Perspective from Emirates Steel Project/UAE

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ABU DHABI CCUS: VALUE DRIVERS

Strategic Gas Demand & EOR

Environmental

Commitment to Abu Dhabi 30% Clean Energy

CCS Global & Regional Leadership

This CCUS Project Will enable future CCS Projects

ADNOC

Gas Liberation and Enhanced Oil Recovery (EOR)

AD Government

CCS Projects

CO₂ injection for EOR

Increased oil Recovery + Domestic gas availability

Regulatory Framework

CO₂ capture and transportation projects at $/MT
Al Reyadah, a Joint Venture between Masdar (49%) and ADNOC (51%)

- The result of years of on-going collaboration between Masdar and ADNOC sparked by the inspiring vision of Abu Dhabi’s leadership

- Al Reyadah is a pioneering initiative and a knowledge hub for Abu Dhabi and the region in CCS technology, and a working platform for future CCS projects
ESI CCUS PROJECT TECHNICAL OVERVIEW

CO₂ Source (from ESI Steel Facility)

CO₂ Compression & Dehydration

CO₂ Transportation

CO₂ Injection in Rumaitha & Bab fields
• CO₂ is generated through the Process of Direct Reduced Iron (DRI)
  – Methane Gas is reformed to a H₂ & CO Syn Gas
  – Iron Ore (Fe₂O₃) is reduced to Iron (Fe) in reactors – producing CO₂ and H₂O waste
  – CO₂ is removed via a traditional MEA Amine Absorption System
  – CO₂ rich waste stream (>99% dry) is available for the CCS Project
ESI Direct Reduced Iron (DRI) Process

- Fuel → Reformer → Reducing Gas
- Iron Oxide → Reactor
- Gas → Recycle
- CO₂ separation
- CO₂ released to atmosphere
- Redirect CO₂ for Utilization

- DRI
- CO₂ Treatment & Compression
- Transport to Oil Wells
- CCS Facility & Pipeline
- EOR
• Sized for 800,000 TPA CO₂ (98% min purity) = 41.5 MMSCFD
• LP Compression:
  – Integrally geared 6 Stage Centrifugal Compressor (0 – 41barg)
• Mol Sieve dehydration system
  – Reduce water content to 20lb/MMSCF
• HP Compression:
  – Reciprocating 2 Stage Compressor (35 – 238barg)
• Custody Mass Transfer Meter
  – Coriolis Meter complete with Gas Chromatograph and Multiple Moisture Analysers
• Utilities:
  – Electrical Substation transformers/switchgear for 25MW
  – Control Room & Maintenance Warehouse
  – Air system
CO₂ COMPRESSION FACILITY - LOCATION
CO$_2$ TRANSMISSION PIPELINE - LOCATION
CO₂ as an EOR agent has been endorsed:
  - Success of the ESI CCS Project and Rumaitha / Bab Injection are key to future development.
CO₂ capture linked to ADNOC field demand and performance;
Whilst preliminary, the EAA CCS Value Proposition study forecast a growing CO₂ demand in the next 25-30 years, based on ADNOC estimations.
Two new CCUS projects have been identified and currently in the FEED phase.
Future potential for clean coal!
Thank you

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• Pipeline:
  – 8” X65 API5L carbon steel buried pipeline designed for 245 barg
  – 2 Block Valve Stations
  – Remote isolation and maintenance blowdown facilities
  – Launching / Receiving facilities for Pipeline Scrapper
  – Telecoms, SCADA, CCTV and Leak Detection running over buried fiber optics

• Rumaitha Metering Station:
  – Custody Mass Transfer Meter (Coriolis Meter), complete with Gas Chromatograph and Moisture Analyser
  – CO$_2$ transferred to ADCO in Rumaitha