Regulatory Process Required to Support National CCS Regulation
(Indonesia Case)

The 6th Meeting of The International Energy Agency CCS Regulatory Network
Paris, France, 27 – 28 May 2014

Ministry Of Energy and Mineral Resources
Agency of R&D for Energy and Mineral Resources
OUTLINE

1. Background

2. Milestones of Research and Development Agency of EMR Role on CCS Development in Indonesia

3. Proposed Roadmap for CCS Development in Indonesia

4. Developing Regulatory Framework for CCS Deployment in Indonesia

5. Closing Remarks
1. Background
CCS AS KEY MEASURES OF CO2 EMISSIONS REDUCTION

• Significantly increase of energy demand due to high economic and population growth is projected for a couple next decades

• Energy is still dominated by fossil particularly oil currently in which depleted continuously. Indonesia is endowed by huge amount of coal resources which might be used to match the high growth of domestic energy consumption.

• GHG emissions from energy sector comes second largest after forestry sector recently, energy sector however drives a significant part of the emissions growth in the future. GHG emissions will swiftly grow alongside high energy development.

• Anticipating soaring growth of CO2 emissions and considering availability of 60 huge sedimentary basins in Indonesia, CCS deployment in Indonesia is very strategic to be realized in order to participate also in global initiative for reducing CO2 emissions.
2. Milestones of Research and Development Agency of EMR Role on CCS Development in Indonesia
**CCS Milestones in Indonesia**

**Sojitz & Mitsubishi:**
Investigating CO₂ storage potential combined with EOR

**Shell:**
Joint Study with UK Government:
A first comprehensive study to identify CCS potential deployment in Indonesia

**METI-Japan CCS**
KIGAM

**ADB**
Identify a promising demonstration project in specific site

**2003-2005**
**2008**
**2009**
**2010**
**2011**
**2012**

**Total Indonesie:**
• Multiyears joint research At TOTAL field

**MHI & JCOAL:**
• Schedule for CO₂ Injection to Oil Fields
• Economical study for CO₂ EOR

**Shell:**
Jointly develop detailed scopes for CCS Project’s proposals that have potential to attract external funding
SELECTED AREA FOR CCS PILOT PROJECT

Regional area
- South Sumatera

Specific Area for Pilot Project
- Source: Merbau Gas Gathering Station (CO\textsubscript{2} Removal Plant)
- Storage: Depleted oil and gas reservoirs surrounding Merbau GGS

Rationale
- Based on outcomes and recommendations from previous study with UK Government.
- Large presence of the industrial and power sector in South Sumatera.
- Large and various CO\textsubscript{2} sinks (depleted hydrocarbon reservoirs, and coal seams).
- Attractive for CO\textsubscript{2}-EOR development
- South Sumatera has low density population.
- Existing infrastructure.
- Relatively stable geological setting from seismic and tectonic activity.
**CO₂ Sources Identification and Assessment**

Focus on technically amenable to CO₂ capture

<table>
<thead>
<tr>
<th>Overview</th>
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</thead>
<tbody>
<tr>
<td>- Detailed inventory of facilities emitting CO₂ includes:</td>
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<tr>
<td>- Power plant</td>
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<td>- Petroleum refinery</td>
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<tr>
<td>- Cement Plant</td>
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<tr>
<td>- Gas gathering station</td>
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<tr>
<td>- Fertilizer plant</td>
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<tr>
<td>- Ranking and suitability assessment of CO₂ sources for capture technology</td>
</tr>
<tr>
<td>- Emissions estimates from industrial and energy sectors</td>
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</tbody>
</table>

Merbau Gas Gathering Station - Early Opportunity
CO₂ Storage Screening and Capacity Estimates

Main Scope of Work

- **Oil & Gas storage options ranked by suitability for CO₂ storage**
  - Preferential criteria
    - Capacity
    - Injectivity
    - Confinement
    - Contamination
    - Economics
    - Willing partner
  - Qualifying criteria
    - Capacity > 10 mt CO₂
    - Injection rate > 100 t/CO₂/day/well
    - Depth > 100 m from top of reservoir
    - Seal thickness > 3 m
    - No active faults
    - Reservoir > 3 m thick

- **Saline Aquifers**
  - Sandstone
  - Limestone
  - Sedimentary basin scale
  - Trapezoidal method based on seismic cross section
  - Theoretical storage capacity

- **CBM Resources**
  - Data based on ADB report on CBM
  - Speculative theoretical storage capacity

- **Oil fields**
  - 557 reservoirs screened
  - 98 fields representing 60% of OOIP
  - CO₂ storage capacity based on production and reserve estimate method

- **Gas fields**
  - 33 fields representing 47% of OGIP
  - CO₂ storage capacity based on OGIP method

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Linking the Sources and Storages (Sinks)

An integrated approach of assessing potential CCS-chain

How we did source-sink matching

- A quantitative scoring system:
  - scores assigned based on proximity.
  - suitability score for the source.
  - suitability score for the sink.

GIS Map Platform

Overlaying the following information:

- Existing Pipeline network
- Identified CO₂ sources
- Screened oil and gas reservoirs
3. Proposed Roadmap for CCS Development in Indonesia
WHY WE NEED A CCS ROADMAP?

The roadmap will provide an analytical footing that enables:

- Stakeholders to move forward on specific actions,
- Address unidentified key issues, and
- Take timely action.
Pilot
- 50-100 tonnes per day of CO₂ over several months
- Knowledge of reservoir performance to support financing and designing a Demo project. (18,000 – 37,000 ton per year)

Demonstration
- Larger quantities of CO₂ injected into many wells continuously over many years
- 500-1,000 tonnes per day or more of CO₂ injected over 10 + years.
- Confirmation of long-term successful CO₂ storage to support financing and construction of at least one full scale commercial operation
(180,000 – 370,000 ton per year)

Commercial
- Very large quantities of CO₂ captured from one or more sources injected into one or more locations for a very long time period
- 2,500 -5,000 tonnes per day CO₂ captured and injected over 20+ years.
- Capture and store sufficient quantities of CO₂ to substantially reduce Indonesia’s CO₂ emissions (1 – 2 million ton per year)
## PROPOSED ROADMAP FOR CCS DEPLOYMENT IN INDONESIA

<table>
<thead>
<tr>
<th>Capture Site Development</th>
<th>Transport Development</th>
<th>Storage Site Development</th>
<th>Storage with or without EOR (Technical)</th>
<th>Monitoring</th>
<th>Risk Assessment</th>
<th>Financial</th>
<th>Legal/Regulatory</th>
<th>Socio/Environmental</th>
<th>Government</th>
<th>Capacity Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify pilot source &amp; plan</td>
<td>Transport plan</td>
<td>Development plan</td>
<td>Site screening &amp; selection</td>
<td>Monitoring plan</td>
<td>Confirm laws &amp; regulatory path</td>
<td>Financing identification &amp; secure initial funding</td>
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<tr>
<td>Supporting equipment design</td>
<td>Transport design</td>
<td>Development design</td>
<td>Site characterization</td>
<td>Monitoring baseline</td>
<td>Permitting</td>
<td>Project cost estimate &amp; secure total funding</td>
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<tr>
<td>Supporting equipment construction</td>
<td>Transport construction</td>
<td>Pilot Construction</td>
<td>Injection or and production plan</td>
<td>Risk assessment plan</td>
<td>Environmental Impact Assessment</td>
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<td></td>
<td>Monitoring &amp; interpretation</td>
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</tr>
<tr>
<td>CO₂ Captured</td>
<td>CO₂ Transported</td>
<td>CO₂ Injected &amp; produced</td>
<td>Data collection and modeling</td>
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</tr>
<tr>
<td>Demonstration source identification</td>
<td>Demonstration transport identification</td>
<td>Pilot shut-in</td>
<td>Pilot assessment</td>
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</table>

### GATEs
- **GATE 1**: GATE 1
- **GATE 2**: GATE 2
- **GATE 3**: GATE 3
- **GATE 4**: GATE 4
- **GATE 5**: GATE 5
4. Developing Regulatory Framework for CCS Deployment in Indonesia
Indonesia strong commitment in reducing CO2 Emissions, however there is no specific law and regulation for supporting CCS deployment.

Current condition on policy and regulation for encouraging CO2 emissions reduction.

Assessing the impact of CCS implementation in terms of electricity tariff.

The need for global common understanding and agreement on CO2 emissions reduction encouraging the deployment of CCS.
Climate change and GHGs emission reduction become national priorities.

President RI commitment in G-20 Pittsburgh and COP15 to reduce GHGs emission by 2020.

- **Domestic Efforts**:
  - 26% (767 mln Ton)
  - Through renewable energy, energy efficiency and clean energy technology implementation

- **Domestic and International Support**: 41% (26%+15%)

Pres. Reg No. 71/2011
GHG Inventory and MRV

Pres. Reg No. 61/2011
RAN-GRK

Forestry, Peat Land and Agriculture (680 mill tonne)
Energy & Transportation (38 million tonne)
Industry (1 million tonne)
Wastes (48 million tonne)
CURRENT CONDITION ON POLICY AND REGULATION FOR ENCOURAGING CO2 EMISSIONS REDUCTION

- A complex and long term project like CCS will require comprehensive and complicated arrangements which should be supported by well defined laws and regulations.
- The laws and regulations on CCS should reflect cost and benefit for the entity as well as the benefit to the national as well as the local government.
- At present no law on CCS available in Indonesia. Several regulations under oil & gas reflect similarity for CCS arrangements, however the existing regulations are not sufficient to motivate industry to make strategic investments in CCS.
- Even though there is no specific regulation for CCS, current regulation for promoting renewable energy and energy conservation can be perceived as an initial step for supporting CCS deployment.
- Indonesia intensifies the development of renewable energy and improvement of energy efficiency aiming at reducing oil dependency. It is however resulting in significant CO2 emissions reduction and might match the 26% reduction target. Consistently maintaining policy instruments for encouraging renewable energy development is similar to implementing targeted deployment of CCS as one of IEA policy framework for CCS deployment.
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- Incentives for Renewable energy development
- Dedicated legislation on CCS is desirable. To follow up it, R&D Agency for EMR has been proposing the implementation of roadmap for CCS deployment in Indonesia and development of CCS pilot project.
1. Average electricity tariff in 2013: Rp 820/kwh; electricity costs: Rp 1300/kwh; kurs: Rp 11500/$

2. Average CO2 emissions of coal power plant: 870 gram CO2/kwh

3. Component electricity subsidy: almost 40% (end of 2013)

4. Implementation of Carbon tax at US$ 100/ton for enabling the deployment of CCS resulting in the double of current electricity tariff.

5. Removing electricity subsidy by increasing electricity tariff is politically difficult
THE IMPORTANT ROLE OF STRONG GLOBAL COMMITMENT FOR CCS DEPLOYMENT

- Limited motivation for industry to make long term strategic investments for CCS
- Slow progress on CCS development and deployment
- Market barrier

- Absence of robust carbon pricing mechanism
- Energy pricing subsidy in most developing countries
- Political uncertainty over regions’ future development or stringency means for reducing CO2 emissions

- Intensive global cooperation and strengthening commitment on reducing CO2
Thank You

http://www.litbang.esdm.go.id
http://www.lemigas.esdm.go.id
http://www.p3tkebt.esdm.go.id
http://www.tekmira.esdm.go.id
http://www.mgi.esdm.go.id
PROJECTION OF ENERGY DEMAND
(NATIONAL ENERGY POLICY TARGET)  Million BOEPD

ENERGY DEVELOPMENT IN INDONESIA

PROJECTION OF INDONESIA ENERGI BALANCE ON 2025

<table>
<thead>
<tr>
<th>ENERGY TYPE</th>
<th>DEMAND (1)</th>
<th>DOMESTIC SUPPLY (2)</th>
<th>SURPLUS / DEFICIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil</td>
<td>1870 (25%)</td>
<td>400</td>
<td>-1470</td>
</tr>
<tr>
<td>Gas</td>
<td>1650 (22%)</td>
<td>800</td>
<td>-850</td>
</tr>
<tr>
<td>Coal</td>
<td>2250 (30%)</td>
<td>3750</td>
<td>+1500</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>1720 (23%)</td>
<td>750</td>
<td>-1250</td>
</tr>
<tr>
<td></td>
<td>7500 (100%)</td>
<td>5700</td>
<td>-1800</td>
</tr>
</tbody>
</table>

Note:
(1). Source: National Energy Agency (DEN)
(2). Source: ARDEMR Projection (2013)
NATIONAL GREENHOUSE GASSES EMISSION: FROM ENERGY SECTOR

Giga Ton

Source: Indonesia Second National Communication under the UNFCCC, November 2009
60 TERTIARY SEDIMENTARY BASINS IN INDONESIA

- **Production Basin**
- **Development Basin** (Drilled and Proven Discovery but not Production yet)
- **Exploration Basin** (Drilled Basin, no Discovery yet)
- **Not Developed Basin** (Frontier Basin)
Solution to increase purchasing price by **feed-in tariff** (FIT) method:

1. **New Regulation of** FIT:
   - Biomass Power Plant increase from Rp 656/kWh to Rp 1,325/kWh (multiply by factor).
   - Geothermal Power Plant maximum US$ 9.7 cent/kWh to US$ 10 – 18.5 cent/kWh.

2. **Other new FIT (under GOI assessment)**:
   - Mini/Micro Hydro Power Plant increase from Rp 656/kWh to Rp 975 – 1,050/kWh.
   - City Waste Power Plant increase from Rp 1,398/kWh to Rp 1,450 – 1,798/kWh.
   - Solar Power Plant around Rp 1,880 – 3,135/kWh.
   - Wind Power Plant around Rp 1,250 – 1,810/kWh.
INCENTIVES FOR RENEWABLE ENERGY DEVELOPMENT

Tax and Fiscal Incentives:

- Minister of Finance Regulation No 21/PMK.011/2010 on tax and customs facility for renewable energy:
  - Income tax: reduced net income for 30% of total investment, accelerated depreciation, imposition income tax on dividend paid to foreign taxable at 10%, and compensation for losses in certain circumstances
  - Value added tax exemptions for taxable goods, machinery and equipment for renewable energy utilization
  - Import duty exemptions for goods and machinery for development and capital investment
  - Tax borne by government.

- Minister of Finance Regulation No 130/PMK.011/2011 on provision of exemption facilities or income tax reduction for RE based industries
  - Exemption of corporate income tax for 5-10 tax year
  - Reduction of corporate income tax: 50% of income tax payable for 2 tax year.

- Biofuel subsidy: Rp 3000-3500/liter on top of fuel subsidies