CCS REGULATION IN GULF COOPERATION COUNCIL (GCC): CURRENT PROGRESS & FUTURE PERSPECTIVES

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AGENDA

- Overview of CCS in GCC
- Current CCS Regulation in GCC
 - Int'l CCS Regulation and Related Int'l Conventions
 - Domestic Regulation
- Summary Note on Current Progress
- Future Prospective
- Conclusion

GULF COOPERATION COUNCIL (GCC)

- 6 member states
 - Bahrain
 - Kuwait
 - Oman
 - Qatar
 - Saudi Arabia
 - United Arab Emirates
- Common features
 - Large hydrocarbon reserves
 - Harsh climate
 - Scarce water resource
 - Carbon intensive industrial production



An atlas of pollution: the world in carbon dioxide emissions



GCC ENERGY CONSUMPTION GROWTH

energy consumption (BP) 10% 9% 8% 7% 6% 5% 4% 3% 2% 1% 0% China India OECD World GCC US Iran 1992-2001 2002-2011

Average yearly growth primary

GCC Primary Energy consumption; projections to 2020 (EIU)



CCUS IN GCC

- Potential Benefits
 - Enhance hydrocarbon production
 - Substitute gas for EOR
 - Reduce GHG emissions
 - Diversify economy
 - Sustain global use of hydrocarbon as clean source of energy
- Engagement already started
- Challenges
 - Technology
 - Regulation

CURRENT LARGE SCALE CCS PROJECTS IN GCC



Source: http://sequestration.mit.edu/tools/projects/map_projects.html (Updated Dec 6, 2013)

OTHER CCUS ACTIVITIES IN GCC

Bahrain	 Developed a CCS project that captures flue gases from an existing petrochemical plant for urea and methanol production.
Kuwait	 launched a carbon project which will capture more than 150,000 tons of CO₂ annually from Equate, a large petrochemicals company, for food and beverage production
Oman	- Currently focus primarily on research and development of feasible CCUS technology.
Qatar	 The Qatar Fuel Additives Company will install a CO₂ capture plant in its methanol production plant by 2014. Qatar Petroleum (QP) has jointed venture with Shell and some academic institutions in establishing the Qatar Carbonates and Carbon Storage Research Centre (QCCSRC).
Saudi Arabia	 Developing the world's largest CO₂ purification and liquefaction plant in Jubail. The plant will bring 1,500 metric tons per day of raw CO2 coming from two ethylene glycol plants to three SABIC-affiliated companies for enhanced methanol and urea production. In the process of developing several similar CCS projects, including some pilot projects on CO₂ for EOR.
UAE	 Identified CCS as a key national GHG mitigation measure in its UNFCCC communications. Developing, through Masdar, a CCS network bringing CO2 from emitters to the Abu Dhabi National Oil Company (ADNOC) for enhanced oil recovery (EOR). Pilot project: 2 a year CO2-EOR project completed in November 2011 at an onshore field Hydrogen Power Abu Dhabi (HPAD): a commercial-scale hydrogen-fuelled power plant incorporating CCS by a Masdar/BP (60/40) joint venture, placed on hold in January 2011 due to issues associated with negotiating prices for the CO2 and electricity produced at the hydrogen plant with its two main customers: ADNOC and Abu Dhabi Water Electricity Authority (ADWEA). Dubai Integrated Energy Strategy 2030 calls for consideration of CCS-equipped coal power in the next ten years. Ras Al Khaimah announced feasibility studies for a CCS-equipped coal plant

CCS AS CDM PROJECTS

- Decision 10/CMP.7 (UNFCCC, 2012) adopts CCS as Clean Development Mechanism (CDM) project activities.
- Stricter regulation for CCS projects:
 - Life cycle includes capture, transportation, storage, closure, and post-closure
 - Provide remedial measures for seepage
 - Provide measures to address liability arrangements
 - Fulfill obligations on net reversal of storage
 - More thorough Environmental Impact Assessment (EIA) with frequent updates

INTERNATIONAL CCS REGULATION AND GCC

- As non-Annex I countries to host CCS projects, GCC countries have to:
 - Submit agreements to the UNFCCC on implementing CCS in their territories.
 - Pass CCS related laws and regulations:
 - Site selection criteria
 - CO2 ownership, rights of CCS activities, and access rights to infrastructure
 - Compensation and remediation measures
 - liability arrangements for permanent storage
 - Obligation to address a net reversal of storage
- Issues not yet settled:
 - CCS-EOR
 - Transboundary CCS

IEA CCS MODEL REGULATORY FRAMEWORK

- CO ₂ classification	The classification of CO_2 as hazardous, waste, pollutant, or commodity affects what regulatory system may apply to CCUS operations.
- Property rights	Ownerships of captured and stored CO ₂ , surface facility, subsurface pore spaces, intellectual property rights of CCUS technology, access to CCUS facilities for CCUS operators and third parties.
 Co-authorizations and preferential rights 	Interactions between CCUS regulation and the regulations on CCUS-related activities such as EOR.
- Transboundary CCS	Regulations that deal with (1) CO_2 capture and storage in different jurisdictions; (2) transit of CO_2 crosses a third country; (3) cross border storages; (4) unintended cross border CO_2 migration; and (5) cross-border secondary effects from storage activities.
- Incentives	Incentive to mobilize CCUS deployment as part of an integrated climate change mitigation policy.
 Environmental risk, health, and public engagement 	Incorporation of environmental, health, and safety regulation of CCUS operations and public engagement of CCUS deployment under existing regulations.

Reference: IEA (2010), "CCS Model Regulatory Framework"

IEA CCS MODEL REGULATORY FRAMEWORK (CONT'D)

- CO ₂ impurity	Regulation of CO ₂ stream from different sources for share use of transportation facility and better prediction of CO2 migration in storage.				
 CO₂ capture specific regulation 	Incorporation of CO_2 capture in industrial process, the permitting of capture facility, and the liability of damage				
CO₂ transportation specific regulation Regulations on the liability of leaking as well as pipeline re-use, routing, correction of right-of-way.					
- CO ₂ storage specific regulation	 Authorization of storage site exploration activities Regulating site selection and characterization activities Project inspections Monitoring, reporting, and verification requirements Corrective measures and remediation measures Liability during the project period Authorization for storage site closure Liability during the post-closure period Financial contributions to post-closure stewardship Regulation for CCS with EOR 				
- Knowledge transfer and data sharing	Exchange of knowledge on CCUS technology and regulation, as well as the sharing of geological and other data that are relevant to CCUS.				

KEY REGULATORY ISSUES FOR CCS IN GCC

· CCS-EOR

- Alignment with existing petroleum laws
- Interactions with existing oil and gas agreements
- Transboundary CCUS
 - Potential post-closure CO₂ migration
 - Uncertainty from unpublicized border agreements
- Institution
 - Economy dominated by public/semi-public entities, normally not explicitly regulated
 - Linkage with International carbon regulation requires domestic regulation

CCUS-RELATED INTERNATIONAL CONVENTIONS FOR GCC

International Convention	
- Kyoto Protocol	 Applies to estimating and reporting of emissions at the capture, transport and injection phases of CCS, with transboundary CCS included.
- London Convention	 Regulates offshore CO2 transport and deposit. Annex I amended in 2006 to permit offshore CCS. Article 6 was amended in 2009 to permit transboundary CO2. The 2009 amendment has not entered into force.
- Basel Convention	 Regulates international trade in hazardous and other waste. Amended in 1995 to ban exports of hazardous waste from OECD countries to non-OECD countries for final disposal. The 1995 amendment has not entered into force.
- UNCLOS	 Governs world's ocean and marine environment, including the seabed and subsoil. Limits the ability to explore for sub-seabed geological storage sites and prohibits the injection and permanent storage of CO2 in international waters.
- MARPOL	 Regulates the pollution by ships Transboundary CO2 shipment of CO2 in gas cylinders or in liquefied form may be subject to regulation.
Regional Convention	
- GCC Custom Union	 Enables free movement of goods among GCC states without customs
- Kuwait Convention	 Regulates common marine environment of GCC + Iran and Iraq Does not explicitly prohibits dumping of waste in the seabed and subsoil Parties are to ensure effective compliance with relevant international rules

Convention	Bahrain	Kuwait	Oman	Qatar	KSA	UAE
International Convention						
Kyoto Protocol	x	x	x	x	x	x
	2006	2005	2005	2005	2005	2005
2009 Amended London Convention						
Basel Convention	x	x	x	x	x	x
	1992	1993	1995	1996	1990	1992
UNCLOS	x	x	x	x	x	x
	1985	1986	1989	2002	1996	1993
MARPOL	x Annex I/II & V	x Annex I - VI	x Annex I - V	x Annex I - V	x Annex I - VI	x Annex I - V
Regional Convention					•	
GCC Custom Union	x	x	x	x	x	x
	2003	2003	2003	2003	2003	2003
Kuwait Convention	X	X	X	X	X	X
	1978	1978	1978	1978	1978	1978

MARPOL:

Annex I: Prevention of pollution by oil

Annex II: Control of pollution by noxious liquid substances

Annex III: Prevention of pollution by harmful substances in packaged form

Annex IV: Prevention of pollution by sewage from ships

Annex V: Prevention of pollution by garbage from ships

Annex VI: Prevention of air pollution from ships

INT'L REGULATION & COOPERATION

- Int'l/regional conventions will be amendment to accommodate int'l CCS regulation.
- Regional cooperation is more sensitive and may hinder transboundary CCUS.

	Year launched	Gas source	Importing countries	Reason for failure	Source
GCC gas grid	1988	Qatar	KSA, Kuwait, Bahrain, UAE	Political and territorial disputes	Dargin, 2008
Crescent Petroleum pipeline	2001	Iran	UAE (Sharjah)	Pricing disagreement. Contract nullified by Iran after pipeline built	Jafar, 2012; Carlisle, 2010; Adibi and Fesheraki, 2011
Peace Pipeline	1995	Qatar	Israel	Approval depended on peace settlement between Israel and Palestinians	Dargin, 2008
GCC pipeline to Pakistan and India	1995 and 2000	Qatar	Pakistan, India, via Oman	Pricing disagreement, competing pipeline proposals	Jafar, 2012; and Dargin, 2008
Dolphin Pipeline extension to Kuwait	2005	Qatar	Kuwait	Saudi refusal to grant access to territorial waters	Dargin, 2008

Table: Failed gas pipeline projects in the Gulf region

Reference: Krane J. (2013)

DOMESTIC REGULATION

\cdot Review

- CCUS specific regulation (if any)
- CCUS related regulation
 - CO₂ classification
 - Environmental impact assessment
 - Property rights regulation
 - Incentives for climate change mitigation

Source of Data

- National Communication to the UNFCCC: CCUS specific regulation; incentives
- National Environmental Law: EIA and CO₂ classification
- National Petroleum Law & Land Use Law: property rights regulation
- Ongoing CCUS activities: Incentives

PRESENT DOMESTIC REGULATION

- No GCC country has CCUS specific regulation
- <u>No</u> GCC country has regulation on CO_2 specification
- Environmental Impact Assessment:
 - Bahrain: Articles 20-22 of Decree No. 21, 1996
 - Kuwait: Bylaw No. 210, 2001
 - KSA: Article 5 of General Environmental Law 28 Rajab 1422 H, 2001
 - Oman: RD 63/85 & RD 71/89 of Royal Decree No. 114/01, 2001
 - Qatar: Law No. 30, 2002
 - UAE: Federal Law No. 24

PRESENT DOMESTIC REGULATION (CONT'D)

Property R	lights					
 Bahrain The National Oil and Gas Authority (NOGA) is the regulatory body for hydrocarbon production. Property rights are generally agreed on concession. No specific regulations in relation to the construction and operation of pipelines. No specific regulations for third party access to pipelines and other hydrocarbon infrastructure. Specific permission is required from NOGA for such access. 						
Kuwait	 The Kuwait Petroleum Company (KPC) owns and operates all oil and gas production facilities, transportation pipelines, storages, and associated infrastructure. No scope for private sector access to such pipelines and infrastructure. 					
Oman	 The Oil and Gas Law (amended of the Petroleum Law in 2011) regulates hydrocarbon production. Article 14 states no ownership for concessionaire. Article 29 specifies pipelines as well as pipeline corridors as public utility projects. Article 30 restricts pipelines for oil and gas use. 					
Qatar	 Qatar Petroleum (QP) operates and owns all oil and gas production related facilities. No mechanism to grant third party access to pipelines. 					
Saudi Arabia	 Saudi Aramco has the sole concession to develop the kingdom's hydrocarbon Subcontract services may be granted by Saudi Aramco to foreign companies. 					
UAE	 No explicit petroleum law in Abu Dhabi. Oil and gas issue is handled by Supreme Petroleum Council, and executed by the Abu Dhabi National Oil Company (ADNOC). The ownership, organization and regulation of oil and gas transmission and distribution infrastructure are overseen at individual emirate level. No explicit regulation that permits third party access to pipelines and other infrastructure. Parties are free to negotiate the terms on which the oil or gas is to be transported, including fees charged for accessing the distribution network. Third-party access rights or rights to expand capacity may be granted as a matter of contract. 					

PRESENT DOMESTIC REGULATION (CONT'D)

CCS Incer	ntives
Bahrain	- Plan to develop investment institutions for low carbon initiatives.
	- Interested in fee based mechanism (i.e. utility subsidy reduction) but carbon price is not on the agenda.
	- Initiated CO ₂ capture demonstration projects with public funding.
Kuwait	- Focused on district cooling, green building, fuel switching, development of solar and wind power (Kuwait
	Environmental Public Authority, 2012).
	- No plan to introduce market deregulation or tax based options to reduce CO ₂ emissions.
	- Initiated CO ₂ capture projects for demonstration with public funding.
Oman	- In the process of identifying the country's greenhouse gas mitigation strategies.
Qatar	- Plan to focus on reducing non-productive combustion emissions from the oil and gas sector, as well as
	improving energy efficiency in the water and electricity sector.
	- No plan to introduce market deregulation or tax based options to reduce CO ₂ emissions.
	- Initiated CO2 capture projects for demonstration with public funding.
Saudi	- Intent to deploy CCUS as one of its key measures in mitigating greenhouse emissions.
Arabia	- No plan to introduce market deregulation or tax based options to reduce CO ₂ emissions.
	- Development of a carbon price is not on the policy agenda.
	- Initiated CO ₂ -EOR projects for demonstration with public funding.
UAE	- Identified alternative energy, energy efficiency, and CO2-EOR as key working areas for GHG mitigation.
	- Initiated CO ₂ -EOR projects for demonstration with public funding.

REGULATORY GAPS (X: MAJOR GAP; -: MINOR GAP; BLANK: NO GAP)

Regulatory domain	Bahrain	Kuwait	Oman	Qatar	KSA	UAE
CO ₂ classification	X	X	X	x	X	x
Ownership of surface facility	-	X		x	X	-
Transboundary CO ₂	x	X	x	X	X	X
Environmental Impact Assessment						
CO ₂ impurity	X	X	X	X	X	x
CO ₂ capture regulation	-	X		X	X	-
CO ₂ transportation regulation	-	X		X	X	-
CO ₂ storage regulation*	X	X	X	X	X	X
Liability during the post-closure period	x	x	x	x	x	x
Regulation for CCS with EOR	X	X	X	X	X	X
Incentives	-	-	X	-	-	-

Note: CO₂ storage regulation include regulating site selection and characterization activities; project inspections; monitoring, reporting, and verification requirements; Corrective measures and remediation measures; authorization for storage site closure; liability during the project period; Financial contributions to post-closure stewardship

SUMMARY OF CURRENT PROGRESS

- CCUS Regulation Status:
 - All GCC countries ratified Int'I CCS regulation (As ANNEX II) and related int'I & regional conventions
 - No domestic CCUS regulation is implemented
 - Environmental regulations related to CO2 capture and transportation are covered by existing regulations
 - New regulation for permanent storage needs to be developed to align CCUS with the Clean Development Mechanism (CDM)
- The integration of CCUS and oil/gas regulation can be challenging due to:
 - Lack of explicit oil and gas regulation for highly nationalized industries
 - Potential transboundary CO₂-EOR
- Effective incentive mechanisms can be explored with early stage pilot projects
- Regional collaboration of CCUS may start from capacity development and knowledge sharing.

FUTURE PERSPECTIVES

- Questions:
 - Will GCC be interested in aligning CCUS with CDM in GCC?
 - How may transboundary CCUS regulation integrate with oil & gas agreements?
- Observation:
 - Most GCC countries see CCS as an opportunity.
 - Working on R&D and pilot projects as the preparatory step.
 - Strong external incentive is needed to link CCS with CDM.
 - Otherwise most CO₂ captured will likely go for EOR.
- Factors to monitor:
 - Domestic energy consumption and subsidy.
 - International carbon price.
 - Oil and gas nationalization.

- Opportunities
 - Enhance hydrocarbon production
 - Substitute gas for EOR
 - Reduce GHG emissions
 - Diversify economy
 - Sustain global use of hydrocarbon as clean energy source

POLICY PRIORITY IN GCC



Economic Development

Energy and Climate Policy

Renewable (RE): Int'l Regulation CCS: domestic for EOR? Carbon reduction accounting? RE vs CCUS Policy? CCUS vs Energy Subsidy policy?

United Arab Emirates natural gas imports and exports, 2003-2012

billion cubic feet



Source: U.S. Energy Information Administration, International Energy Statistics

ENERGY-CCUS NEXUS OF EMIRATES STEEL INDUSTRY (ESI)



MAPPING OF MAJOR CO₂ SOURCES & POTENTIAL STORAGE/EOR SITES (UAE)



CONCLUSION

- CCUS regulation is limited developed in GCC countries.
 - Little Incentive for permanent storage.
 - Link with EOR \rightarrow Lack of Oil and Gas law.
- GCC may opt for CO_2 EOR to reduce carbon emissions
 - Economic incentive exits.
 - Accountability of CO₂ reduction is questionable.
- A holistic view on the effects of RE and CCS/CCUS on GCC security and economy is needed to identify the development path of CCS/CCUS in GCC.
 - Data collection and research collaboration is needed.
 - Stakeholder engagement is crucial.

Thank You