### R&D Roadmap-Issues and Problems to be Solved before CCS Deployment



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LEMIGAS

**Republic of Indonesia** 

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## Structure of Presentation

- The Purpose of the R&D Roadmap
- R&D Milestone and Roadmap on CCS
- Main Issues & Challenges-Solutions
- Possible CCS Development in Indonesia
- Key Elements to Prompt Deployment of CCS
- What's Next?



## The purpose of the R&D roadmap

- To identify the knowledge gaps
- To address the challenges of technology integration and scale-up
- To set up R&D target achievement
- To provide a vision for addressing the current challenges



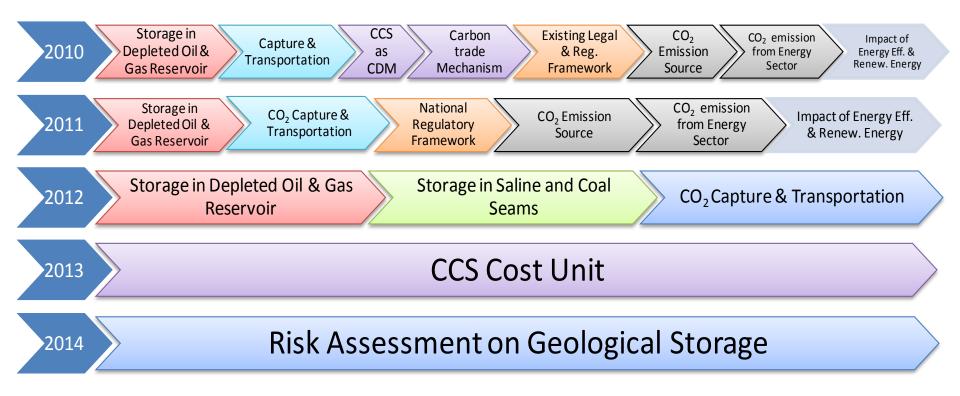
# CCS Development in Indonesia R&D Milestones on CCS

2006	2007	2008	2009
<ul> <li>CO<sub>2</sub> Sequestration on Geological Storage</li> </ul>	<ul> <li>CO<sub>2</sub> Sequestration on Saline Aquifer</li> </ul>	<ul> <li>Laboratory and Reservoir Simulation Study of co<sub>2</sub> Injection in Depleted Reservoir</li> </ul>	<ul> <li>Worksheet Screening CO<sub>2</sub> Sequestration Potential</li> </ul>



### **CCS** Development in Indonesia

#### R&D - Roadmap:





## Main Issues & Challenges-Solutions

Financing near-term demonstration projects and incentivizing longer-term commercialization

- Engaging energy company to invest in CCS projects
- Collaborating with international organization
- Establish incentives to accelerate commercialscale CCS deployment



## Main Issues & Challenges-Solutions

Establishing effective public regulatory schemes

- Review and adapt existing legal frameworks to regulate CCS demonstration
- Develop comprehensive CCS regulatory frameworks
- Address outstanding international legal issues, such as the development of international protocols for monitoring and verification of CO<sub>2</sub>



## Main Issues & Challenges-Solutions

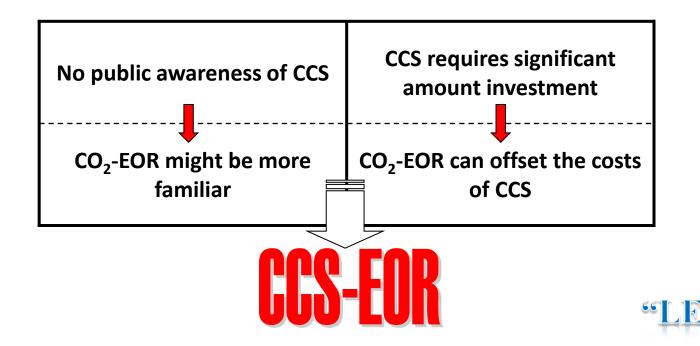
Engaging and educating the public adequately to incorporate their concerns into project designs

- Expand government activities on CCS public outreach and engagement
- Formalize international public engagement networks and create a public education and engagement toolkit

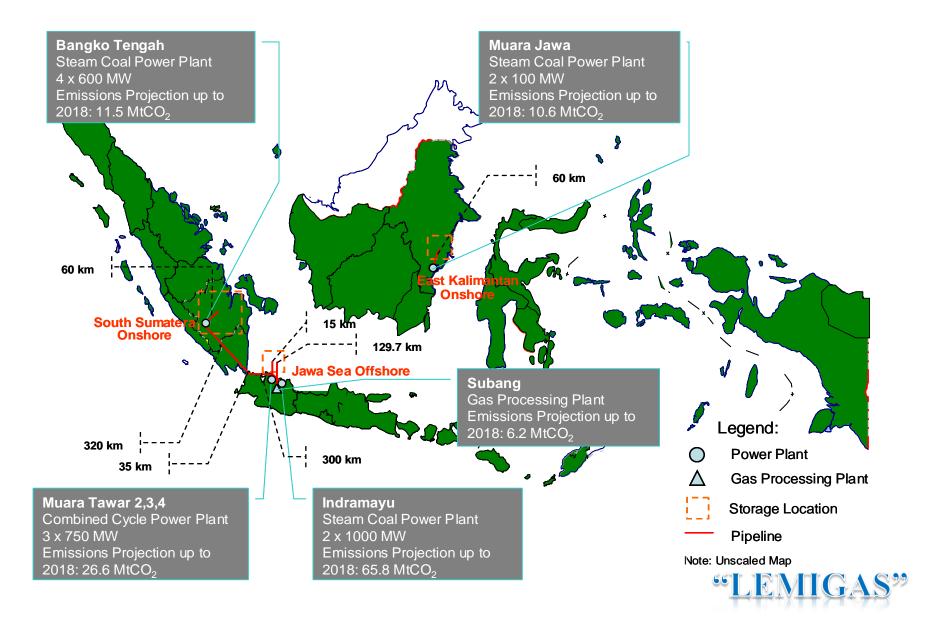


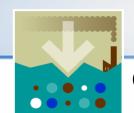
### Main Issues and Challenges on CO<sub>2</sub>-EOR

- Energy company is reluctant on investing money on EOR
- High risk-High Cost-Many Uncertainties
- Lack of attractive incentives from the government
- They prefer doing exploration to find new hydrocarbon fields.



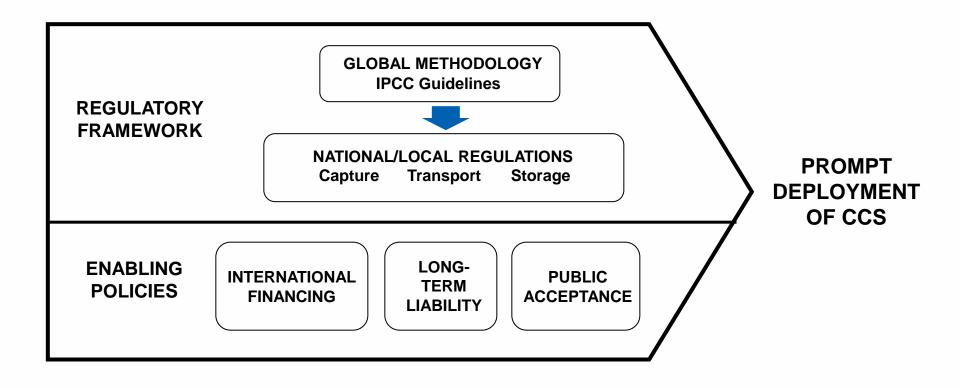
#### **Possible CCS Development in Indonesia**





#### **KEY ELEMENTS**

**CCS REGULATORY FRAMEWORK AND ENABLING POLICIES** 



## What's Next?

- Grow CCS collaborative efforts, particularly related to R&D
- Expand capacity-building efforts in CCS
- Create new CCS collaboration efforts for the most important industrial sectors
- Use international collaboration to speed up the learning process and information sharing that needs to occur
- Demonstration projects are needed in gathering evidence that CCS is safe and effective



### Thank You



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### **Relevant Oil and Gas Regulations with CCS**

#### Regulations

- Government Regulation No.35 year 2004 concerning upstream oil and gas activities
- Law No. 22 year 2001 regarding oil and gas
- Ministerial Decree No. 15 year 2008 concerning hydrocarbon transportation

#### **Characteristics**

- Reservoir management, best practice and environmental protection
- General environmental protection
- Standardization and specification of hydrocarbon pipelines
- Mostly only consider common/general environmental impact
- Oil and gas Laws/Regulations can barely be adapted to CCS activities at the moment

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### **Relevant Environmental Regulations with CCS**

#### Law No. 32 year 2009

- "The protection and management of the environment"
- Only emphasize on adverse impact of climate change and its mitigation and adaptation step
- Exclusion ecosystem damage of subsurface
- Not specify injection of CO<sub>2</sub> to the subsurface

#### Government Regulation No. 18/1999 and No.74/2001

- "Management of hazardous and toxic waste "
- Cover methods of storage, transport, permits and risk assessment, monitoring, liability and cost scheme, transboundary project, public awareness & etc.
- CO<sub>2</sub> is not classified yet as hazardous and toxic waste

#### Minister Regulation No.13 /2007

- "Requirements and procedures of waste water treatment for upstream oil and gas and geothermal activities using injection method into the subsurface"
  - Covers the whole subsurface elements (containment, migration, and etc.)
- Serve as a basis for developing further legal and regulatory frameworks

