Singapore International Energy Week 2020

"Regional Carbon Storage Option: Current Development and Future Prospects"

29 October 2020

State of Development in Carbon Capture, Utilization and Storage in Indonesia and Future Perspectives

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INDONESIA CENTER OF EXCELLENCE CARBON CAPTURE STORAGE

Center for CO_2 & Flared Gas Utilization

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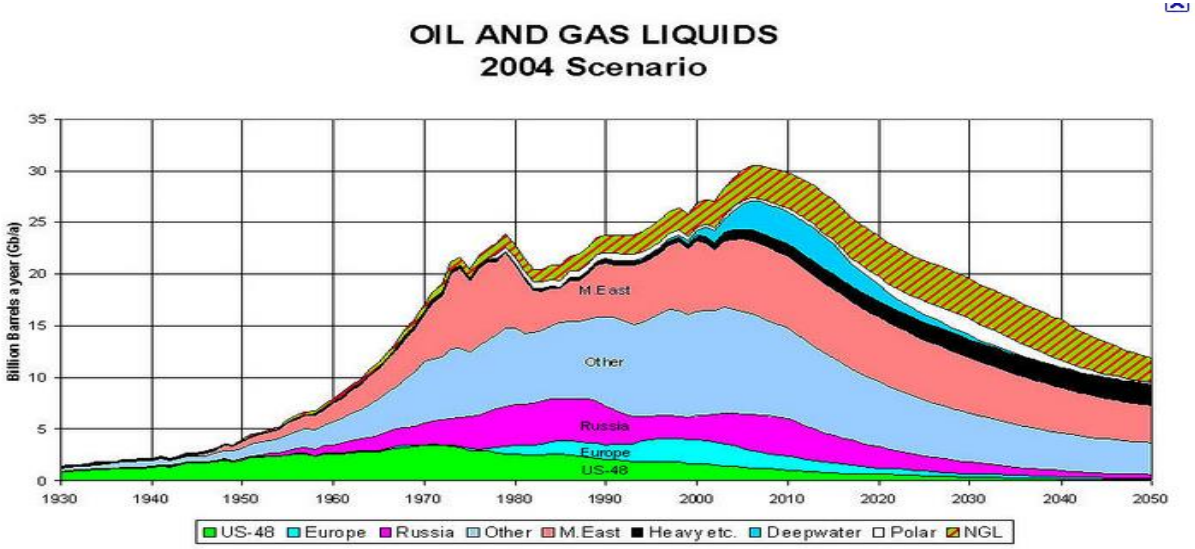
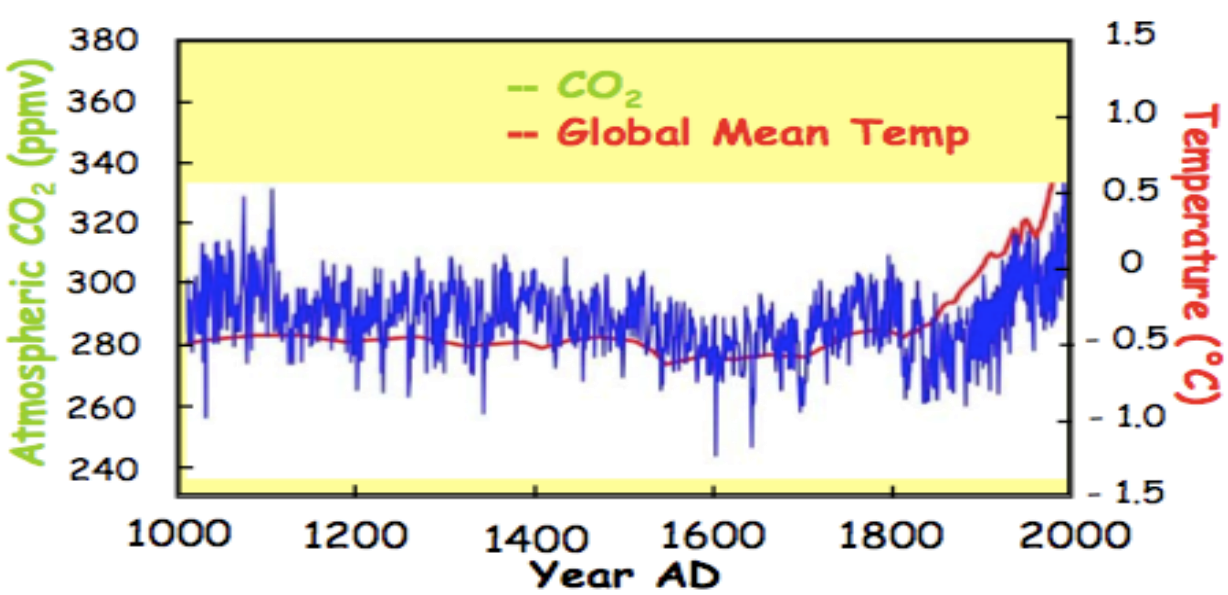
PUSAT UNGGULAN IPTEKS PERGURUAN TINGGI INDONESIA

Present World Crisis





Peak Oil

Climate Change

To stop global warming

- It will take
  - ①increased energy efficiency,
  - ②increased renewable energies,
  - ③the decarbonisation of power generation from fossil fuels.

- The only technology available to mitigate greenhouse gas (GHG) emissions from large-scale fossil fuel usage is CO2 capture and storage (CCS). (from CO2 Capture and Storage, IEA, 2008)

National CoE for CCS - CCUS and ZRF

--- First activity was stated in 2009 ---

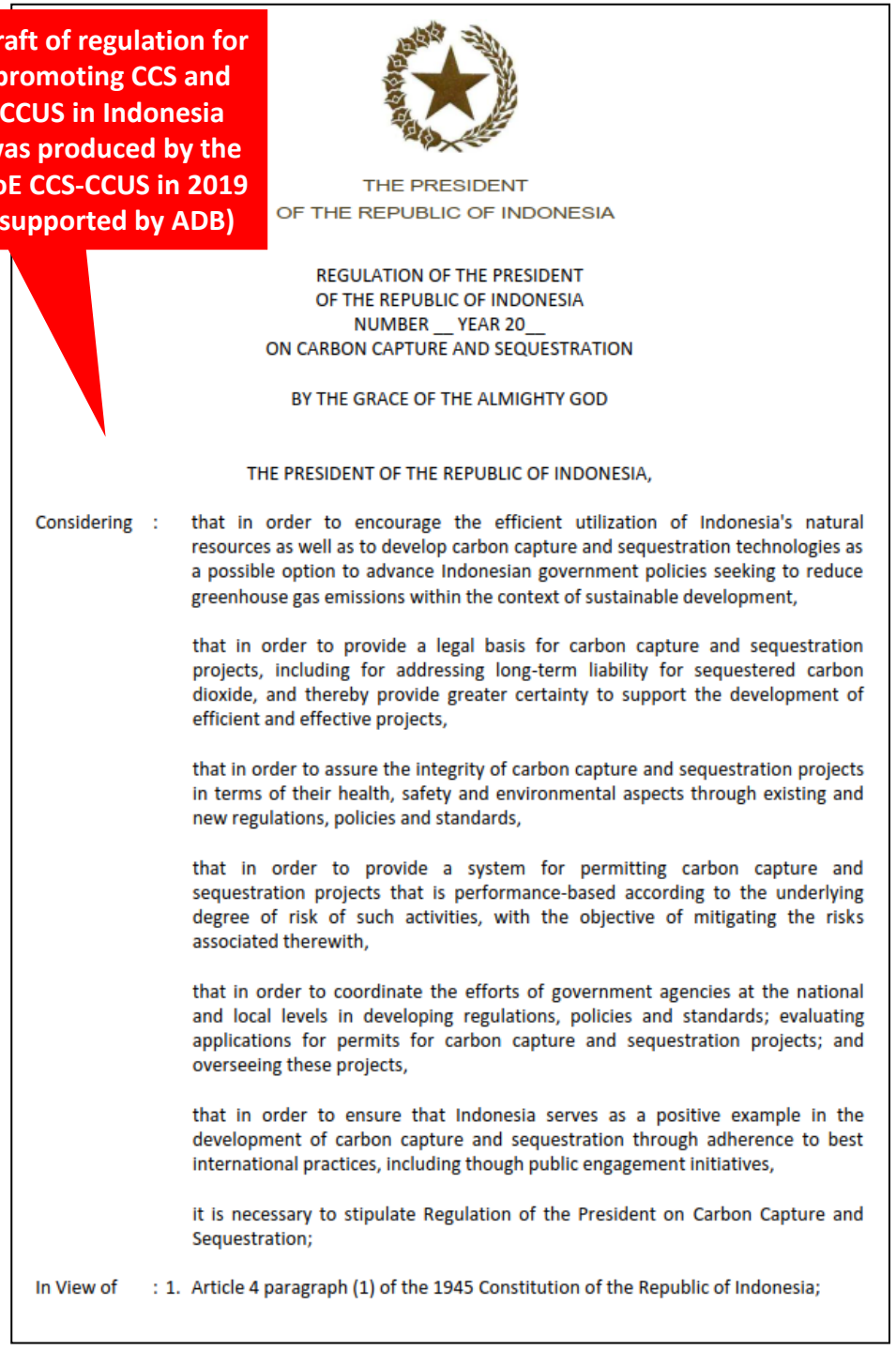
- Established based on DG Oil & Gas Appointed Letter (May 2017) -

The purposes of establishment:

- Realization of National commitment to reduce GHG of 29% in 2030 by national effort and could increase up to 41% if International support is available.
- Promoting the reduction of GHG emission from Energy Sector in Indonesia

1. Developing technology related to CCS/CCUS and it can be used for future EOR and EGR activities (CCUS) in order to maintain and increase oil & gas production.
2. Develop real projects related to CCS and CCUS, such as: Gundih CCS Pilot project, development of CO_2 separation technology, CCS/CCUS SOP, Regulation, etc.
3. Extended to other oil & gas fields with high CO_2 content, such as Natuna D alpha, some fields in South Sumatera and East Java, etc.

Draft of regulation for promoting CCS and CCUS in Indonesia was produced by the CoE CCS-CCUS in 2019 (supported by ADB)



THE PRESIDENT
OF THE REPUBLIC OF INDONESIA

REGULATION OF THE PRESIDENT
OF THE REPUBLIC OF INDONESIA
NUMBER __ YEAR 20__
ON CARBON CAPTURE AND SEQUESTRATION

BY THE GRACE OF THE ALMIGHTY GOD

THE PRESIDENT OF THE REPUBLIC OF INDONESIA,

Considering : that in order to encourage the efficient utilization of Indonesia's natural resources as well as to develop carbon capture and sequestration technologies as a possible option to advance Indonesian government policies seeking to reduce greenhouse gas emissions within the context of sustainable development,

that in order to provide a legal basis for carbon capture and sequestration projects, including for addressing long-term liability for sequestered carbon dioxide, and thereby provide greater certainty to support the development of efficient and effective projects,

that in order to assure the integrity of carbon capture and sequestration projects in terms of their health, safety and environmental aspects through existing and new regulations, policies and standards,

that in order to provide a system for permitting carbon capture and sequestration projects that is performance-based according to the underlying degree of risk of such activities, with the objective of mitigating the risks associated therewith,

that in order to coordinate the efforts of government agencies at the national and local levels in developing regulations, policies and standards; evaluating applications for permits for carbon capture and sequestration projects; and overseeing these projects,

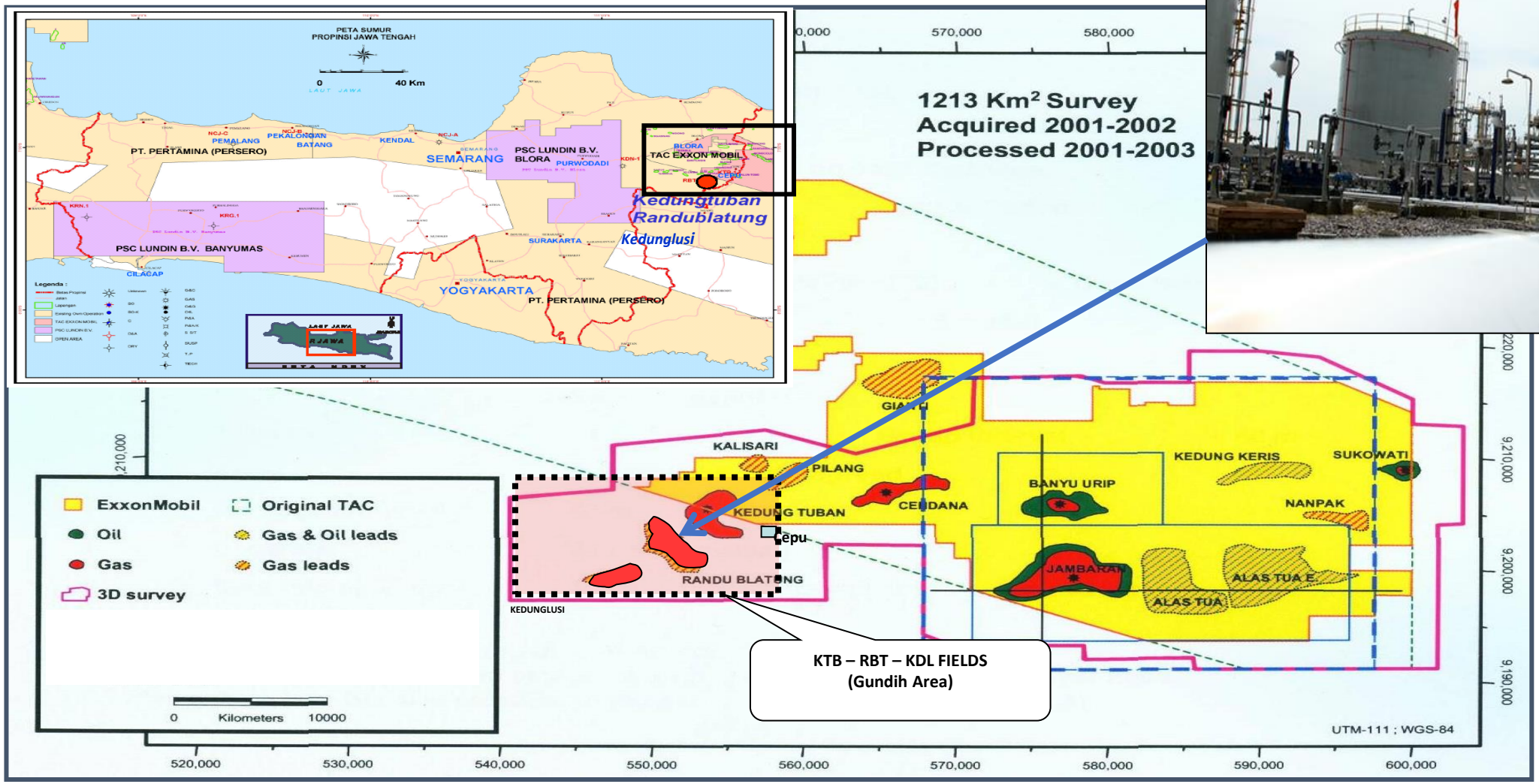
that in order to ensure that Indonesia serves as a positive example in the development of carbon capture and sequestration through adherence to best international practices, including though public engagement initiatives,

it is necessary to stipulate Regulation of the President on Carbon Capture and Sequestration;

In View of : 1. Article 4 paragraph (1) of the 1945 Constitution of the Republic of Indonesia;

Latest Status of Gundih Project: Shifting from CCS Pilot Project to CCUS (CO_2-EGR) Project

Map of Gundih area and its surrounding areas

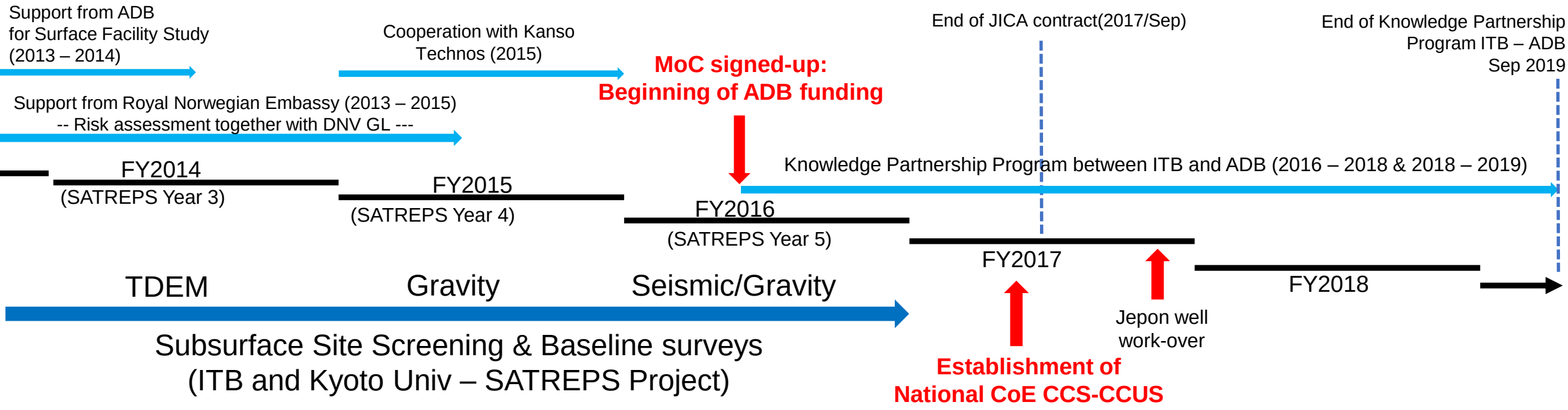


- 70 MMSCFD for 12 years
- CO_2 = 21%, equivalent to 800 tpd

Historical Gundih CCS Pilot Project (2012 – 2019)

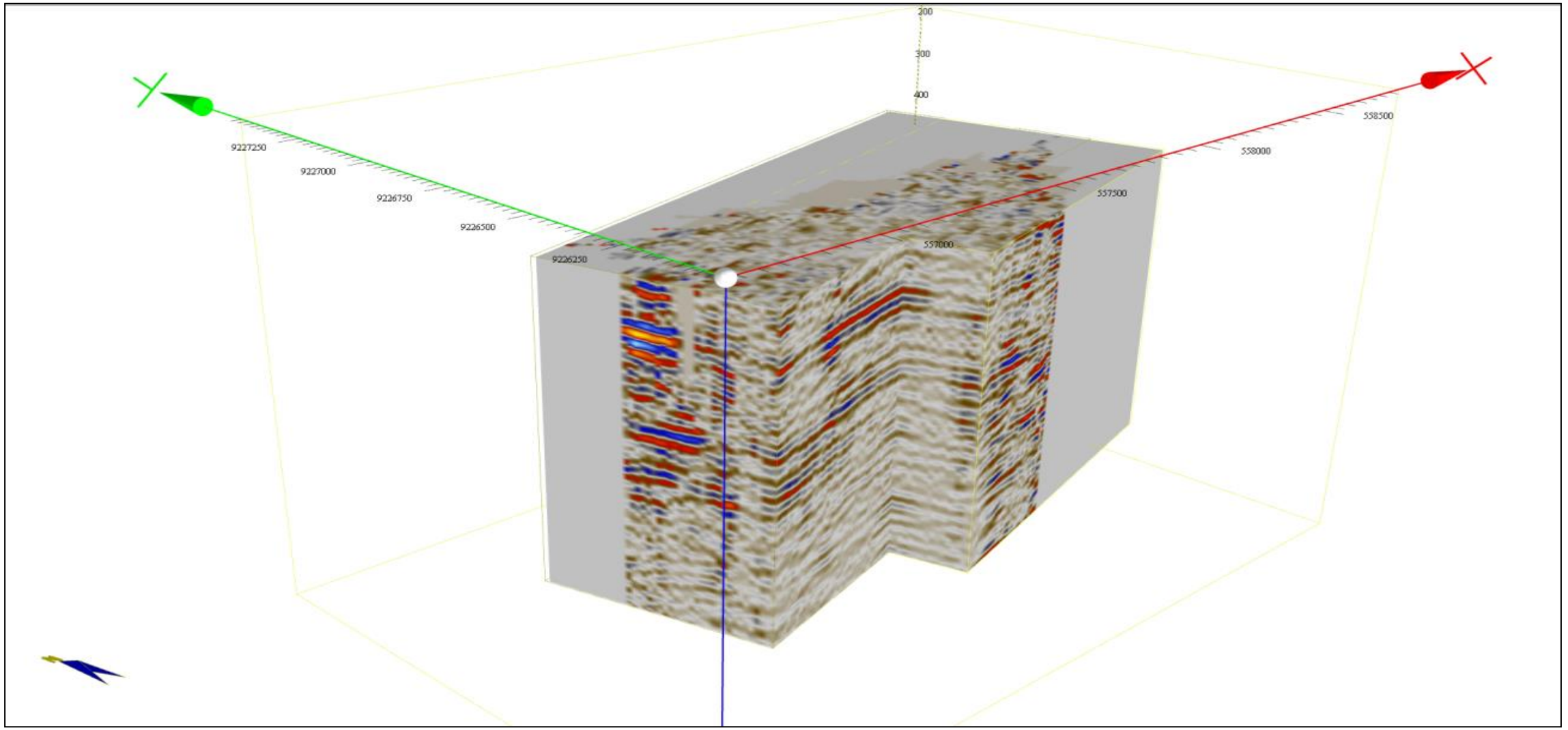
Contributors:

SATREPS project (2012-2017), ADB TA (2013 – 2014),
Royal Norwegian Embassy (2013 – 2015), Kanso Technos (2015)
and Knowledge Partnership Program ITB and ADB (2016 – 2019)

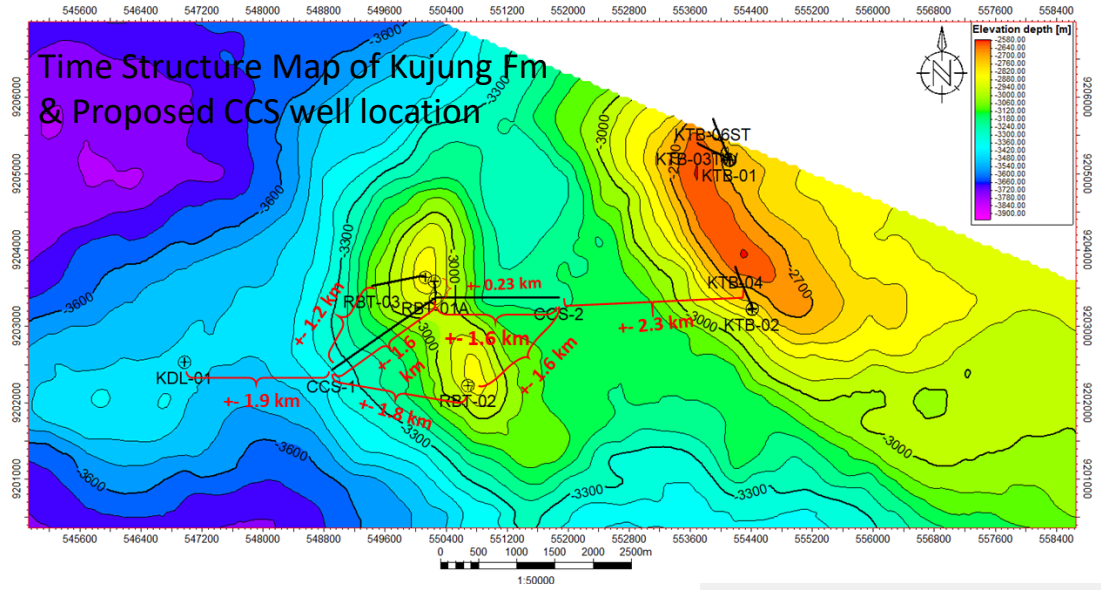


1. Provides guidance to the students before going to the field
2. Vibro being prepared before the action
3. Recording group in action (Labo)
4. DSS-12 recording system
5. GRS system
6. Geophone
7. DSS-12 warehouse

Pseudo 3D seismic cube obtained from Baseline Seismic Survey

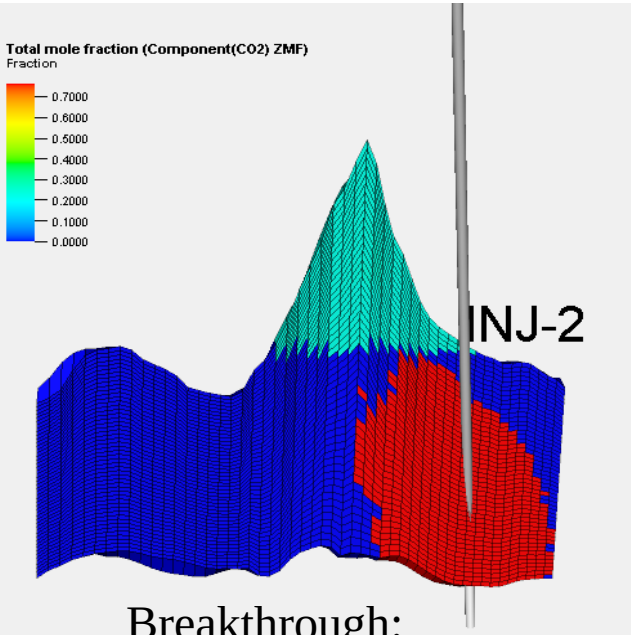


NEW Scenario of CCUS Project in GUNDIH AREA

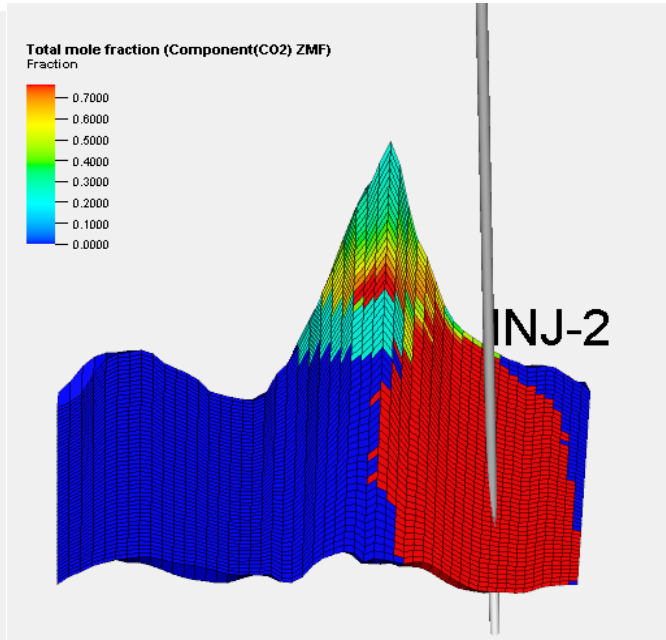


Currently Gundih CPP releases 800 tpd of CO2. If all of available CO2 is injected to Kedungtuban structure:

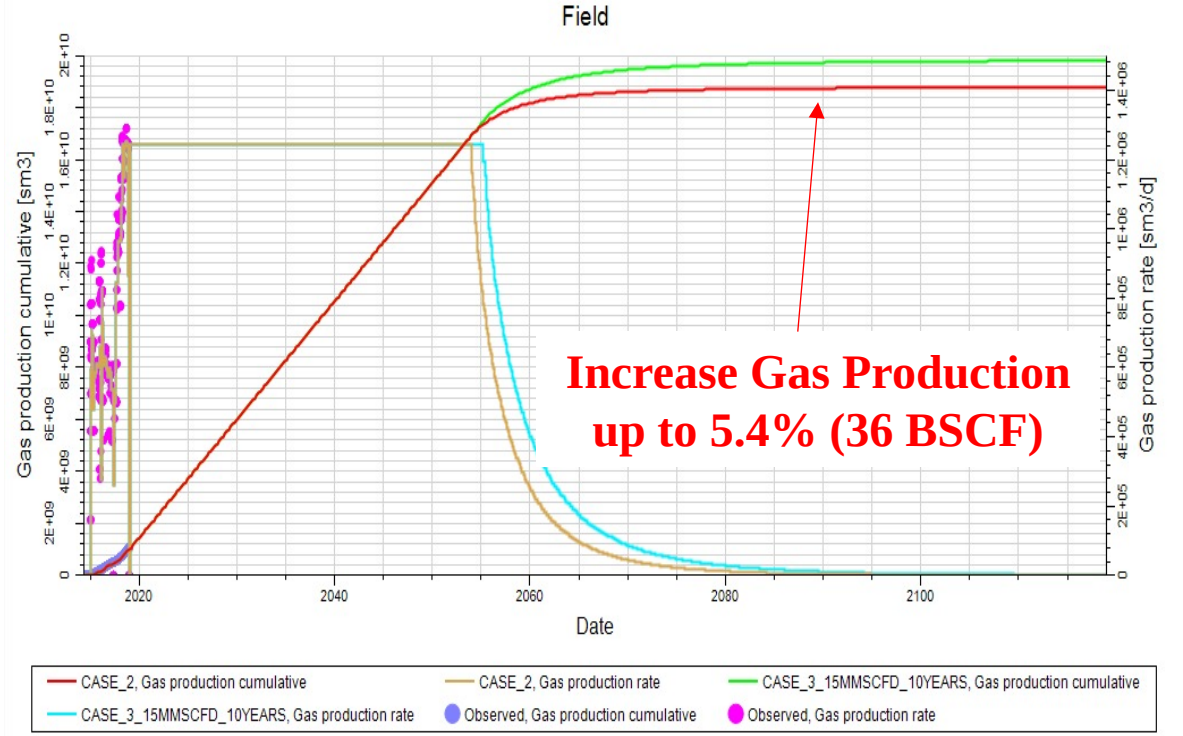
- 3 mio of CO2 will be reduced for 10 years injection time.
- Incremental gas production of 36 BSCF for 10 years, equivalent to approx. USD 120 mio.
- The Opex and Capex for 10 years CO_2 injection = USD 35 mio.
- Offering participation of foreign institutions for injecting CO2, e.g. using JCM scheme.



Breakthrough:
15 years after 1st injection



100 years after 1st injection



Newest Good News that received May 2020:

Approved FS Joint Crediting Mechanism: Proposing MRV Methodology for Gundih Project (Jun 2020 – Feb 2021, funded by METI)

Tasks and Roles 2020 (Just an idea)	ITB/CoE	JN / JP
Subsurface Study		
- Discussion on the Current Study	✓ ✓	✓ ✓
- Further Discussion	✓	✓ ✓ ✓
- Model Modification	✓	✓ ✓ ✓
- New Simulation	✓	✓ ✓ ✓
CO_2 Transport / Injection /Well Systems		
- Discussion on Current Study	✓ ✓	✓ ✓
- Concept Design	✓ ✓ ✓	✓
- Cost Estimation	✓ ✓ ✓	✓
- Study for Permit/License/Approval	✓ ✓ ✓ ✓	
Monitoring Plan		
- Discussion on the Current Study	✓ ✓	✓ ✓
- CO_2 Monitoring	✓	✓ ✓ ✓
- Monitoring Plan after Closure	✓	✓ ✓ ✓
Standards/Regulation		
- Planning compliant to Std./Reg.	✓	✓ ✓ ✓
Social Acceptability		
- Outreach Planning	✓ ✓ ✓	✓
Technology Applicability		
- CO2 injection		✓ ✓ ✓ ✓
- Monitoring		✓ ✓ ✓ ✓
		✓ ✓ ✓ ✓
Symposium for Dissemination of Outcome	✓ ✓ ✓	✓

METI Ministry of Economy, Trade and Industry

Innovative Solutions for Energy and Environment JANUS JAPAN NUS CO., LTD.

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トップ 速報 マネー 経済・金融 政治 ビジネス マーケット テクノロジー 国際 オピニオン スポー

CO2の地中貯留、海外で展開　Jパワーなど実証へ

2020/5/17 22:40 | 日本経済新聞　電子版

保存 共有 その他

二酸化炭素（CO2）を地中に埋めて排出量を減らす技術を日本の官民が海外展開する。経済産業省とJパワーなどがインドネシアのガス田で実証事業に乗り出す。石炭火力の需要が当面残るアジアで、日本の温暖化対策技術をアピールする狙いがある。

近く事業化調査を始め、2021年度から4年かけて数十億円規模の実証事業を計画する。経産省が予算を計上し、Jパワーや日揮のグループ会社、日本エヌ・ユー・エス（東京・新宿）…

EOR Potential

Reserves Distribution:
(Billion Barrel)

Original OIL In Place (OOIP): 74 BSTB

EOR POTENTIAL
???

Unrecoverable Reserves

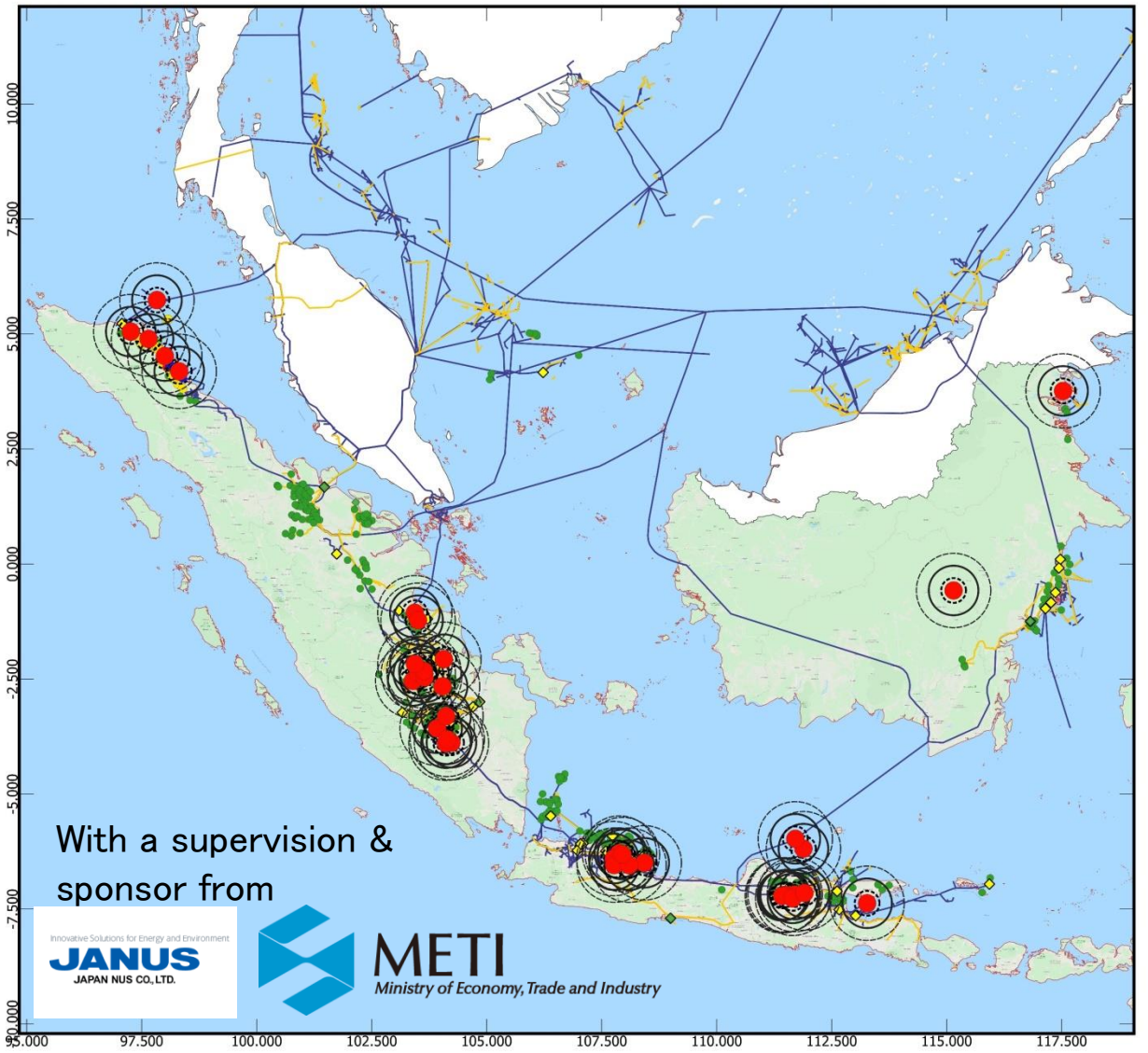
Source: SKK Migas Indonesia Oil Reserves Data (1/1/2014)

Overview of Potential CO2 Source Map (Sumatera, Java, Kalimantan)

CO_2 Source (subject to be discussed)

- The Oil-Gas CO_2 is calculated by CO2 content (%) x remaining gas reserve (mmscf)
  - Low Co2: < 5,000 mmscf
  - Medium CO2: 5,000 – 20,000 mmscf
  - High CO2: > 20,000 mmscf
- Industrial CO_2: from Cement Industry, Petrochemical, Coal Mining, Pulp Industries (>1,500 TCO_2/day)
- Power Plant (coal) CO_2 is classified as:
  - Low: <1,000,000 TCO_2e
  - Medium: 1 - 2 mio TCO_2e
  - High: > 2 mio TCO_2e

Hub-Clustering have been done in Gas Fields, Industry, and Coal Power Plant



Map of Potential CO2 Source in Sumatera, Java, and Kalimantan Region

N

0 200 400 600 km

Legend

- Pipelines Indonesia Liquid
- Pipelines International Gas
- Gas Processing_point
- Industry and CPP CO2 Source

High Oil and Gas Source CO2
- High Source

Coal Power Plant Source of CO2
- High Potential

Indonesia Potential Sink for CCS/CCUS
- Sink (Oil Field)

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- **Note that the CO2 unit available from oil&gas in database is volume (mmscf gas) not flowrate (mmscfd or mmscfy)**
- **Blue hexagon = CO2-rich industry, Red Squares = high CO2 produced from Power Plant.**

Potential CO_2 Source in South Sumatera

CO_2 Source from Oil & Gas

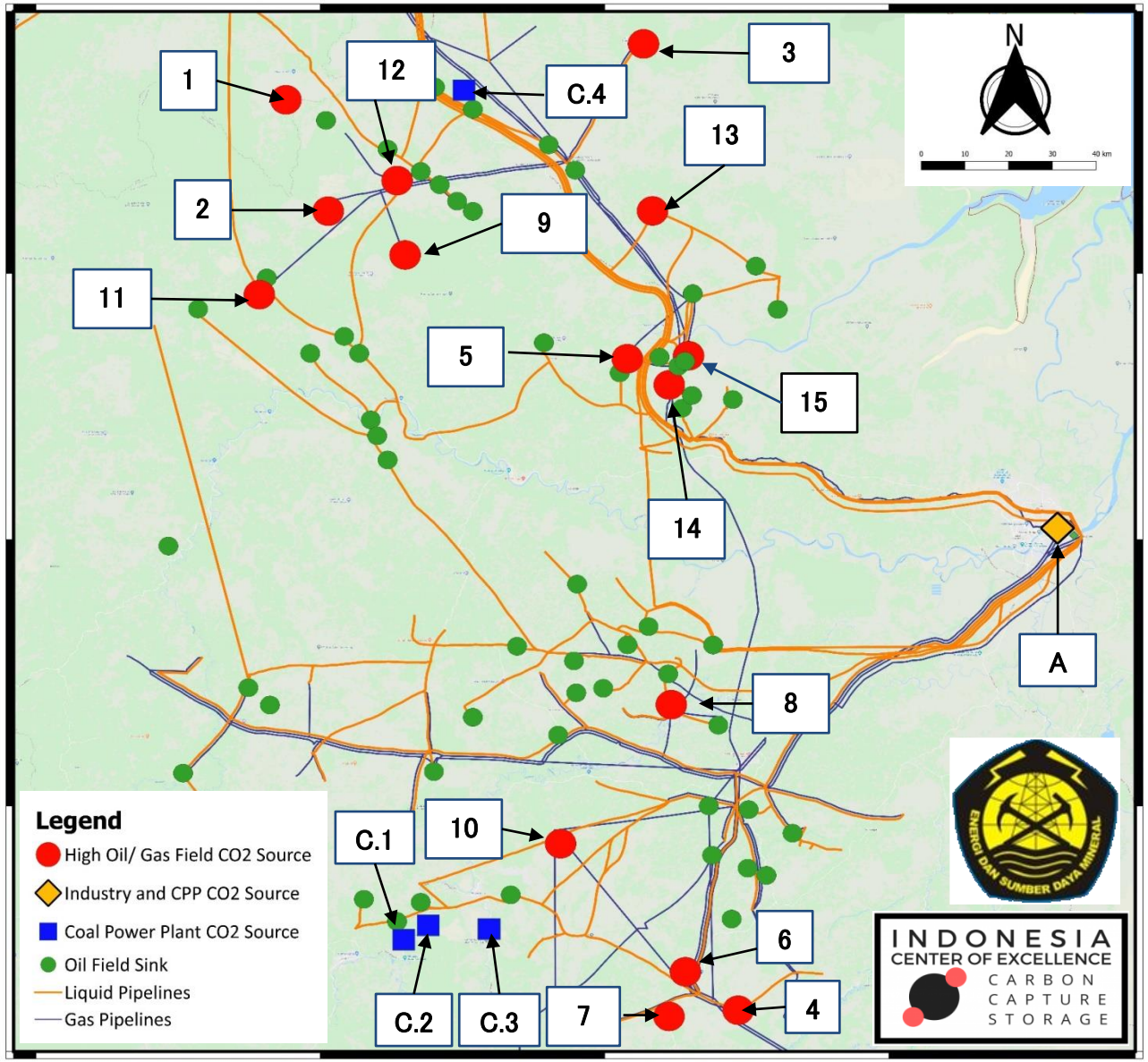
No	Field Name	Operator
1	Bungin 1	ConocoPhillips (South Jambi) Ltd
2	Dayung	ConocoPhillips (Grissik) Ltd
3	Gelam	ConocoPhillips (Grissik) Ltd~PT Pertamina/Talisman (Jambi Merang) Ltd
4	Kuang	PT Pertamina EP
5	Letang	ConocoPhillips (Grissik) Ltd
6	Pagardewa	PT Pertamina EP
7	Prabumenang	PT Pertamina EP
8	Raja	PT Pertamina EP
9	Sambar 1	ConocoPhillips (Grissik) Ltd
10	Singa (Medco)	PT Medco E&P Lematang
11	Suban	ConocoPhillips (Grissik) Ltd
12	Sumpal	ConocoPhillips (Grissik) Ltd
13	Bentayan	PT Pertamina EP
14	Tanjung Laban	PT Pertamina EP
15	Ramba	PT Pertamina EP

CO_2 Source from Industry

No	Industry Category	Company
A	Petrochemical	PT Pupuk Sriwidjaja

CO_2 Source from Power Plant

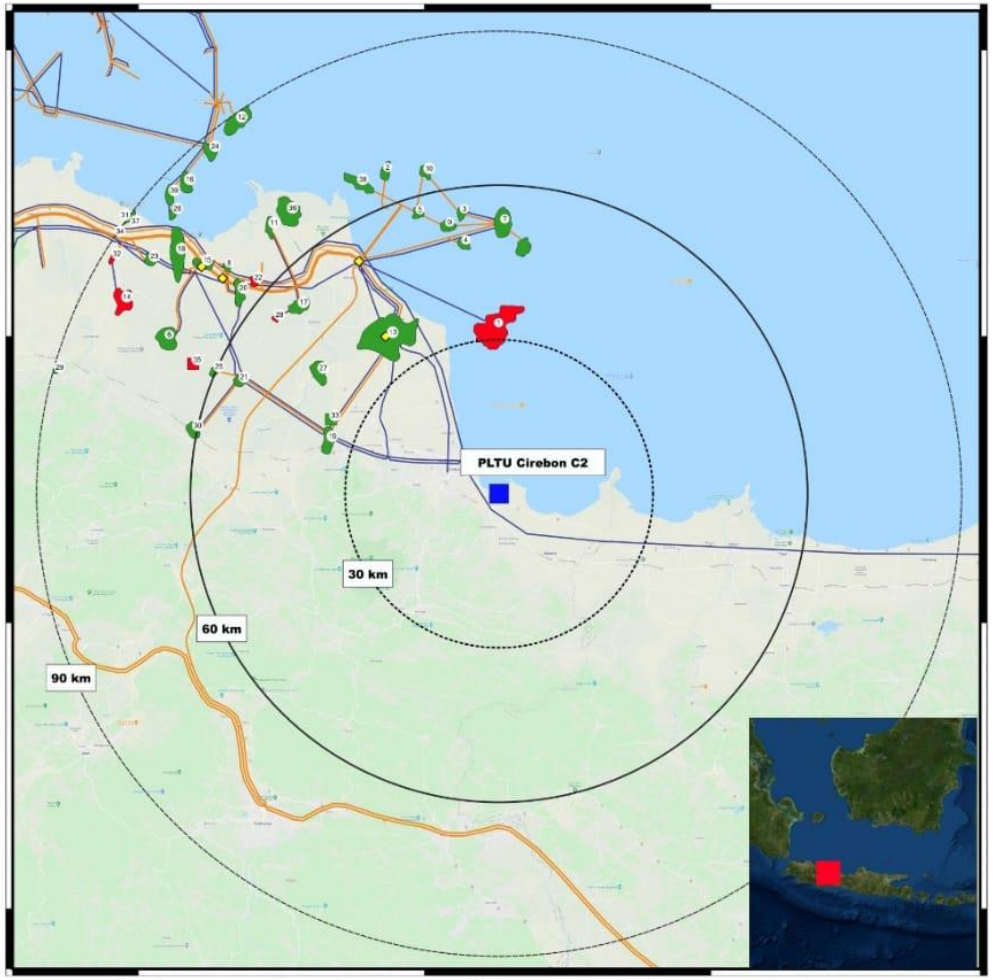
No	Coal Power Plant	Owner
C.1	Keban Agung	PT Priamanaya Energi
C.2	PLTU Banjarsari	PT Bukit Pembangkit Innovative
C.3	Bukit Asam #2	PT PLN (Persero) Pembangkitan Sumatera Bagian Selatan
C.4	Sumsel-5	PT DSSP Power



Map of Potential CO2 Source in South Sumatera Region
Category: Oil and Gas Field; Industry; Power Plant

A perception among us

CO2 from Coal Fired Power Plant



Sink from Oil and Gas Fields Around PLTU Cirebon C2
West Java

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N

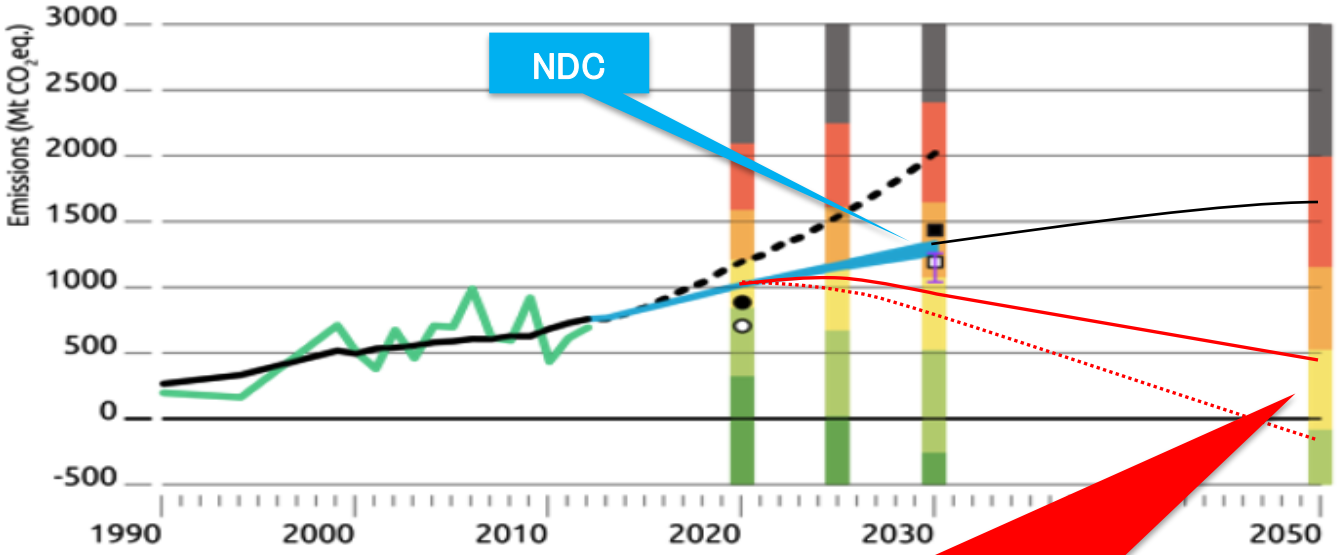
Legend

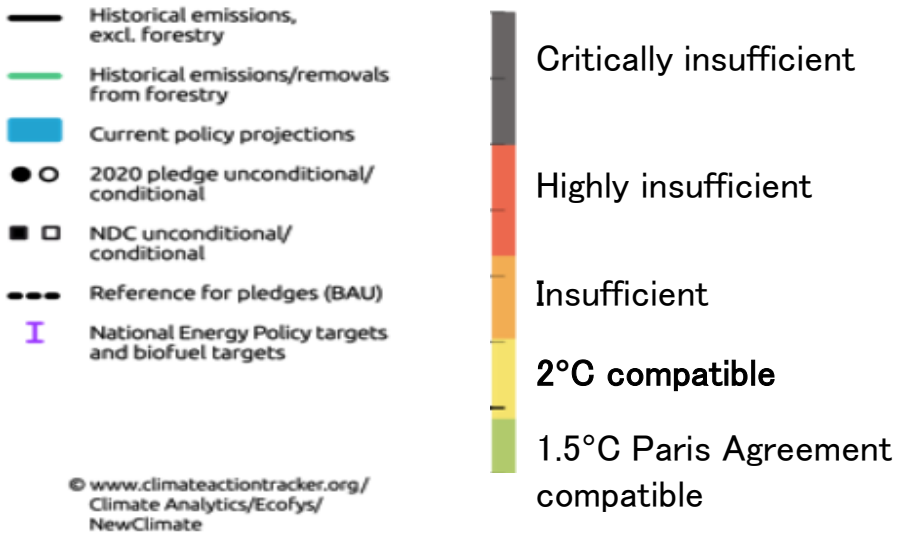
- PLTU Cirebon C2
- Gas Processing_point
- Liquid Pipelines
- Gas Pipelines

Fields_Structure

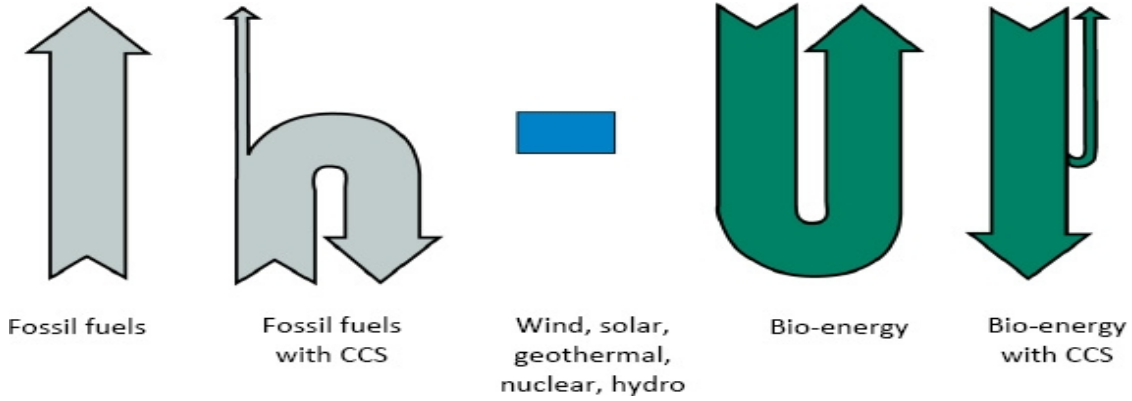
- Gas
- Oil
- Cluster A (30 km)
- Cluster B (60 km)
- Cluster C (90 km)

NEEDS FOR BECCS& DDPP BECCS INDONESIA

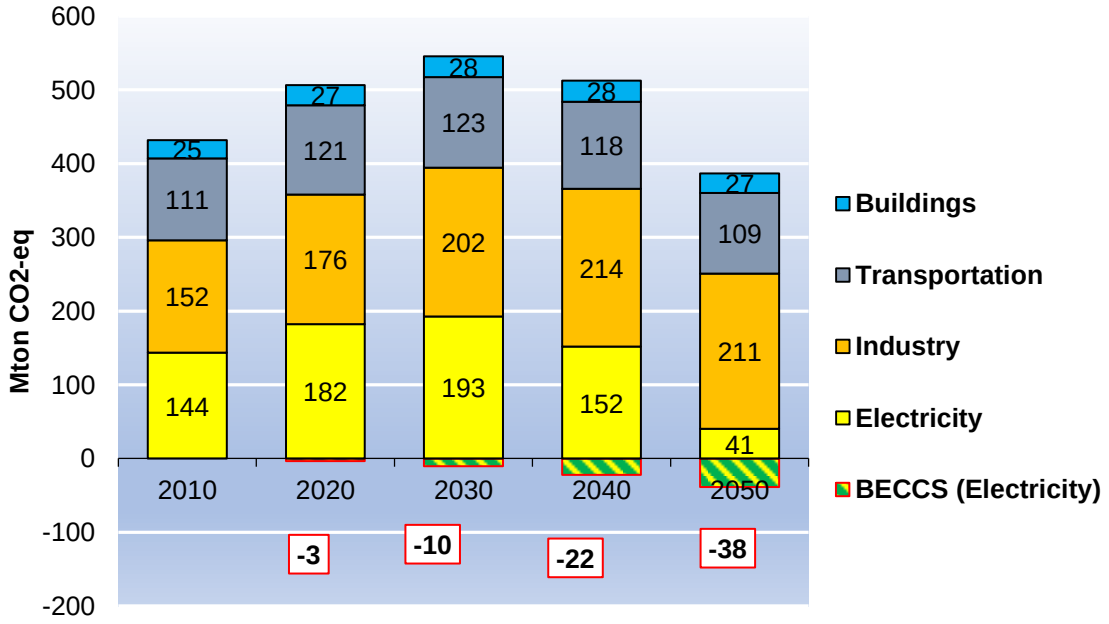




Needs for Negative Emissions



CO2 Emissions Development Scenario



By 2050, 1.14 ton CO_2/cap is compatible with world 2DS (2.2 ton CO_2/cap*) under BECCS scenario

*world average DDPP

Some source: Climate Action Tracker (2017), Global CCS Institute (2016)

ZERO ROUTINE FLARING (ZRF) PROGRAM – 2030

Oil and Gas Field

Oil Refinery

LNG Facilities

- Natural Gas (90% methane)
- CO_2
- Inert Gas: N_2

- Mixture of Hydrocarbon
- H_2 (occasionally)

- Natural Gas

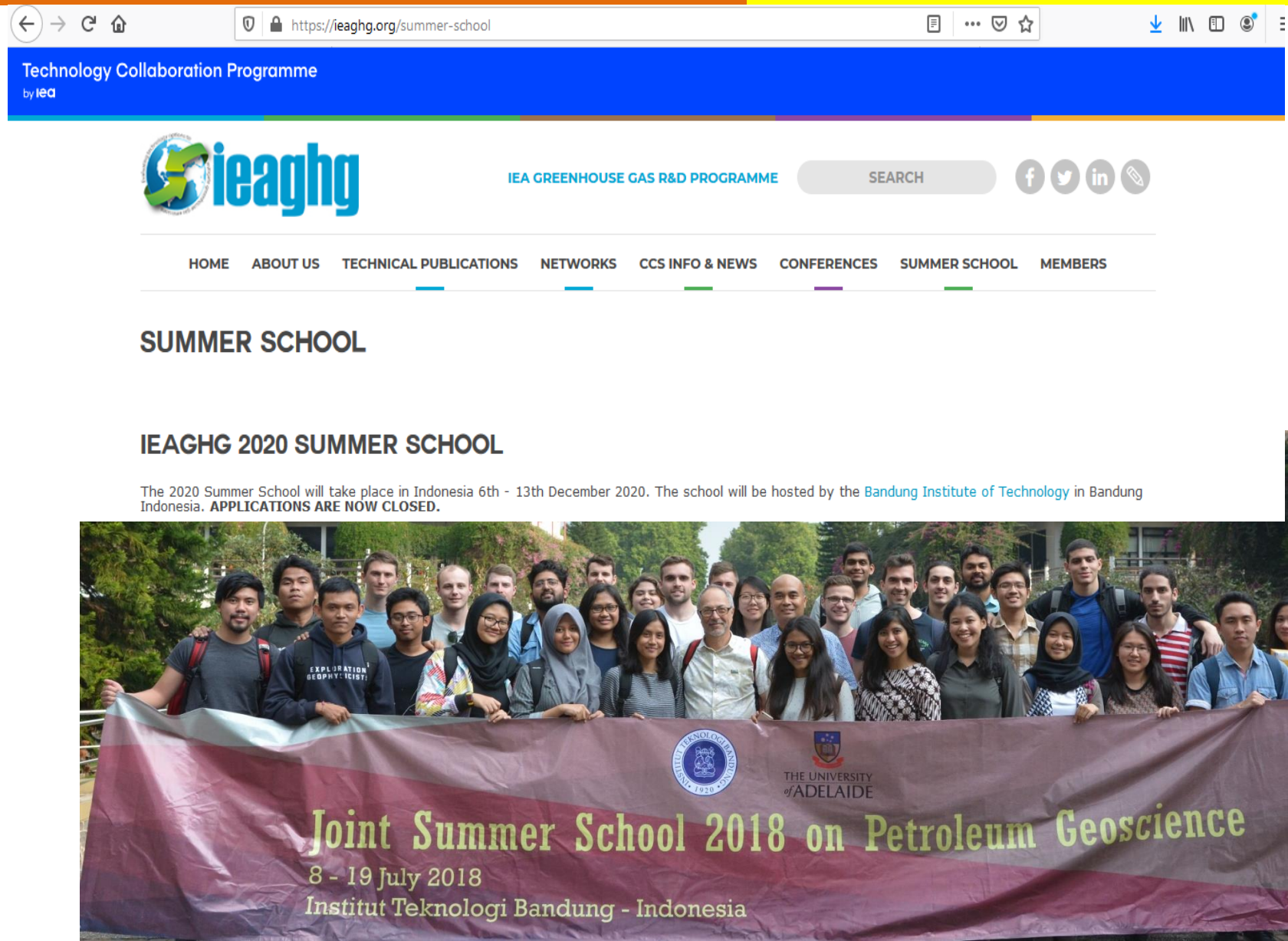
Flaring

→ It should be minimized by monetisation of Flared Gas

CAPACITY BUILDING ACTIVITIES

We will host International Virtual CCUS Course 2020 & IEAGHG CCS Summer School 2020 (Postponed to 2021)

Please visit:
virtualcourse.fttm.itb.ac.id



THANK YOU

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