

CCS and CDM

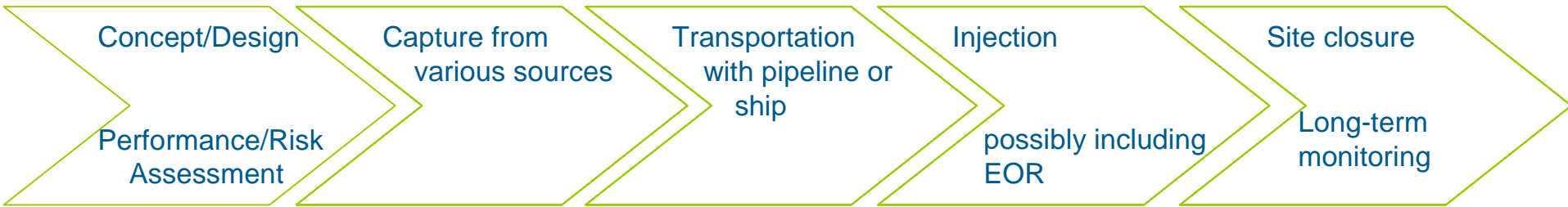


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DNV Along Your Value Chain

MANAGING RISK



Concept/Design

Performance/Risk Assessment

Capture from various sources

Transportation with pipeline or ship

Injection

possibly including EOR

Site closure

Long-term monitoring

Process simulation
 Fuel source evaluation
 Mapping the geosphere
 Mapping background emissions
 Source-sink matching
 Optimisation of CO₂ transport
 Reservoir simulation of plume movement
 CO₂ EHR recovery modelling
 Leakage/seepage simulation
 Well integrity analysis/remediation
 Storage site preparation
 FEED execution: plant, pipeline, field installations
 EPCI execution: plant, pipeline, field installations
 Environmental Licences and permits
 Stakeholder involvement
 GHG accounting
 Financial Analysis
 GHG Accounting

HSE management
 Plant operations

HSE management
 Compressor operations
 Pipeline operations
 Ship design and analysis
 Ship procurement
 Ship operations
 Cryogenic storage on land

HSE management
 Wellbore construction
 Injection operations
 Subsurface monitoring
 Surface monitoring
 Plume simulation
 History matching
 Remedial wellbore op.'s
 Reservoir recovery analysis
 O/G/W/ CO₂ separation op.'s
 Corrosion management

HSE management
 Plugging/abandonment
 Subsurface monitoring
 Surface monitoring
 Plume simulation
 History matching

What can the CDM do for CCS?

Methodology approval process

Project design document (PDD) by project developer

1. Approval of involved countries

3. Validation of PDD by Third Party

4. Review by CDM EB/Supervisory Body

2 and 6. Publication of PDD and monitoring report:
Invitation of comments from global stakeholders, individuals, NGOs

Project implementation and monitoring and reporting

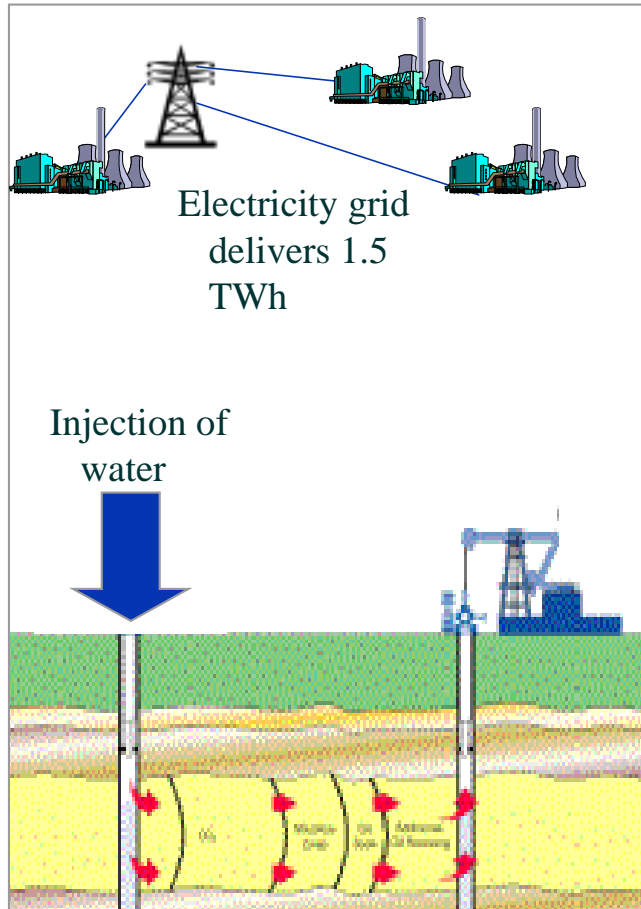
5. Verification by Third Party

7. Review by CDM EB/Supervisory Body

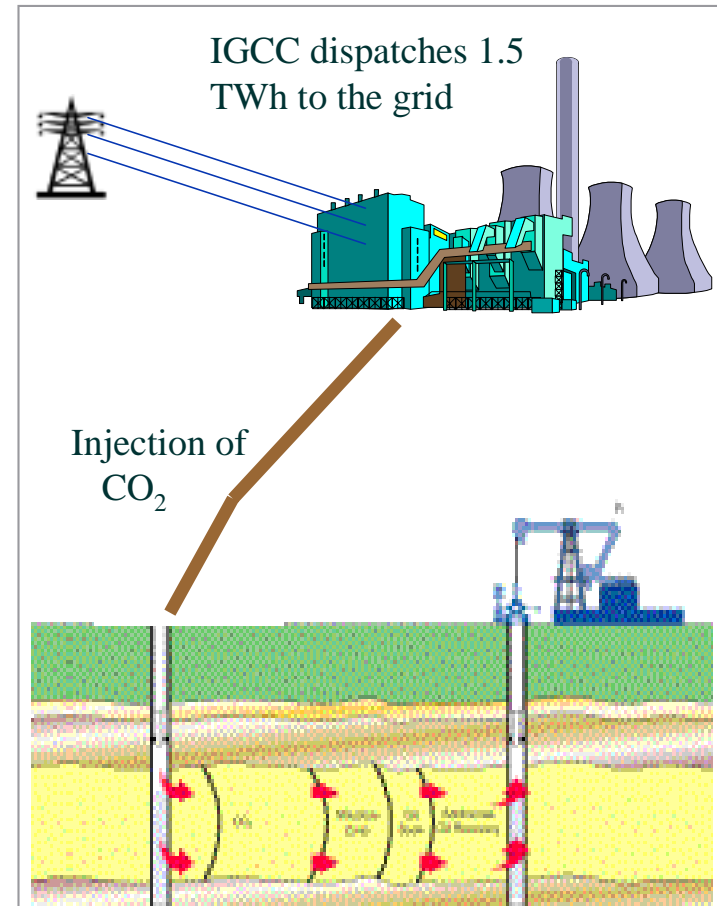
Issuance of Emission Reductions

- Applicability criteria: Bottom up approach. Can be a driver. Spill-over effects
- Baseline scenario
- Boundary and leakage
- Equations to calculate the baseline and project emissions
- Additionality
- Monitoring requirements

Baseline Scenario



Project Scenario



How to define the roles?



	Pre-injection phase	Injection phase	Closure	Post injection phase
COP				
EB				
DOE				
country				
IPCC				
IEA				

- How to assess storage site integrity
- How to define monitoring
- Liability
- Long-term integrity: a ton is a ton

example



	Source	Gas	Included?	Justification / Explanation
Baseline	Emissions from the electricity grid	CO ₂	Yes	Refer to IPCC default values and the already approved CDM methodologies on how to calculate electricity grid emissions.
		CH ₄	No	Negligible. This is conservative.
		N ₂ O	No	Negligible. This is conservative.
	Emissions from operating the water injection equipment	CO ₂	Yes	Refer to IPCC default values and the already approved CDM methodologies on how to calculate energy emissions from substations
		CH ₄	No	Negligible. This is conservative.
		N ₂ O		Negligible. This is conservative.

example



Project Activity	Emissions from the IGCC power plant	CO ₂	Yes	Refer to IPCC default values and the already approved CDM methodologies on how to calculate emissions from fossil-fuelled power plants.
		CH ₄	No	Negligible due to high combustion temperature
		N ₂ O	No	None if IGCC is oxygen fuelled.
	Emissions from the transportation of the CO ₂	CO ₂	Yes	Refer to IPCC default values and the already approved CDM methodologies on how to calculate emissions from fossil-fuelled compressors.
		CH ₄	No	Negligible
		N ₂ O	No	Negligible
	Fugitive emissions from pipeline leaks	CO ₂	Yes	Taken care of by the following equation: CO ₂ emissions from the IGCC plant minus CO ₂ emissions measured at the injection point.
	Fugitive emissions from the oil production well	CO ₂	Yes	Conservative emission rates need to be justified.

Example monitoring during injection phase



ID number	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic : e / paper : p)	For how long is archived data kept?	Comment
1. El	Electricity generated	MWh	M	Continuously	100%	Electronic	During the crediting period and two years after	Cross-checked with invoices to the grid operator
2. F	Fuel used in IGCC	T	M	Periodically	100%	Electronic	During the crediting period and two years after	Inventory records
3. Fs	Fuel used to run the compressors	T	M	Continuously/ Periodically	100%	Electronic	During the crediting period and two years after	Measured by a flow meter. Data to be aggregated monthly and yearly.
Etc.								