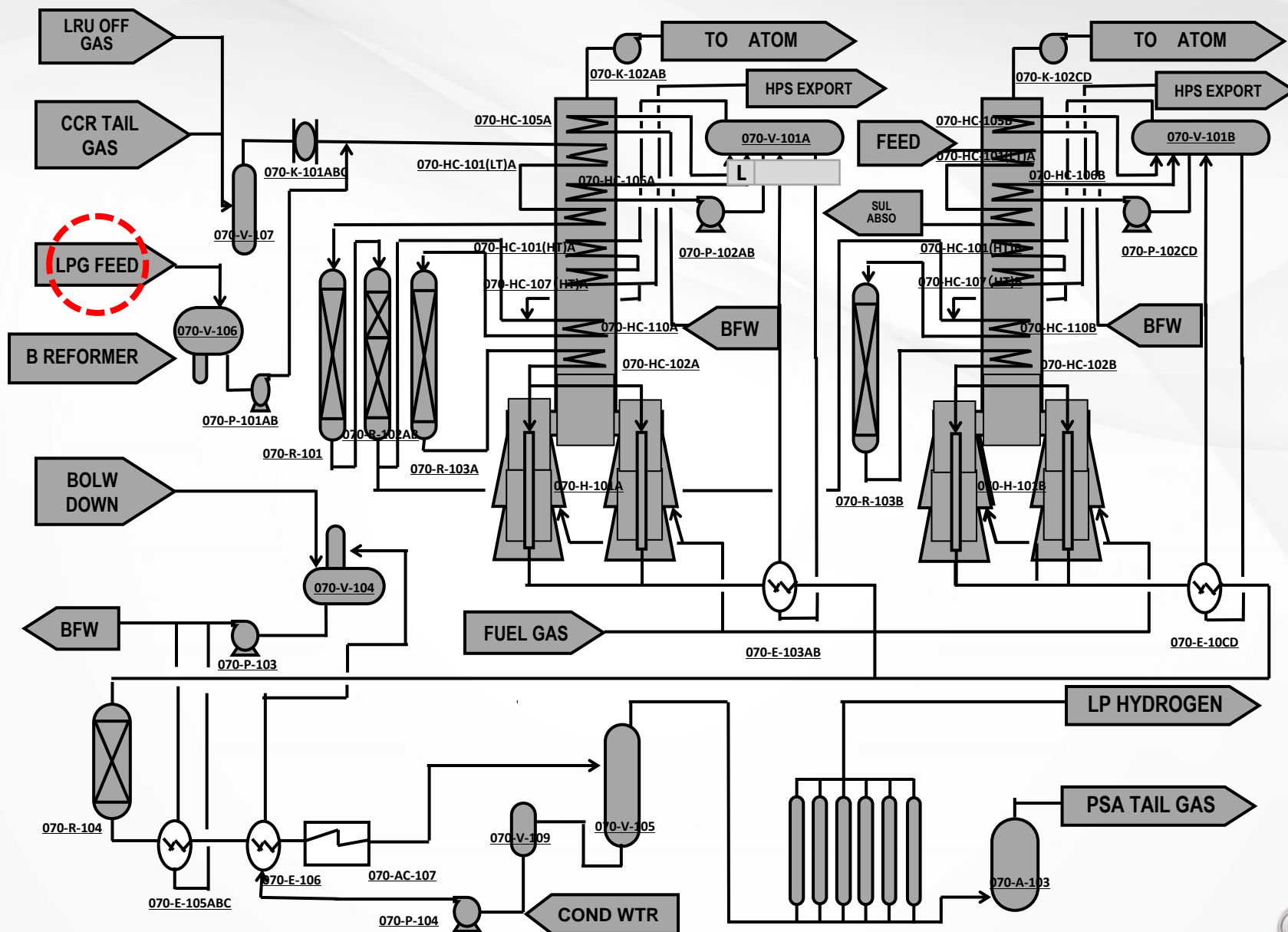


Almost 7 kg of **carbon dioxide** per 1 kg of hydrogen **produced by steam reforming**. Due to heat losses and inefficiencies, the actual number in practice in a large **hydrogen** plant is 21.9 metric tons. This converts to 9.3 kg of **CO<sub>2</sub>** produced per kg of **hydrogen production**. 1 kg of **hydrogen** is the energy equivalent of 1 gallon of gasoline, which **produces** 9.1 kg of **CO<sub>2</sub>** when combusted.



**Indeed, 1 ton of urea** will emit about 0.73 tons of **CO<sub>2</sub>**, but its **carbon** footprint, derived **through** a full life-cycle analysis, will be closer to 5.15 tons **CO<sub>2</sub>-equivalent** (CO<sub>2</sub>e).





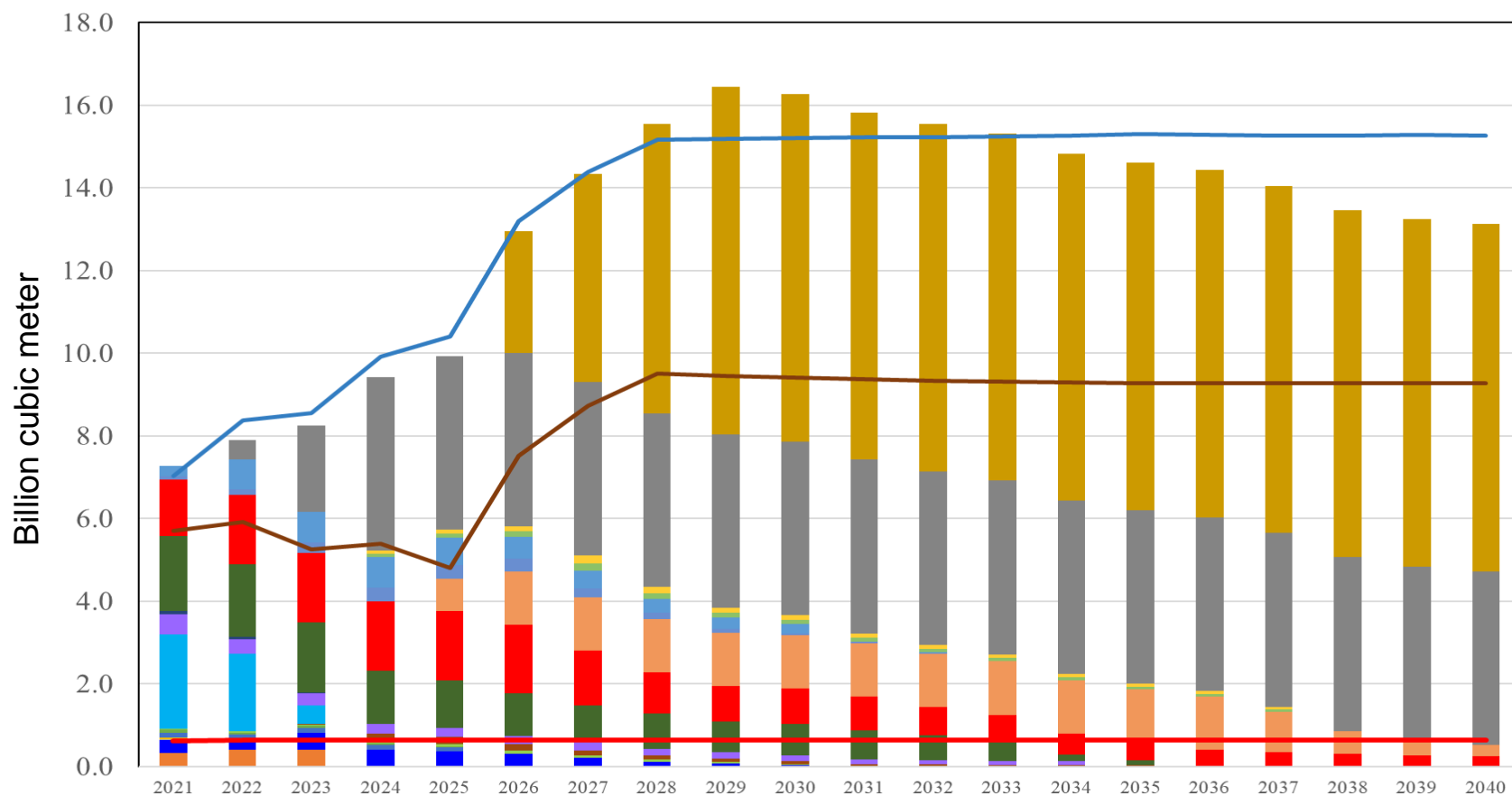


04

# **SUSTAINABLE DEVELOPMENT IN HYDROGEN FOR PVN**

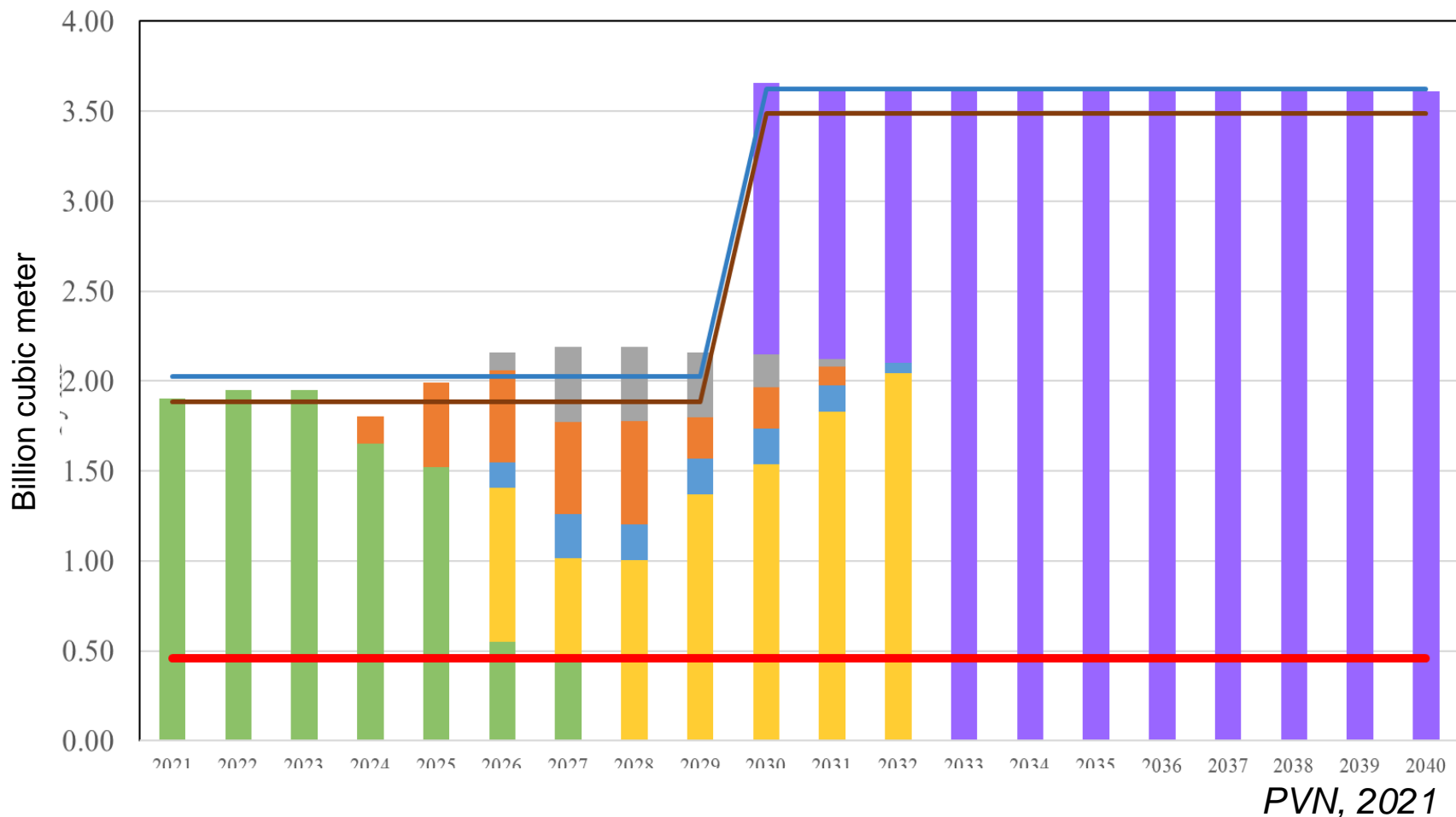


## GAS SUPPLY-DEMAND FOR SOUTH-EAST REGION

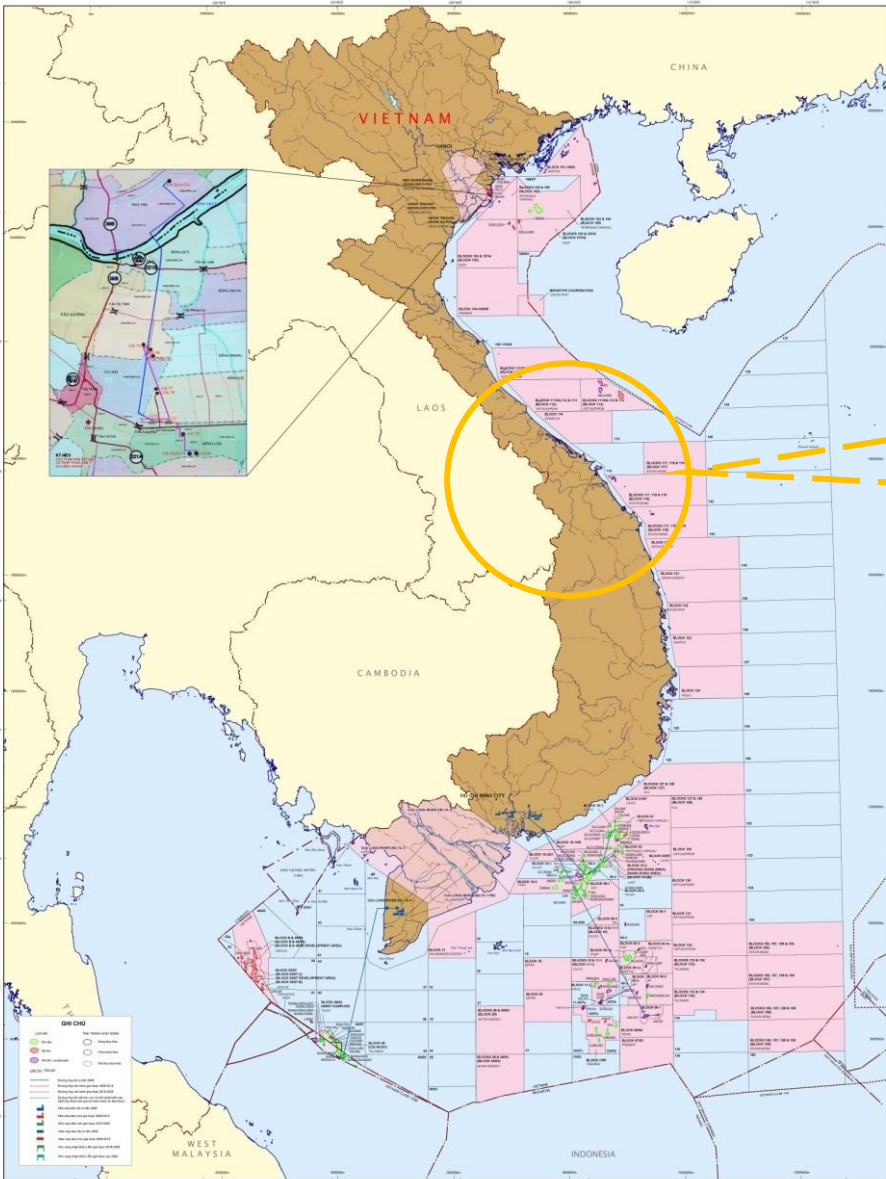


PVN, 2021

## GAS SUPPLY-DEMAND FOR SOUTH-WEST REGION



# CO<sub>2</sub>-RICH NATURAL GAS RESOURCES IN VIETNAM



- Proved natural gas reserves: ~700 bcm (2017);
- CO<sub>2</sub>-rich natural gas fields are quite popular: 10-60 mol% of CO<sub>2</sub>.

- Gas field: Ca Voi Xanh (Block 117-119)
- First gas: 2023
- Gas output ~ 4.5 - 5.0 BCM/Y (Net HC):

Component	Composition (mol%)
N <sub>2</sub>	9.88
CO <sub>2</sub>	30.26
H <sub>2</sub> S	0.21
C <sub>1</sub>	57.77
C <sub>2</sub>	0.92
C <sub>3</sub>	0.31
C <sub>4</sub>	0.18

# RENEWABLE RESOURCES IN VIETNAM



## SOLAR

- Potential: 35,000 MW;
- Installed: 19,400 MWp (16,500 MW).



## WIND

- Potential: 510,000 MW;
- Installed: 377 MW (11 projects);
- Plan: 6,000 MW by 2030.



## BIOMASS

- Potential: 6 million MW (2050);
- Installed: 10 MW from wastes, and 325 MW from biomass .



## MORE ENVIRONMENTAL REGULATIONS



- EU:
  - Roadmap on reduction of CO<sub>2</sub> emission of 40% by 2030, 60% by 2040, and 80% by 2050;
  - CO<sub>2</sub> tax upto >100 USD/ton;
- Energy transition and hydrogen economy;
- Strategy on net zero carbon by 2050 by energy companies



- Demonstration on CO<sub>2</sub> tax up to 2027 and official requirement since 1/1/2028;
- CO<sub>2</sub> reduction of 8% by 2030, and 25% with further support from outside;
- For energy sector:
  - Renewables used by 15-20% by 2030, and 25-30% by 2045;
  - Emission reduction of 15% by 2030, and 20% by 2045.



# PVN'S STRATEGY ON ENERGY TRANSITION

**E & P**

**Increased  
gas  
production**

**GAS**

**LNG &  
gas  
market**

**POWER**

**Development  
of renewable  
energy**

**PROCESS  
-ING**

**Petrochem  
-icals,  
Biofuels &  
H<sub>2</sub>**

**SERVICES**

**Value chains  
of LNG &  
Offshore  
wind power**

*After 2030, PVN is participating in value chain of blue/green hydrogen.*

- Technologies for hydrogen production, storage and transportation;
- Integration of blue/green hydrogen in PVN's refineries, petrochemical, and power plants;
- Demonstration of hydrogen value chain in Vietnam;
- Strategy and roadmap on hydrogen development.



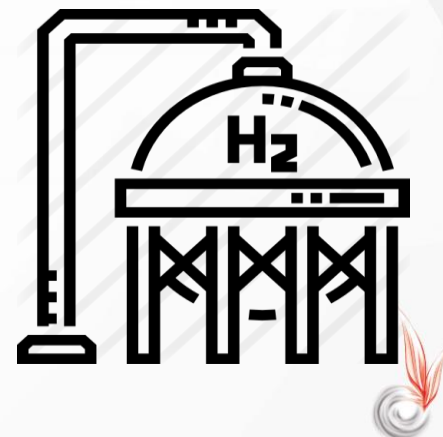


05

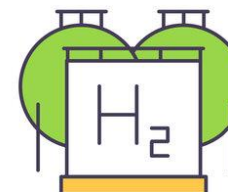
# CONCLUSIONS AND RECOMMENDATIONS



- Energy transition is occurring in the world, including Vietnam;
- Hydrogen is produced and consumed at PVN's refineries and fertilizer plants;
- PVN's current hydrogen is grey, and both opportunity and challenge are existing for blue/green hydrogen development;
- PVN is establishing a strategy on energy transition and hydrogen development is one of its key targets.



- **Connection to German experts for consulting and experience sharing about strategy, roadmap and policies on hydrogen development and energy transition;**
- **Connection to German investors in the fields of hydrogen and renewable energy;**
- **Introduction of advanced technologies for hydrogen production, storage and transportation;**
- **Pilot/demonstration tests for new technologies in the real conditions of Vietnam.**





**THANK YOU**

