

# Carbon Capture and Storage: India's Concerns

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# Prospects

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- Economies of Scope – Oil /CBM production at low marginal costs due to enhanced and efficient recovery
- Potential of tapping learning costs and reducing unit/average costs
- Avoidance of Conventional Mitigation options
- Enable Continuing reliance on fossil fuels



# Disadvantages

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- Risks of leakages and collateral damage to storage media (geological formations, oceans, landfills etc )
- Non-accessibility to technologies on fair and equitable terms
- Increment in costs of energy production
- Non availability of finance on adequate and predictabler terms to absorb the above



# Learning Curve

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- The costs of CCS systems, currently an important obstacle to their widespread deployment, are expected to fall over time as the technology improves and as more experience is gained in commercial applications around the world.



# Incremental Cost of Carbon Capture Vs Economies of Scope in Sequestration

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- Overall, it is estimated that capturing, transporting and storing the CO<sub>2</sub> from a new gas- or coal-fired power plant would increase the cost of electricity generated by that plant by between 37% and 91%. This translates into a CO<sub>2</sub> mitigation cost of US\$30-91/tonne, making CCS a comparatively high-cost method for mitigating carbon emissions, at least for the time being.



# India's Policy Framework

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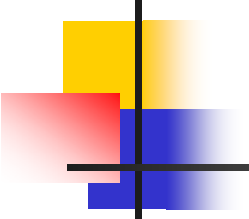
- National Action Plan on Climate Change
- National Mission for Enhanced Energy Efficiency
- Petroleum Sector



# National Action Plan on Climate Change

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- Mitigation strategies are presaged on national growth objectives which will be through qualitative change in the direction that enhances ecological sustainability
- Deploying appropriate technologies for both adaptation and mitigation of GHG emissions extensively
- Energy Efficiency



# India's National Mission on Enhanced Energy Efficiency set up under NAP on Climate Change

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- Facilitating Private investment
- Perform, Achieve and Trade Plan – 9 industrial sectors ( Al, Paper, cement, Chlor-alkali, Fertilizers, Power generation, steel , railway)
- Lack of EE projects using CDM to overcome high first cost bias
- Tie up Partial Risk Guarantee Fund – overcome credit risk and transaction structuring barriers to EE finance



# India's Energy Financial Mechanism

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- PRGF will be first loss, subordinated recovery guarantee and will be placed in a guarantee reserve account and will be paid to participating banks in the event of a loss or default
- This means that the banks will pursue recovery procedures in the event of default and will pay PRGF any monies recovered after first satisfying its own receivables
- The amount paid out will be equal to the amount of outstanding principal times the guarantee % and will not cover accrued interest or other fees owed to the bank
- Guarantee % - 50%: Max Guarantee term 5 years; Maximum single transaction guarantee limit :to be decided by PFFE Committee: Guarantee fee pricing: one time upfront fee based on guarantee liability – range 0.5 to 1%
- Recovery – PGFE subordinate to lending bank

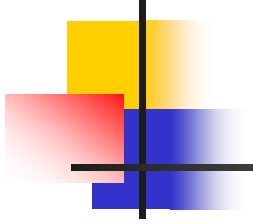


# India Hydrocarbon Vision 2025\*

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- Optimize production of crude oil and natural gas in the most efficient way
- Tap unconventional sources of natural gas like Coal Bed Methane

\* Ministry of Petroleum and Natural Gas,  
GOI



# India's Concerns



# Basic Concerns

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- Risks of technology failure and collateral damage
- Risks of leakages in long run – particularly in short term CDM projects in the after project phase
- Pinpointing Liability of source insofar as leakage is concerned
- Monitoring requirements (CDM – Methodology Panel)
- Uncertainty of Technology Performance and economic efficiency – still on learning curve
- Technology transfer – IPR issues
- Is it fully compatible with FCCC sink definitions?
- Uncertain links with CDM
- Boundary Issues
- Non availability of effective guidance and regulatory tools – national and global



# Risks

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- Leakages
- Collateral (Ecosystem) Damage – oceans, geological formation
- Technology failure and non-availability of tested and performing technologies of capture and storage on affordable terms

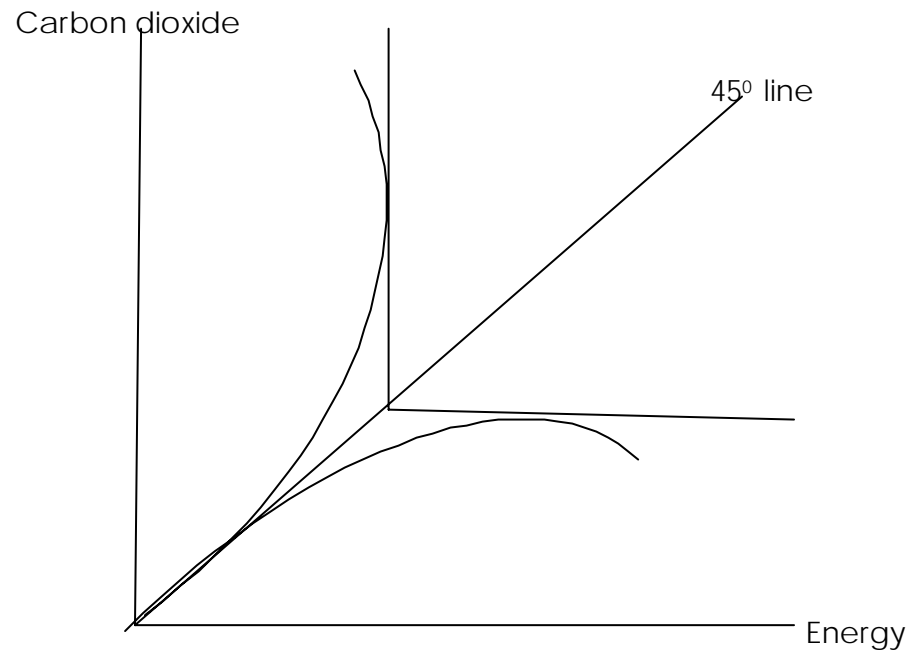


## Will there be a Low cost source in a high Energy Efficiency Policy Regime?

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- **The IPCC report suggests that carbon capture and storage can be “economically feasible under specific conditions.” This may be the case, for example, if CO<sub>2</sub> is captured from low-cost sources, such as gas processing or ammonia plants, and used towards a productive end, such as enhancing oil recovery at a nearby oil field.**
- **High CO<sub>2</sub> flue gas concentration enhances efficiency of capture and enables low unit costs, ceteris paribus – EE by reducing concentration should raise unit costs**
- **Who else (other than GEF) will absorb incremental cash flows in capture**

# The Trade off Problem





# Incremental Cost of Carbon Capture: Won't it have a Bearing on Power Costs?

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- The IPCC report shows that approximately 90% of total CCS costs relate to the capture of CO<sub>2</sub>, a process that requires additional energy: about 10-40% more in the case of new coal- or gas-fired power plants that incorporate carbon capture technology, and considerably more in the case of older power plants that are retrofitted to capture CO<sub>2</sub>.



# Transport and Storage: Do we have an Option Here?

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- The costs of transport and storage are less onerous in comparison, and can be minimized by achieving economies of scale and/or by siting emitting plants close to potential storage sites such as oil and gas reservoirs.



# Economic and Financial Concerns

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- **Risks of Leakages and collateral damages from Capture, Transport and Storage**
- **We are concerned about stability of deliveries of CO<sub>2</sub> to storage units in the absence of long term delivery contracts – and lack of transit contracts - risk of non delivery**
- **We are concerned about financing of technologies of capture and storage – capital subsidy scale**
- **Incentives not there by way of transfer payment of capture services**
- **Large scale capital subsidy availability**
- **Development finance to go with hedging finance in one window**



## Economic and Financial Concerns

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- Costs depend on level of concentration of CO<sub>2</sub> in flue gas and availability of heat nearby as energy costs are high
- Incremental costs on electricity generation \$ 2.4 to \$ 3.3/kwh



# CER Markets

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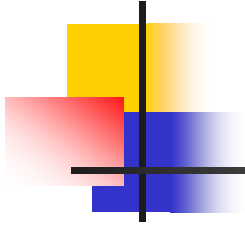
- Linkage to CER markets uncertain
- Either way when carbon prices are low, CCS technologies do not kick in (models show unless \$45 – 60/Mt of CO<sub>2</sub> , CCS cannot take roots)
- Given the trends in carbon prices this does not look like happening
- Natural Gas prices and CCS are inversely related – we will have to wait for the former to rise for the latter to come in



# What we need to do

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- Risk assessment – long term leakage and collateral damage
- Test and Demonstration Projects for ascertaining technological reliability, cost efficiency
- Formulation of guidelines for monitoring and evaluation of CCS projects under CDM
- Working out financing systems to enable all the above and also helps capture economies of scope



**Thank You**