



World Bank activities in CCS



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The World Bank CCS Trust Fund

- World Bank CCS Trust Fund (CCS TF) was established in December 2009
- Main objectives are
 - To support strengthening capacity and knowledge building
 - To create opportunities for developing countries to explore CCS potential
 - To facilitate inclusion of CCS options into developing country low-carbon growth strategies and policies
- Supported by two CCS TF donors:
 - UK government
 - Norway government
- Total funds allocation to date of USD 55.8 million across two phases



The World Bank CCS Trust Fund

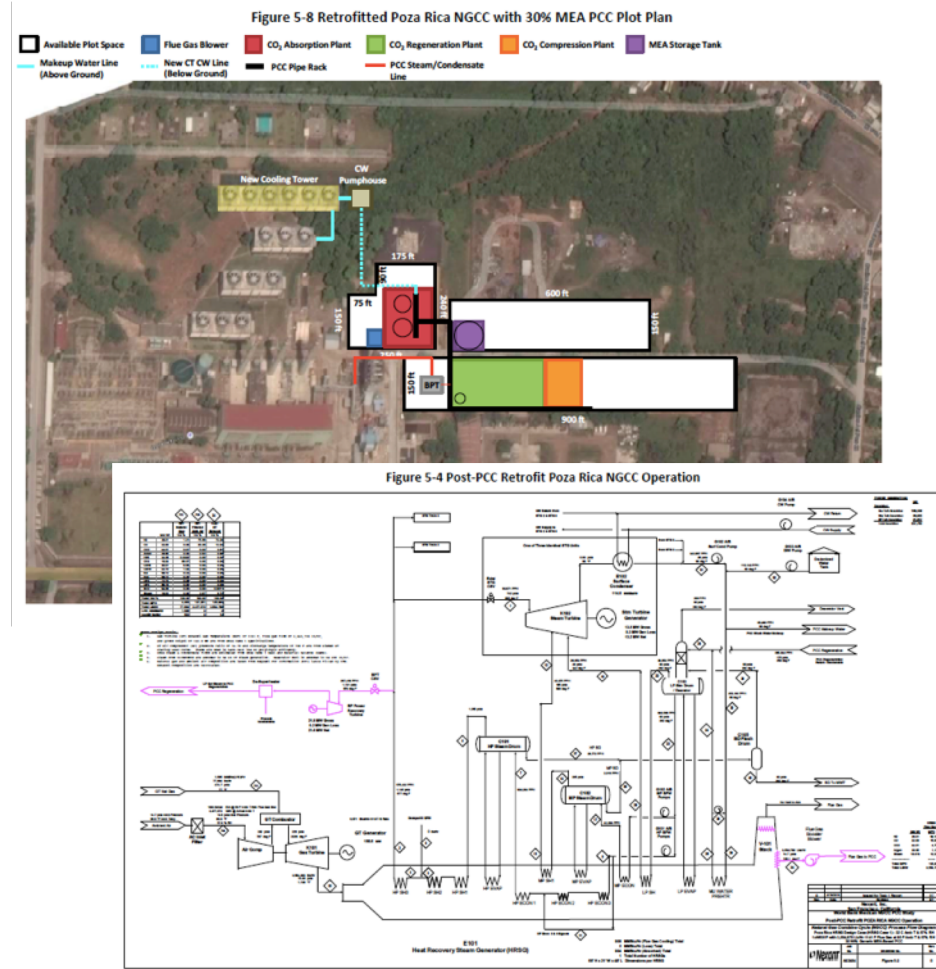
- Phase I CCS TF support
 - Allocated funds to date: USD 7.9 million
 - Nine countries/regions
 - Provided capacity building and undertook desk-top CCUS studies and analysis
- Phase II CCS TF support
 - Allocated funds to date: USD 47.9 million
 - Focussed on South Africa and Mexico
 - Provides support for four CCUS pilot projects - two capture, two storage
- CCS TF Economic and Sector Work
 - Decarbonizing Natural Gas Study

| Country/region | Allocation (USD) |
|----------------|------------------|
| Botswana | 1.4m |
| South Africa | 1.35m |
| China | 1.8m |
| Mexico | 1.3m |
| Indonesia | 0.85m |
| Kosovo | 0.4m |
| Egypt | 0.3m |
| Jordan | 0.15m |
| Maghreb | 0.4m |
| TOTAL | 7.9m |



Phase I World Bank Support for CCUS in Mexico

- Budget
 - USD 1.3 million
- Comprised five studies
 - A prefeasibility study for a capture pilot plant at a natural gas-fired power station
 - Assess the monitoring and regulatory requirements for converting EOR sites into permanent CO₂ storage sites
 - Undertake a study to establish a legal and regulatory framework for CCUS
 - Develop a public engagement strategy
 - Support capacity building where opportunities arise
- Completed in 2015



Source: Pre-Feasibility for Establishing a CCPP in Mexico, 2016

Phase II World Bank Support for CCUS in Mexico

- Led by INEEL and SENER
- Supported by
 - PEMEX, CFE, Mexican Centre for CCUS
- Total project budget
 - Mexican Hydrocarbon Fund: USD 12.5 million
 - CCS TF: USD 20.5 million
 - Bank-executed PTA: USD 5.5 million
 - Recipient-executed TAP: USD 15 million
- Two components
 - CO₂ Capture Pilot Project (CCPP)
 - CO₂ EOR & Storage Monitoring Project
- Current status
 - PTA implementation underway
 - TAP approval/effectiveness expected 2019



Mexican CO₂ Capture Pilot Project



- To be hosted by CFE in Poza Rica, Veracruz State
- Comprises
 - Post-combustion capture on a Natural Gas Combined Cycle power plant
 - ~2.4MWe (~20tCO₂ per day)
 - Generic, flexible design to allow testing of a range of advanced amine technologies
- World Bank support
 - Support on project preparation, construction and operation
 - USD 15 million (total project budget USD 27.5 million)



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Mexican CO₂ Storage & EOR Monitoring Pilot Project



- To be hosted by PEMEX at the Brillante Oil Facility, Veracruz State
- Comprises
 - A one-week CO₂ “huff-and-puff” test (~100tCO₂ per day); and, if successful
 - A two-month CO₂ injection test (~100tCO₂ per day)
- World Bank support
 - CO₂ storage and EOR injection and monitoring technical advice and support
 - USD 1 million (PTA)

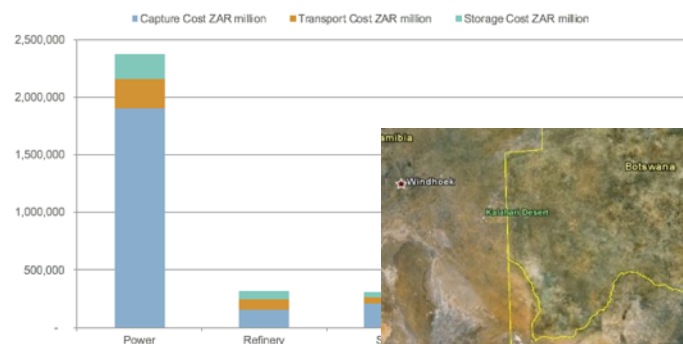


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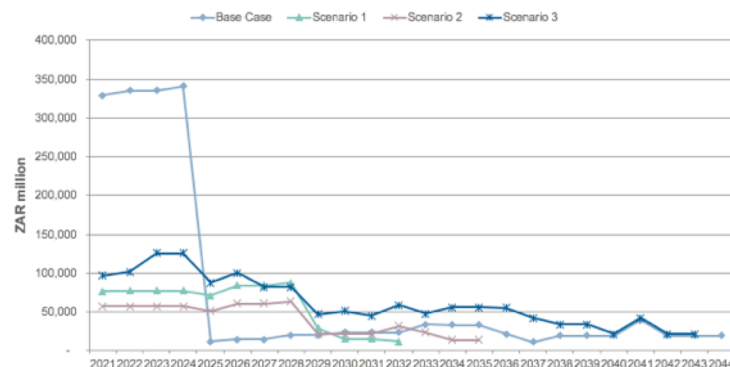
Phase I World Bank Support for CCS in South Africa

- Budget
 - USD 1.35 million
- Comprised four studies
 - Regulatory review to enable the implementation of the Pilot CO₂ Storage Project
 - Techno-economic assessment for deployment of CCS Technology in South Africa
 - Capacity Building for CCS in South Africa
 - National and Local Public Engagement Plan for the Pilot CO₂ Storage Project
- Completed in 2015

Consolidated CAPEX & OPEX by Sector - Base Case



Capital Investment Profile



Source: Techno-Economic Analysis of CCS in South Africa, 2013



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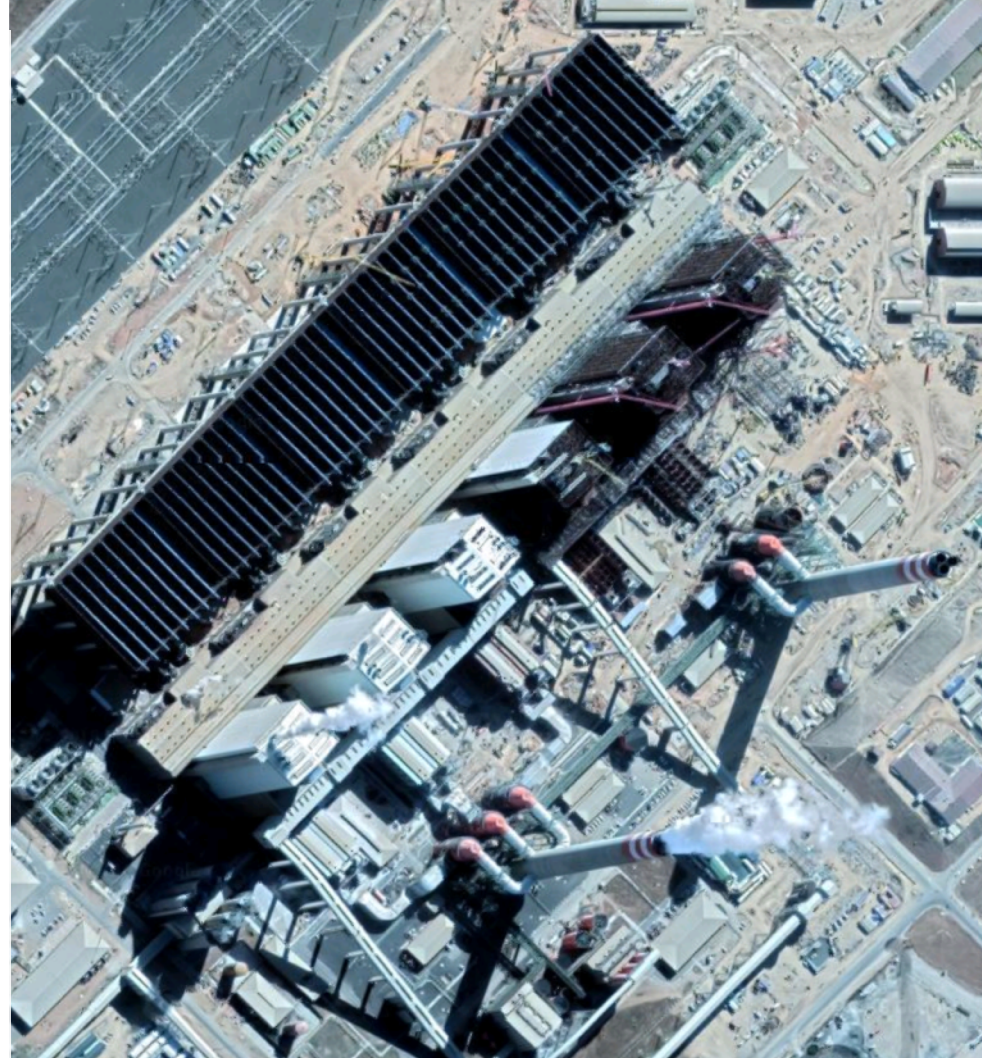
Phase II World Bank Support for CCS in South Africa

- Led by SANEDI
- Supported by
 - Department of Energy, Council for Geosciences, Eskom
- Total project budget
 - South African Department of Energy: USD 15 million
 - CCS TF: USD 27.4 million
 - Bank-executed PTA: USD 4.4 million
 - Recipient-executed TAP: USD 23 million
- Two components
 - CO₂ Capture Pilot Project (CCPP)
 - Pilot CO₂ Storage Project (PCSP)
- Current status
 - PTA and TAP implementation underway



South African CO₂ Capture Pilot Project

- Preparatory analysis to be based around an Eskom, Kusile coal-fired power station
- Comprises
 - A post-combustion capture pilot project, on a coal-fired power station
- World Bank support
 - Support for Technology Assessment and FEED
 - USD 2 million (total project budget yet to be determined)



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South African Pilot CO₂ Storage Project

- To be located in the northern KwaZulu-Natal province
- Preliminary technical support provided by Battelle Memorial Institute
- Comprises
 - 10,000 - 50,000 metric tons of CO₂
 - Saline aquifer storage
 - Commercially sourced industrial CO₂
 - Truck CO₂ transport
- World Bank Support
 - Support for project preparation, construction and operation
 - USD 21.5 million (total project budget USD 36.5 million)



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Decarbonizing Natural Gas study

- Analysis of the role of natural gas in deep, global CO₂ mitigation
- Study will look at the CO₂ mitigation potential of
 - Fuel switching from coal/oil to natural gas
 - CCS in the natural gas production industry
 - CCS in industry where natural gas is the feedstock (e.g. cement production, hydrogen production, steel production, gas-to-liquids production, etc)
 - CCS on natural gas-based hydrogen production (Blue Hydrogen)
 - CCS on natural gas-fired power generation
- The analysis will be supported by case-studies, both in developed and developing countries
- Study will include the development of a natural gas accounting methodology
- Being scoped and implemented in partnership with the ADB and IEA



World Bank Financing for CCUS

- World Bank has multiple mechanisms for potential CCUS funding support
- Grant funding
 - Facilitated through the World Bank CCS Trust Fund
 - Total funds allocation to date of USD 55.8 million
 - Recipients request CCUS project grant financing support
- Lending and guarantees
 - World Bank lending
 - Climate finance lending (in combination with World Bank lending)
 - World Bank guarantees
 - No CCUS lending or guarantees requested to date



World Bank Grant CCUS Activities

- World Bank Grant supported CCUS activities
 - CCUS policy analysis
 - CCUS techno-economic analysis
 - CCUS legal and regulatory analysis and support
 - CCUS stakeholder engagement analysis and support
 - CCUS capacity building
 - Analysis of CCUS financial mechanisms
 - Analysis of the role of EOR in national climate change strategies
 - Identification of potential "low-hanging fruit" CCUS projects
 - Support for CCUS pilot project planning and development
 - Recipient country specific CCUS proposals
- World Bank CCUS activities leverage
 - World Bank developing country CCUS experience, sector knowledge and project scoping and development experience
 - World Bank economic, energy and climate change expertise



World Bank Lending and Guarantees for CCUS

- The World Bank currently has no CCUS lending or guarantees activity
- Lending and guarantees initiated at the request of recipient countries
 - Recipients request CCUS project financing support
 - Must meet World Bank lending criteria especially with regard to environmental and social safeguard policies
 - Likely to require collaboration with climate finance to establish project economics e.g. GCF
- World Bank direction on CCUS guided by donor countries
 - World Bank priorities set by member countries (the WB Board)
 - Member country priorities communicated through a country's representative Executive Director





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