Possibility of Combining Coal Downstreaming and CCUS Implementation for Supporting Energy Transition in Indonesia

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The 31st "Clean Coal Day in Japan" International Symposium (2022)
5th - 6th September 2022

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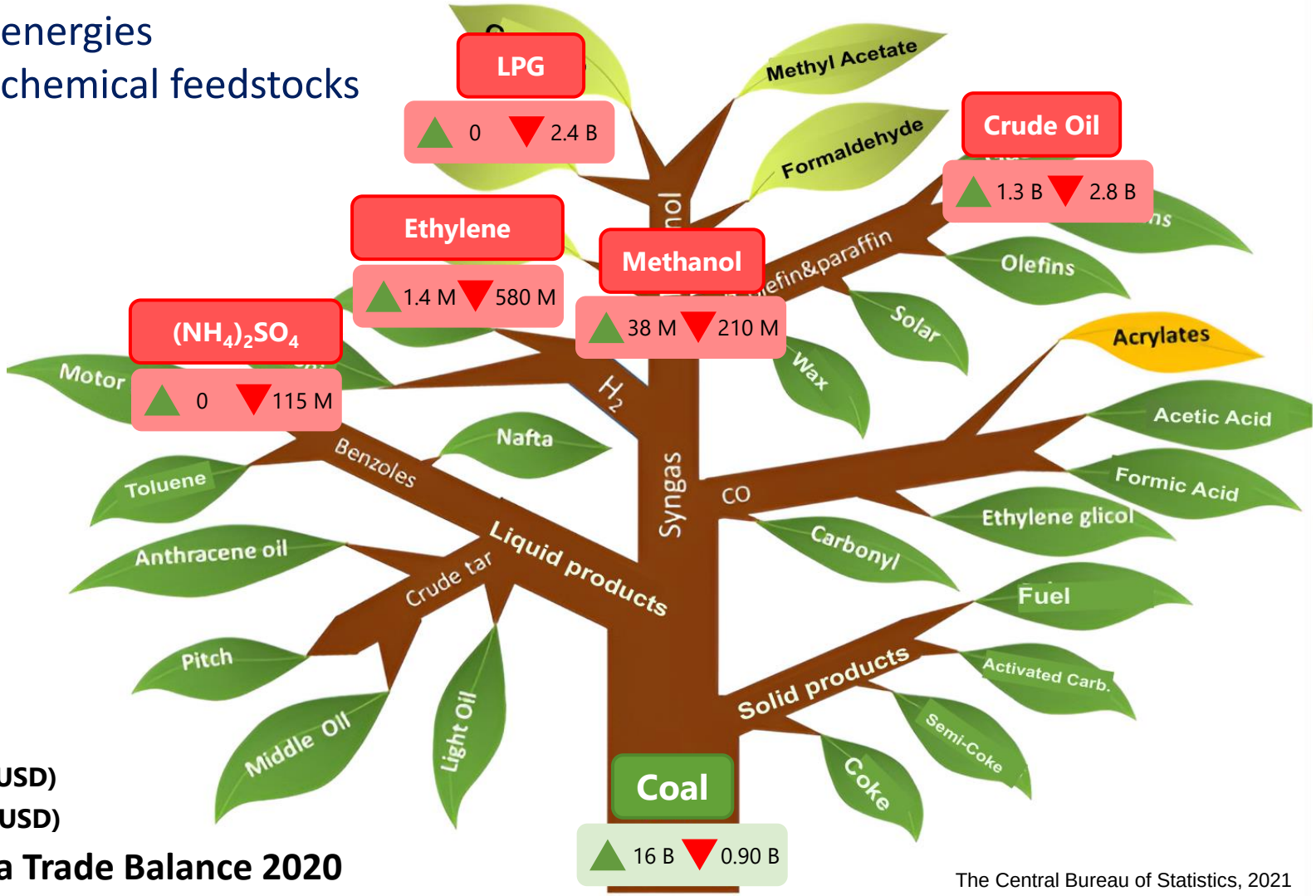
Coal Downstream Products and Its Trade Balance

Indonesia's Challenges:

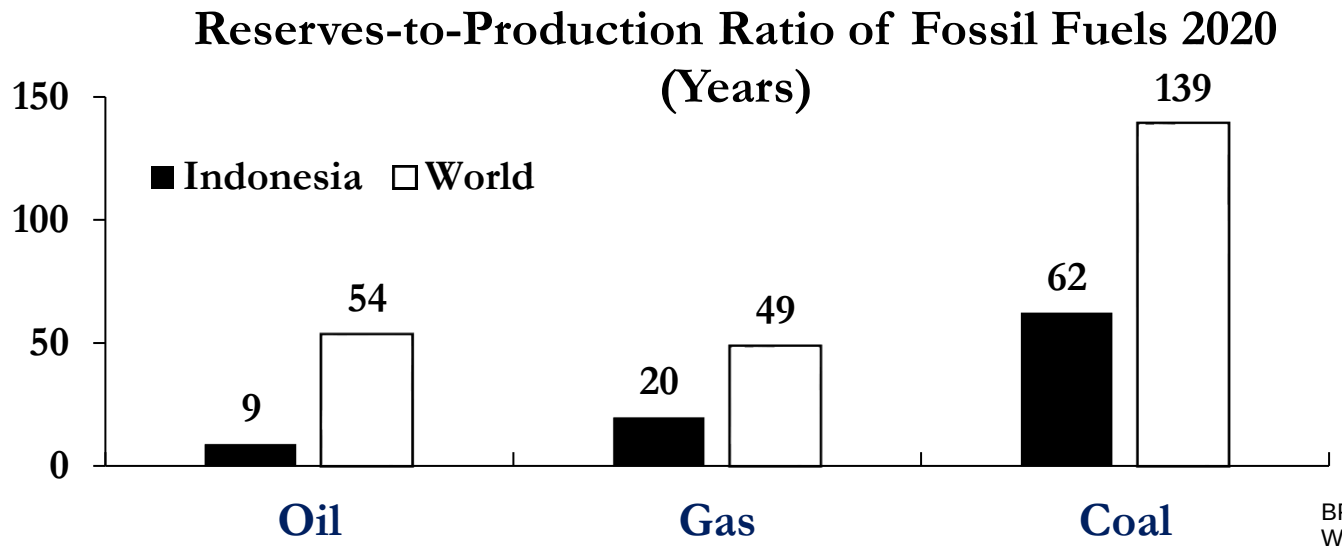
1. Import energies
2. Import chemical feedstocks



Indonesia Trade Balance 2020

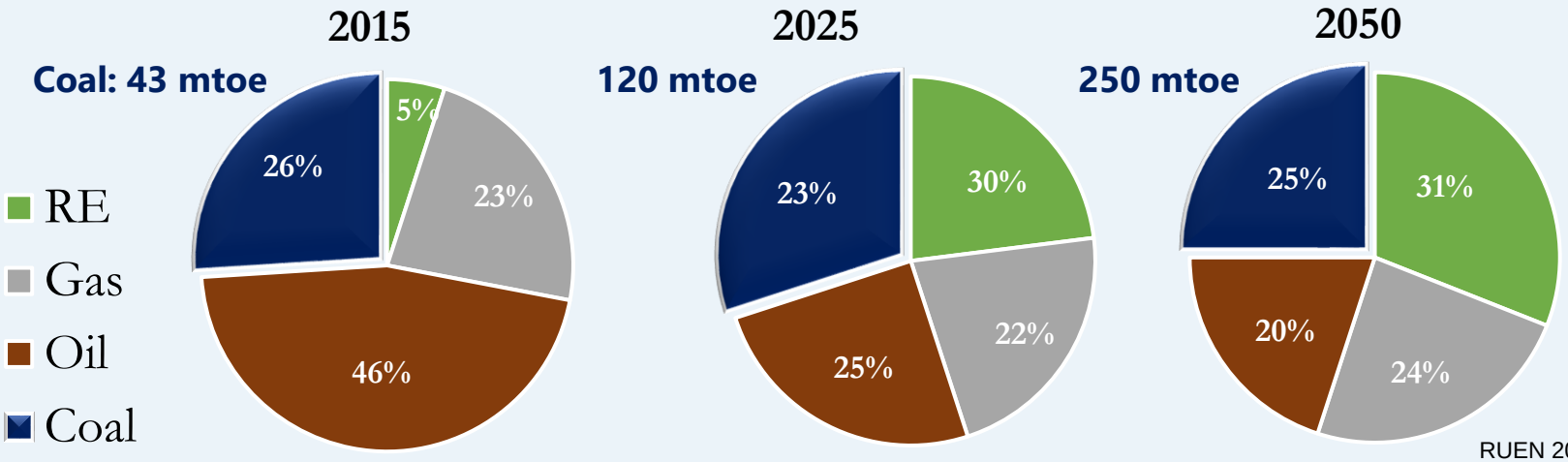
The Central Bureau of Statistics, 2021

Coal Reserves and Consumption Plan



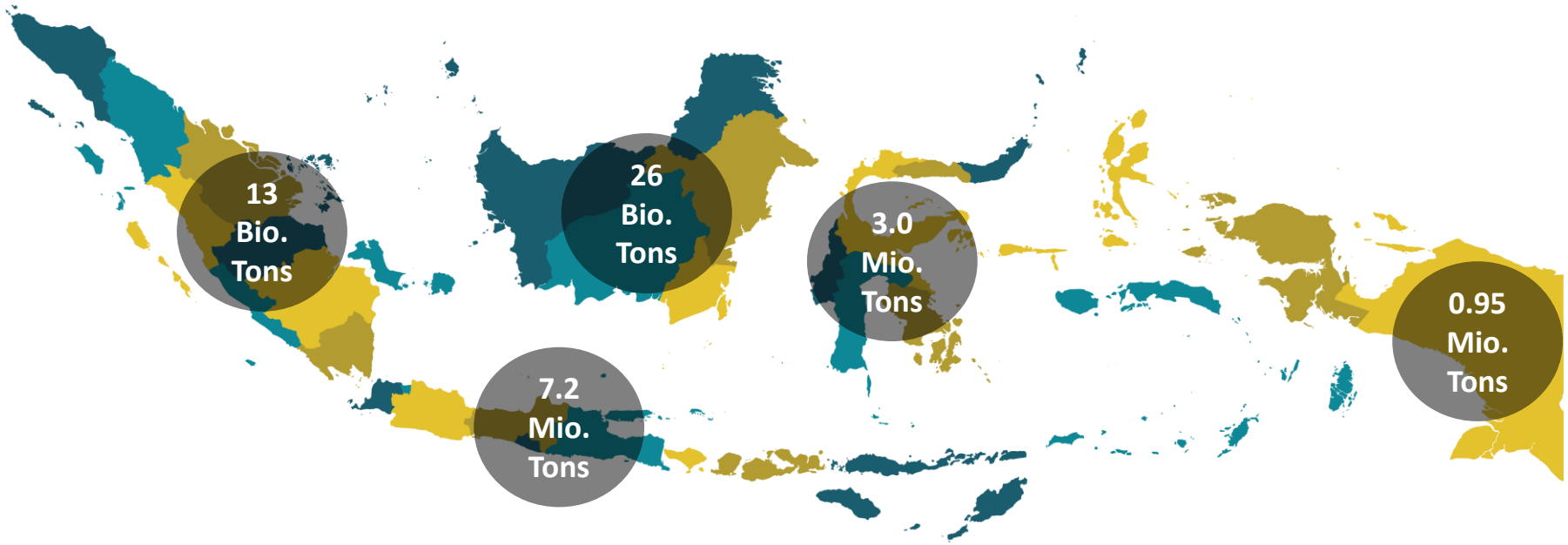
BP Statistical Review of World Energy, 2022

Indonesia's Primary Energy Supply Mix

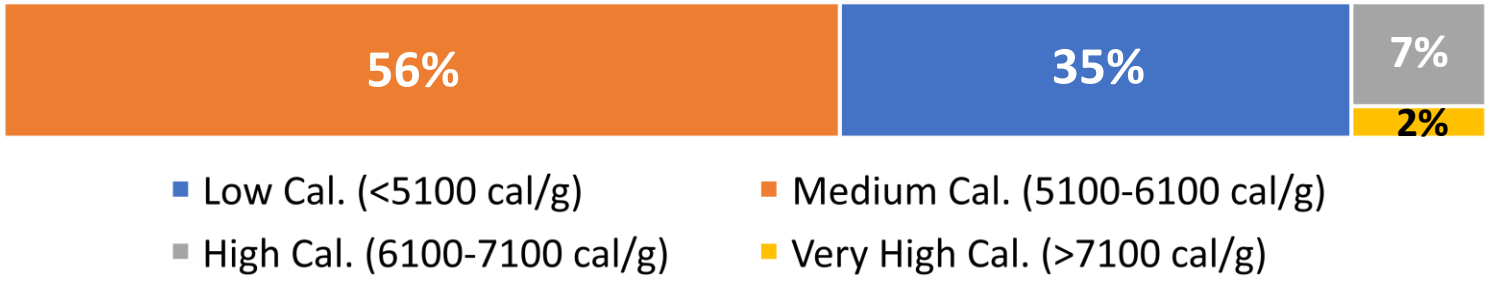


RUEN 2017

Distribution of Coal Reserves and Reserves Category



Coal Reserves by Calories



The National Industry Development Master Plan (RIPIN) 2015-2035

Priority Sector: Downstream Petrochemicals Industry
(Basic Chemical Industry from Oil, Gas and Coal)

2015-2019	2020-2024	2025-2035
Ethylene	Formic acid	Methanol
Propylene	O-Xylene	Ammonia
Butadiene	Benzene	Formic Acid
P-Xylene	Toluene	Paraffin Liquid
Methanol		BTX

Gasification for CO Production

Challenge: CO_2 gasification is relatively slow

COMBUSTION

$$C + O_2 \rightarrow CO_2$$

$\Delta H_{273\ K} = -394$ kJ

$\Delta G_{1173\ K} = -397$ kJ

SHIFT

GASIFICATION

$$C + CO_2 = 2CO$$

$\Delta H_{273\ K} = +173$ kJ

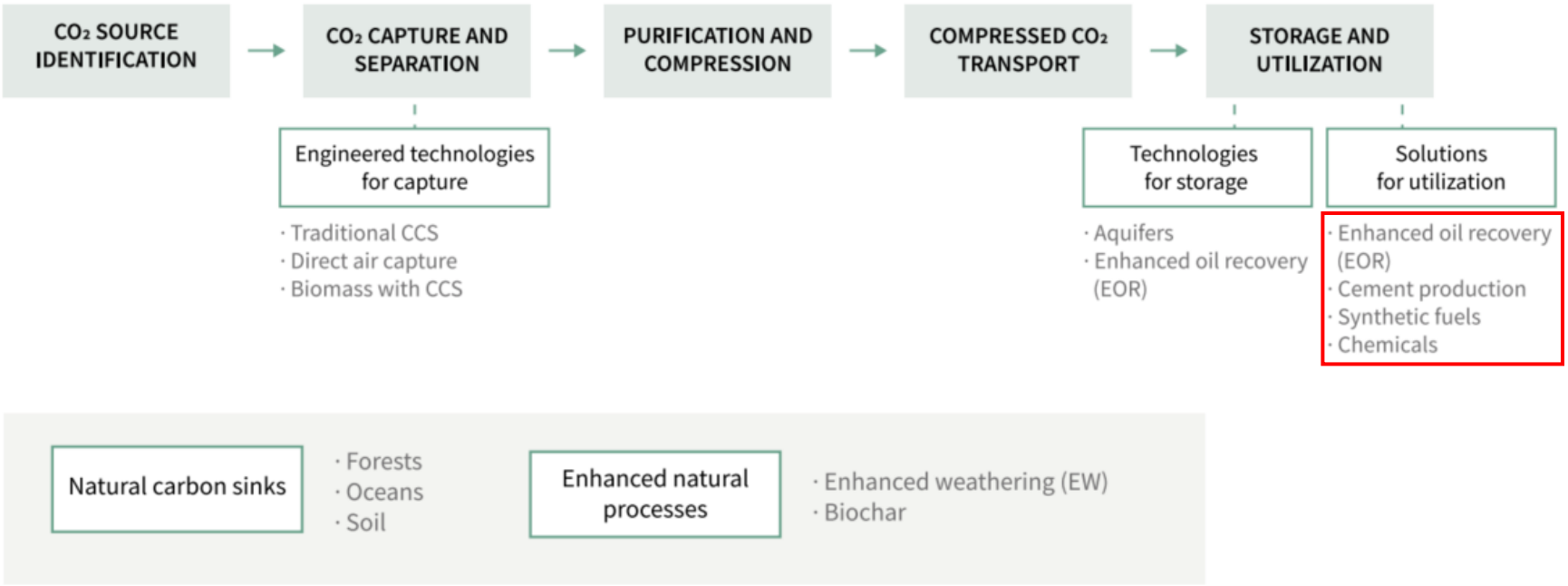
$\Delta G_{1173\ K} = -34$ kJ

improve

resources

eco-friendly

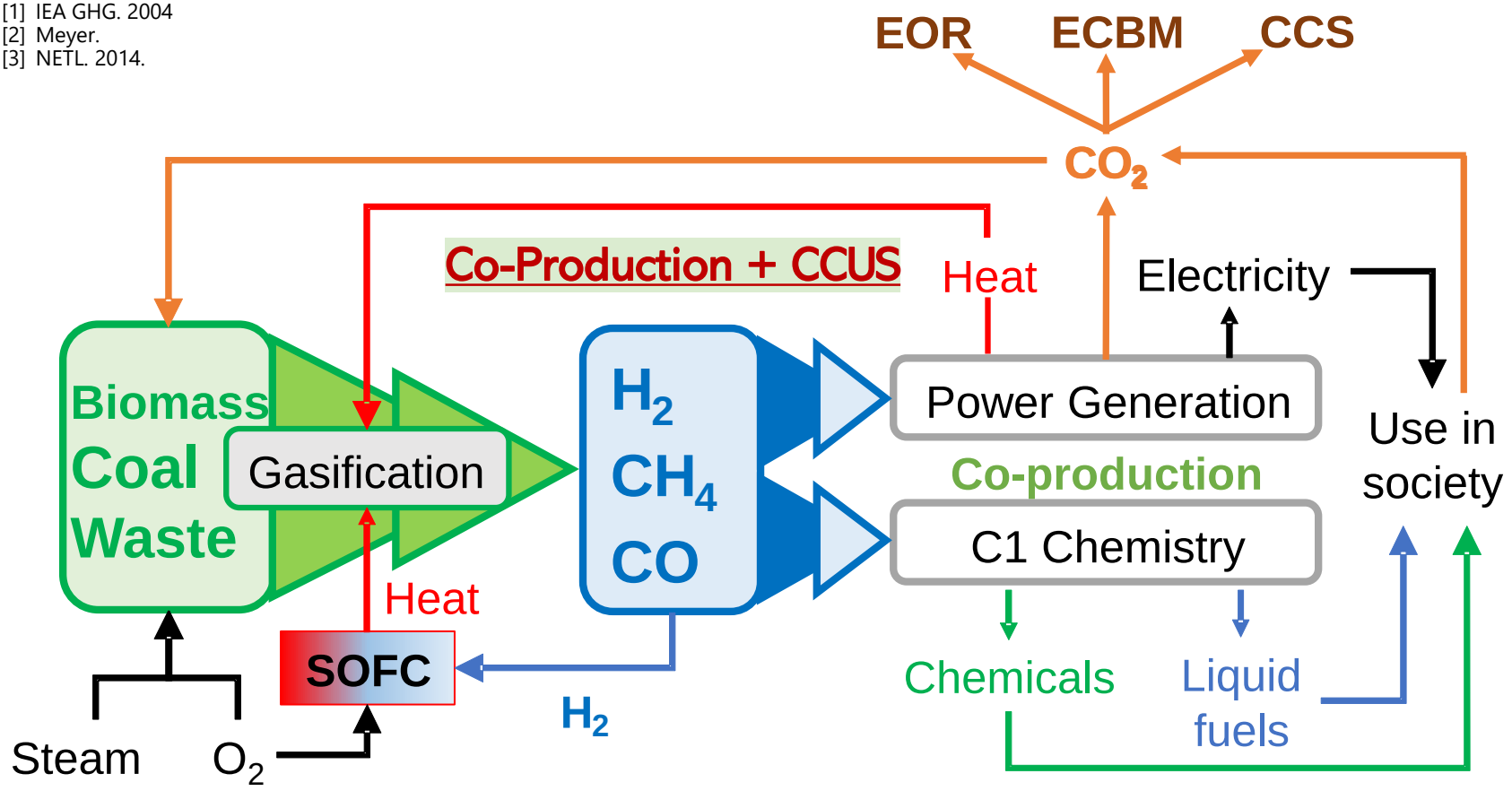
efficiency



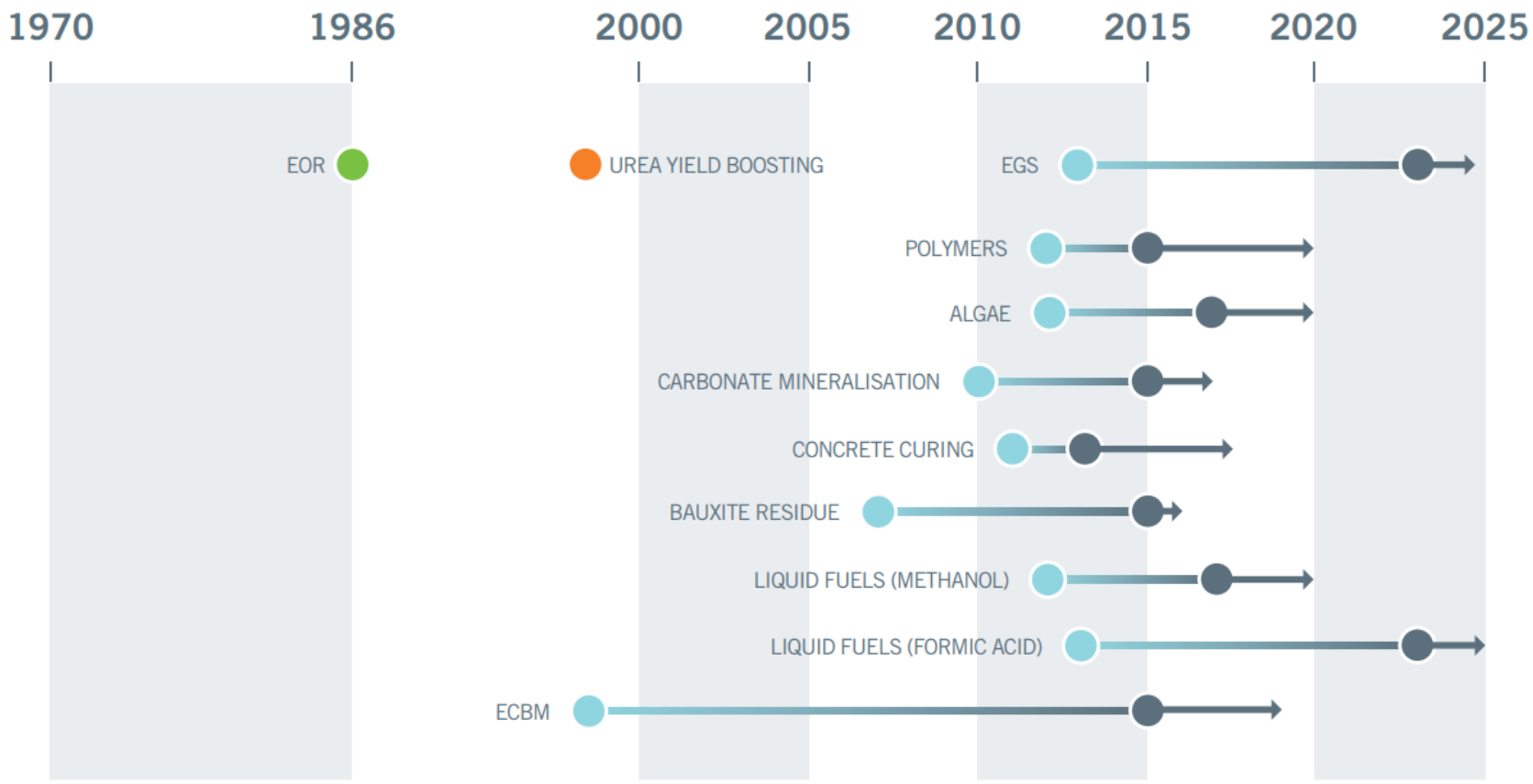
Combining Coal Downstreaming and CCUS Implementation

- Enhanced Oil Recovery (EOR) ▶ 92-97% CO_2 (specification)[1,2]
- Enhanced Coalbed Methane (ECBM) ▶ 50% CO_2[1]
- CO_2 for dry feeding Gasification ▶ 99%[3] CO_2

[1] IEA GHG. 2004
[2] Meyer.
[3] NETL. 2014.



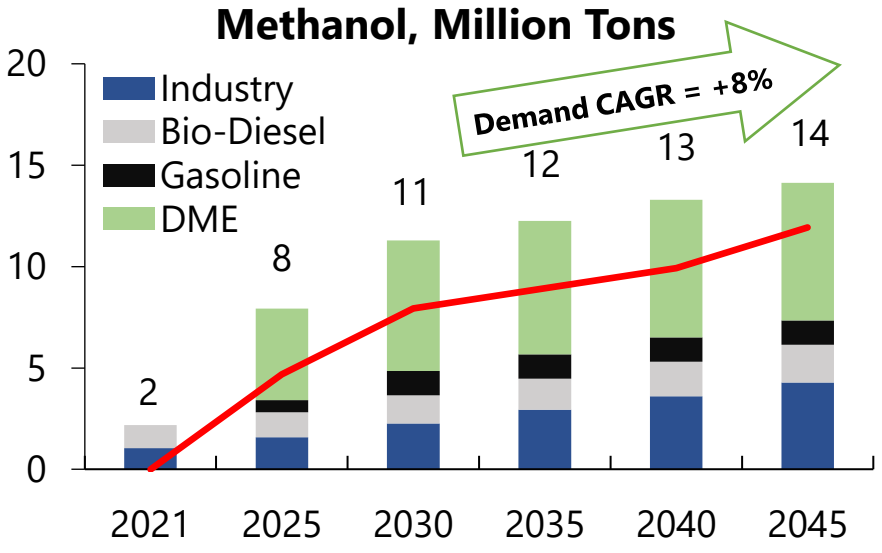
CO_2 Reuse Technologies

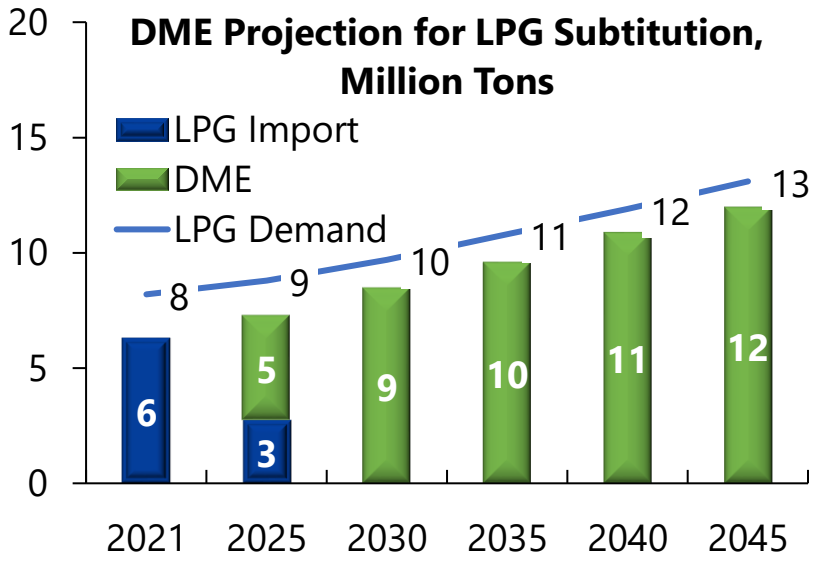


Note: The light blue circle represents the technology at demonstration scale, while the dark blue circle represents commercial operation of the technology based on claims from the respective proponents. Consequently, the predictions appear optimistic. The arrow extending from the dark blue circle indicates a more pragmatic timeframe to commercialisation.

Global CCS Institute 2011

Coal Downstream Trend in Indonesia





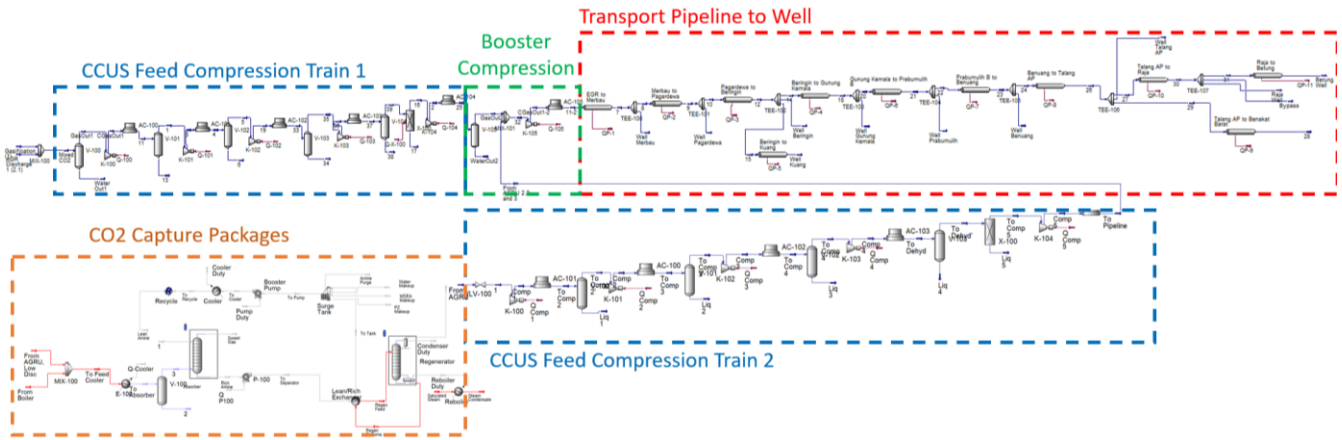
GAGR = Compound Annual Growth Rate

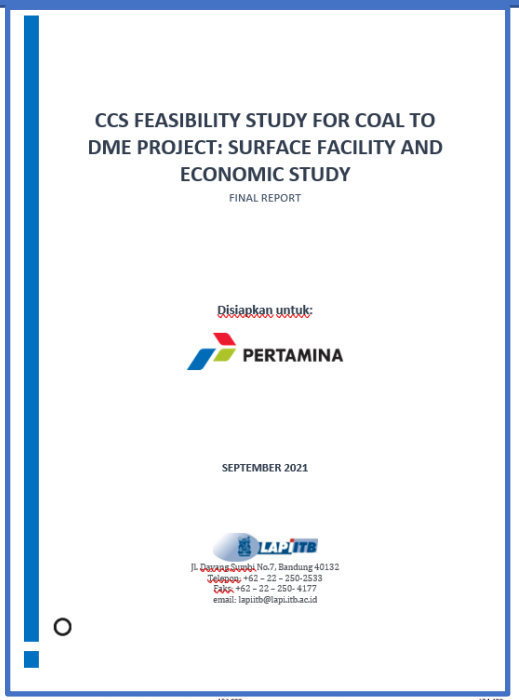
Coal Downstream Program Plan in Indonesia

Company	Planned Downstreaming	Annual Coal Feed	Annual Production Cap.	Investment	Status
PT Bukit Asam	Gasification	8 Mt (4000 kcal/kg GAR)	1.4 Mt DME 300 kt methanol 4.25 Mt MEG	± USD 2.1 bio.	Pre-FS
PT Kaltim Prima Coal	Gasification	5-6.5 Mt (4200 kcal/kg GAR)	1.8 Mt methanol	± USD 1.8 bio.	Pre-FS
PT Arutmin Indonesia	Gasification	6 Mt (3700 kcal/kg GAR)	2.8 Mt methanol	± USD 2.7 bio.	Pre-FS
PT Adaro Indonesia	Gasification	1.3 Mt	660 kt methanol	± USD 1 bio.	FS
PT Kideco Jaya Agung	Underground gasification	4 Mt	Under review	Under review	FS

FS for CCS related to Coal-to-DME in South Sumatra (2021): Surface Facility & Economy

It was conducted by RTI Pertamina and ITB




CCS FEASIBILITY STUDY FOR COAL TO DME PROJECT: SURFACE FACILITY AND ECONOMIC STUDY

FINAL REPORT

Disiapkan untuk:

PERTAMINA

SEPTEMBER 2021

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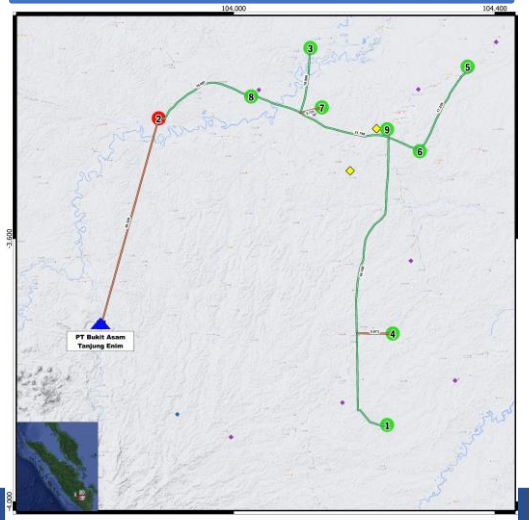
Telepon +62 – 22 – 250-2533
FAX: +62 – 22 – 250- 4177
email: lapiitb@lapi.itb.ac.id



Proposed Shortest Pipeline Route for Selected Sinks of CO2 around PLTU Bukit Asam

New Study Cooperation:
CCUS FS related to Coal-to-DME in South Sumatra (FY 2022)

The cooperation is between Pertamina and Chiyoda Corp, and supported by ITB and XODUS

No	Field	Status	Type	OOIP (MMSTB)	RF Oil (%)	OGIP (BSCF)	RF Gas (%)	CO_2 Storage Capacity (MMT)	Distance from CO_2 Source (km)	CO_2 Inj. Objective
1	Betung	Producing	Gas Fields				84%	32.7065	30-60 km	EGR / CCS
2	Lembak	Prod, improved recov	Gas Fields				77%	38.7794	60-90 km	EGR / CCS
3	Musi	Prod, improved recov	Gas Fields				92%	41.7177	60-90 km	CCS
4	Benuang	Producing	Oil & Gas Fields				42%	15.4534	30-60 km	EOR / EGR
5	Gunung Kemala	Producing	Oil & Gas Fields				46%	13.6846	30-60 km	EOR / EGR
6	Raja	Prod, improved recov	Oil & Gas Fields				86%	11.1792	30-60 km	EOR / EGR

hide

JOINT STUDY AGREEMENT
PERJANJIAN STUDI BERSAMA

IMPLEMENTASI TEKNOLOGI *CARBON CAPTURE STORAGE* ("CCS") / *CARBON CAPTURE UTILIZATION AND STORAGE* ("CCUS") DENGAN MENGGUNAKAN EMISI KARBON YANG DIHASILKAN PABRIK GASIFIKASI BATUBARA MENJADI DIMETHYL ETHER DI TANJUNG ENIM

CARBON CAPTURE STORAGE ("CCS") / CARBONCAPTURE UTILIZATION AND STORAGE ("CCUS") TECHNOLOGY IMPLEMENTATION BY UTILIZING CARBON EMISSION WHICH IS GENERATED FROM COAL TO DIMETHYL ETHER GASIFICATION PLANT IN TANJUNG ENIM

Antara

PT PERTAMINA (Persero)

dan

CHIYODA CORPORATION

Between

PT PERTAMINA (Persero)

and

CHIYODA CORPORATION

Nomor/Number :
Nomor/Number :

Perjanjian studi bersama ini ("**PERJANJIAN**") dibuat dan ditandatangani hari ini pada tanggal 15 Agustus 2022, ("**TANGGAL EFEKTIF**") oleh dan antara:

This joint study agreement (the "**AGREEMENT**") is made and signed on 15 August 2022, (the "**EFFECTIVE DATE**") by and between:

(1) **PT PERTAMINA (Persero)**, suatu perseroan terbatas yang didirikan dan beroperasi berdasarkan hukum Indonesia, memiliki kantor resmi di Jalan Medan Merdeka Timur No. 1A Jakarta 10110, dalam hal ini diwakili oleh **Oki Muraza**, dalam kapasitasnya sebagai **SVP Research & Technology Innovation** (selanjutnya disebut sebagai "**PERTAMINA**"); dan

(1) **PT PERTAMINA (Persero)**, a limited liability company organized and existing under the laws of the Republic Indonesia, having an office at Jalan Medan Merdeka Timur No. 1A Jakarta 10110, in this matter represented by **Oki Muraza**, in his capacity as the **SVP Research & Technology Innovation** (hereinafter referred to as "**PERTAMINA**"); and

(2) **CHIYODA CORPORATION**, suatu perusahaan yang didirikan berdasarkan hukum Jepang dan memiliki alamat kantor di 4-6-2, Minatomirai, Nishi-ku, Yokohama 220-8765, dalam hal ini diwakili oleh **Kimiho Sakurai**, dalam kapasitasnya sebagai ***Associate Director***, dan

(2) **CHIYODA CORPORATION**, a company organized and existing under the laws of Japan, having its registered office at 4-6-2, Minatomirai, Nishi-ku, Yokohama 220-8765, Japan, in this matter represented by **Kimiho Sakurai**, as **Associate Director**, and Division Director of Business

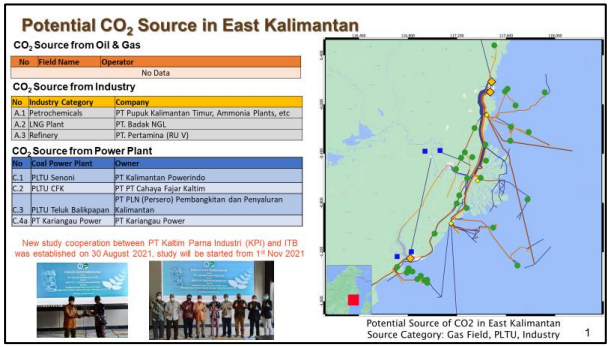
PERTAMINA	CHIYODA

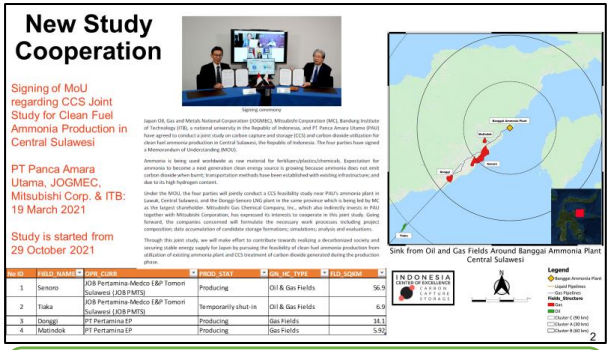
1 | *Joint Study Agreement PERTAMINA – CHIYODA*

The study will also cover the dynamic simulation and the impact of CO2-injection to the both fields,

Current Studies/Projects with Industries and International Partners

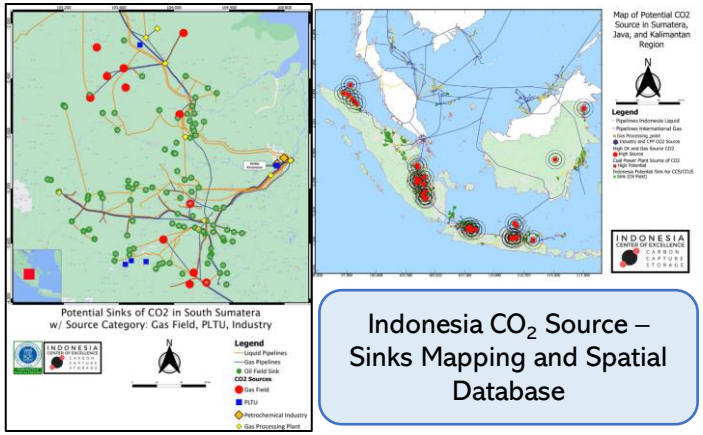
→ Most of CCS/CCUS studies in Indonesia are involved by National CoE CCS/CCUS at ITB and Japanese partners



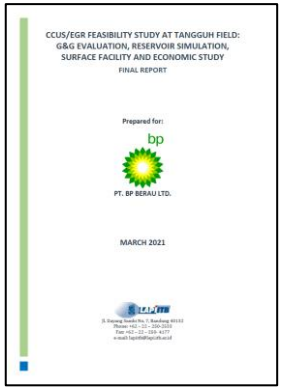


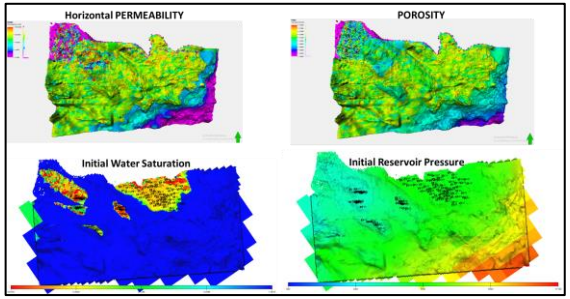
CCS Joint Study for Clean Fuel Ammonia in East Kalimantan and Central Sulawesi

Decarbonization Study For Greenhouse Gases Emission Reduction Program

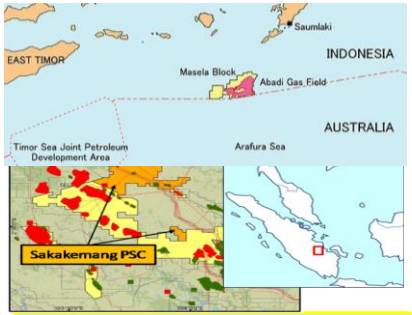


Indonesia CO_2 Source – Sinks Mapping and Spatial Database



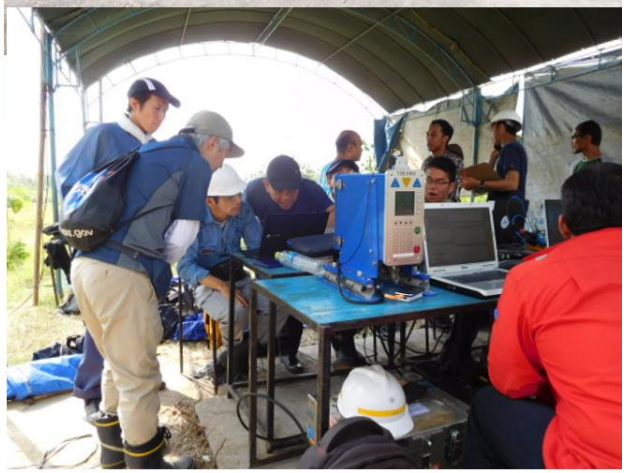


CCUS/EGR Feasibility Study At Tangguh Field:
G&G Evaluation, Reservoir Simulation, Surface Facility and Economic Studies



NEXT: Abadi & Sakakemang CCS Feasibility Study

Thank You



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