CLEAN DEVELOPMENT MECHANISM

(CDM)

The Initiatives

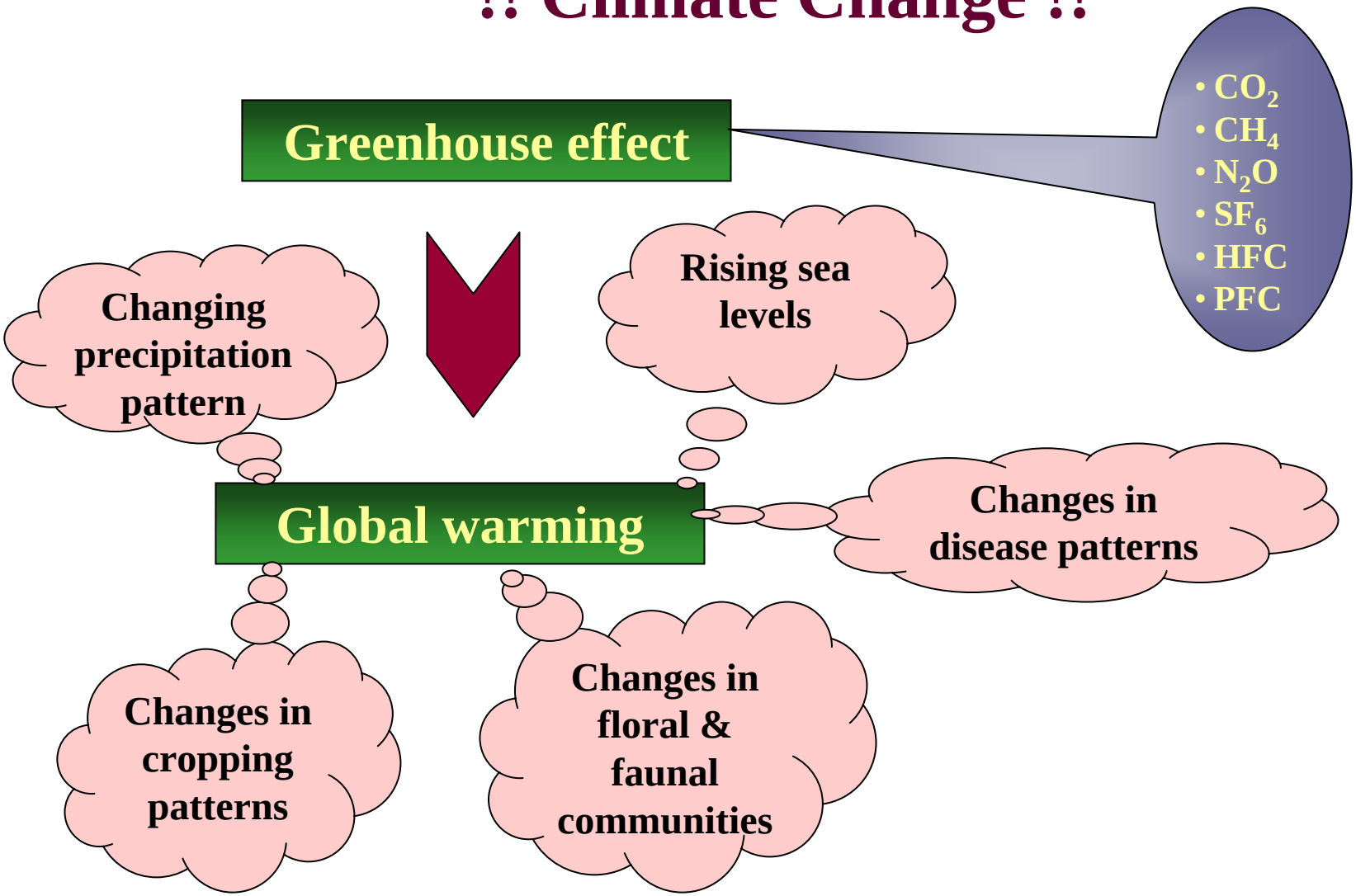
by

Indian Oil Corporation Limited

13 th November, 2009

FACTS ABOUT GLOBAL WARMING

!! Climate Change !!

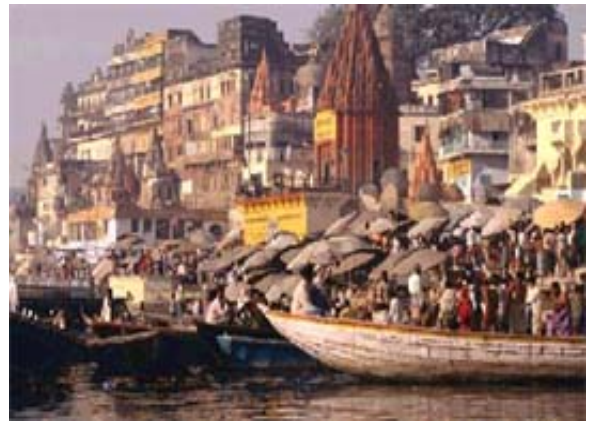


Six main GHGs & its global warming potential

Carbon Di-oxide and Methane are relevant to Oil & Gas industry

	Name	Formula	CO2 equivalent
1	**Carbon dioxide**	**CO2**	**1**
2	**Methane**	**CH4**	**21**
3	**Nitrous Oxide**	**N2O**	**310**
4	**Per Fluorocarbon**	**PFCs**	**9200**
5	**Hydro fluorocarbons**	**HFCs**	**11700**
6	**Sulphur Hexafloride**	**SF6**	**23900**

World Population(2008) : 6,056,528,577



The Challenge: Sustainable management of an ever changing planet

Human activity: Average per capita CO2 emission in the globe is 4.0 MT per annum (US- 11.0 MT & India- 1.2 MT) which gets multiplied with population growth.

Some important developments on Climate Change

- The recent discussions in Bangkok on climate change came to a standstill as the developed Annex – I countries were not ready to commit to emission reduction targets for the second phase of the Kyoto Protocol starting in Dec,2012.
- The US senate is debating on a draft Bill that would legislate domestic action on climate change, the Clean Energy Jobs and American Power Act , know as Kerry-Boxer and Waxman-Marking bill. The bill would legislate:
  - A cap and trade programe for US industries
  - Standards targeting specific sectors
  - Programs to encourage reduction in developing countries.
- It was clear in the Bangkok meet that US climate legislation would not be ready in time for Copenhagen Meet in December,2009.

KYOTO PROTOCOL

GENESIS OF KYOTO

- The United Nations Framework convention of Climate Change (UNFCCC) was adopted in 1992.

- The UNFCCC provides a framework to stabilize greenhouse gases at a level that would prevent “dangerous anthropogenic (human induced) interference with the climate system”.

- The framework convention recognized developed countries as the source of past and current greenhouse gas emissions, and made them responsible to cut their greenhouse gas emissions.

GENESIS OF KYOTO

- In 1997, parties to the convention agreed to a Protocol to the UNFCCC in Kyoto, Japan. The Kyoto Protocol commits industrialized nations (known as Annex-I under the treaty) to emission reduction targets.

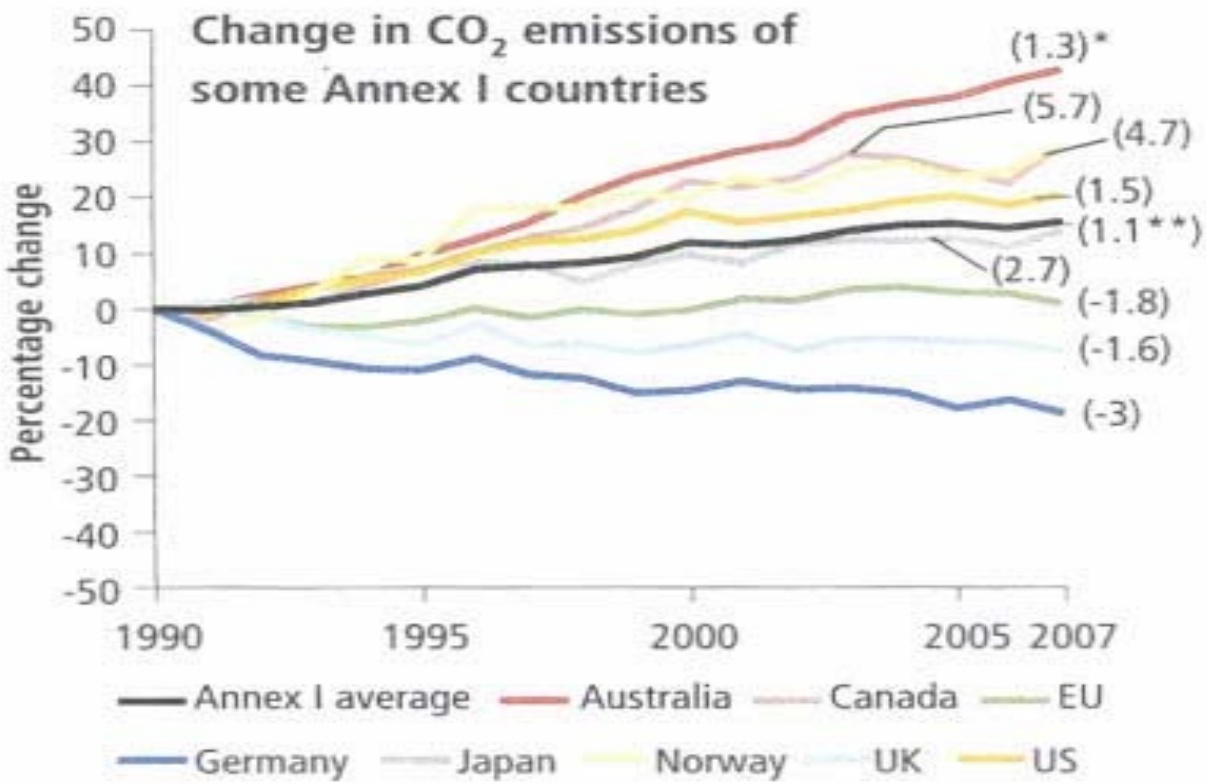
- These countries agreed to reduce their overall emissions by 5.2% below 1990 levels in the first commitment period of 2008-2012.

- Specific targets varied from country to country, ranging from -8% for the EU collectively to +10% for Iceland. The Kyoto Protocol came into force in February, 2005. 141 countries signed the protocol initially now it is 190.
- CDM was born. Article 12 of Kyoto Protocol provides for the Clean Development Mechanism (CDM).

- Negotiations are on for the reduction targets of Annex I countries in the second commitment period.

- The Bali Action Plan, adopted in Bali in December, 2007, set a deadline for the conclusion of negotiations at Copenhagen in December, 2009.

CO2 emissions since 1990



Based on UNFCCC data; * Figures in bracket show emission increase in 2006-2007; ** Annex I average excludes economies in transition

CLEAN DEVELOPMENT MECHANISM (CDM)

CDM PROCESS

- Article 12 of the Kyoto Protocol provides for the Clean Development Mechanism (CDM) to combat climate change in the globe.

- CDM is a process where developing country as non Annex-I party is eligible to host CDM projects and generate Certified Emission Reduction (CER) for trading with Annex-I countries.

- CDM is anticipated to catalyze investments and technology transfer to developing counties who do not have GHG reduction commitments under the Kyoto Protocol but have opportunities to promise sustainable development.

Sectors for CDM Projects

1 – **Energy Industries (renewable and non-renewable)**

2 – Energy Distribution

3 – Energy Demand

4 – Manufacturing Industries

5 – Chemical Industries

6 – Construction

7 – Transport

8 – Mining/ Mineral Production

9 – Metal Production

10 – Fugitive emissions from fuels (solid, liquid and gas)

11 – Fugitive emissions from production and consumption of HFCs and SF6

12 – Solvent Use

13 – Waste Handling and Disposal

14 – Afforestation and reforestation

15 - Agriculture

Potential CDM Sectors

- **Renewable Energy (Biomass, Hydro, Wind, Solar)**
- **Specific GHG Related Sector (HFC, Cement, Nitric Acid)**
- **Energy Efficiency (Industry)**
- **Power Sector (Fuel Switch, Energy Efficiency)**
- **Transport**
- **Water Management**
- **Agriculture**
- **Afforestation & reforestation**

Types of CDM Projects

Afforestation and Reforestation projects:

- **Projects where barren/ non-usable lands have been converted to forested areas without changing a productive land-use category.**
- **Projects that are legally mandatory are not eligible.**

Small-scale projects:

- **Renewable energy based projects with installed capacity up to 15 MW.**
- **Energy efficiency projects with annual savings of 60 $GWh_{electrical}$ or 180 $GWh_{thermal}$.**
- **Other projects with annual emission reductions up to 60,000 tCO_2, including recovery of methane from wastewater treatment facilities.**

Large-scale projects:

- **All other projects that do not fit the above two criteria should be under this category, and includes power/ energy savings, flare gas recovery, waste material utilization, process/ material changes, etc., that will directly or indirectly be linked to reduction of GHG emissions.**

CDM Eligibility Requirements

1. **CDM revenue has been considered at the time of taking decision/ approval for a project. Start date could be inception date, real action/ approval/ equipment order date/ commissioning/ implementation date.**

2. **CDM project should not be a legal/ regulatory requirement.**

3. **Alternative options are generally available that would have provided similar outputs as the CDM project.**

4. **CDM project faces barriers (technological, financial, prevalence, and other) that would have prevented its implementation but not implementation of the alternative options.**

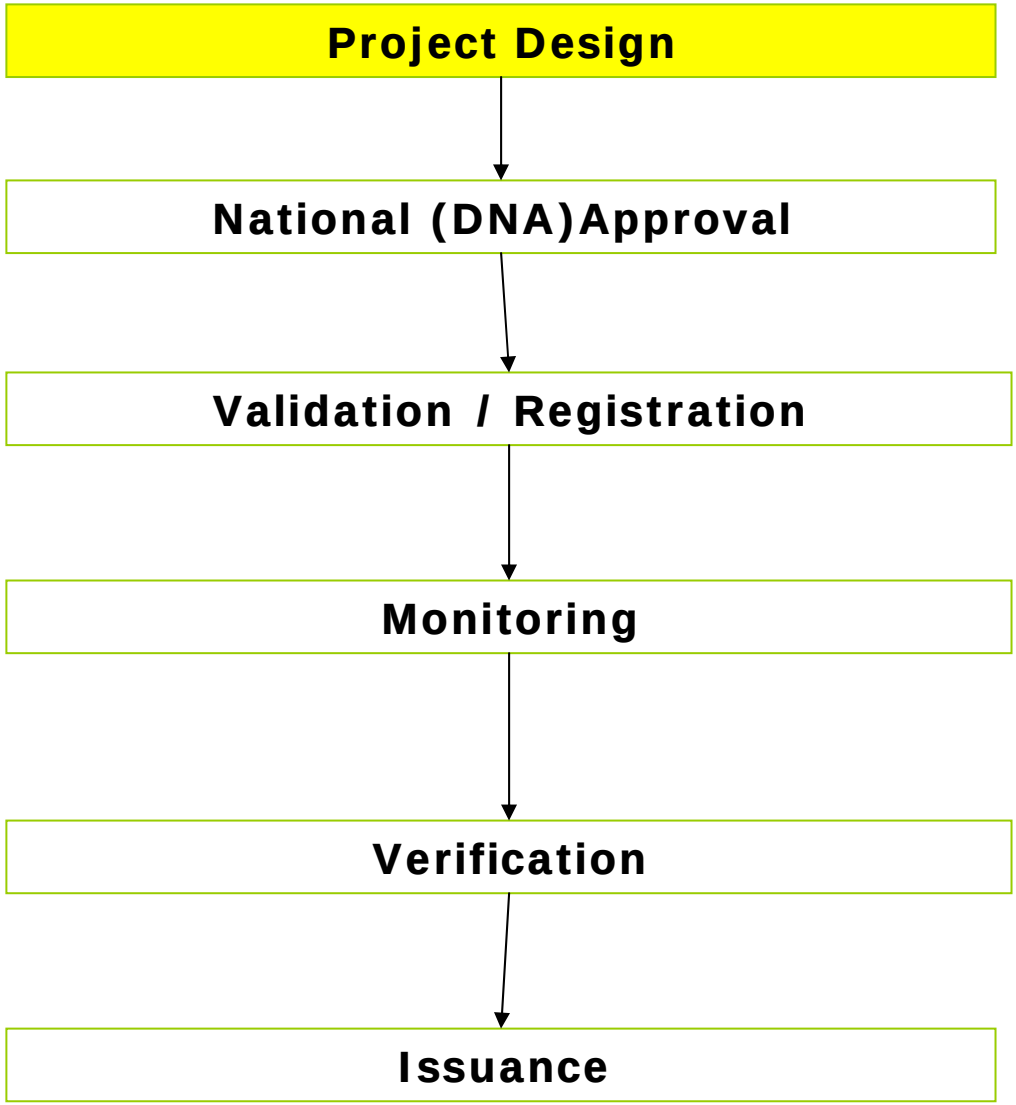
CDM Eligibility Requirements

- **Technological barriers could be lack of skilled manpower, operational knowledge, uncertainty about expected results, etc.**
- **Financial barriers could be risks to project investments based on uncertain returns in terms of IRR, NPV, etc.**
- **Prevalence barriers could be that no one has implemented similar projects in the past.**

5. CDM project is not a common practice and was not implemented elsewhere under similar circumstances and without CDM revenues.

6. Registration of CDM project by UNFCCC would bring revenues that would mitigate the barriers that the projects faces/faced during implementation.

CDM PROJECT CYCLE



Practical timelines for CDM projects till CER realization

- PDD/PCN/PIN development with approved CDM methodologies
  -- 3 months. With new methodology to be approved -- 12 months
- Host Country Approval from the DNA who is MoEF --- 2 months
- Validation by DOE -- 3/4 months
- Registration by UNFCCC -- 3/4 months
- Monitoring of project parameters as per PDD and data generation– 4 months
- Verification by DOE and CER issuance -- 3 months
- Finding correct buyer with favorable terms and attractive prices
  -- 2 months
- Minimum Total time till revenue generation thro' selling of CER :
  - 22 months(with approved methodology)
  - -- 27 months (with new methodology)

What International buyers look for…

- **Clear national level CDM rules**
  - Host country endorsement rules
  - Investment rules
- **Robust and large CDM projects**
  - robust carbon, robust project
- **Reputation of Project Developer**
  - Ability to standby performance obligations
  - Portfolio of credits
- **Projects having high sustainability criteria**
  - Stakeholders' perspective
- **Risks to Project Registration**
- **Availability of CER registry for issuance and transfer of CERs.**

Demand – Supply for CERs

- **Main demand for CERs is from:**
  - Japan,
  - EU and
  - Canada

- **Demand and prices are mainly driven by:**
  - Current shortage of CERs in the Market
  - Extent/ potential for availability of “hot air” from Russia in the Market

- **Emergence of the VER market.**

CDM BUSINESS GLOBALLY

GHG EMISSION REDUCTION EFFORTS

&

CDM PROJECT INITIATIVES

IN IOCL

GHG Emissions Mitigation Opportunities in IOCL

Energy efficiency measures like:

- **Optimization of process energy input *(e.g., heat integration/ optimization measures, Pinch Technology, etc.)***

- **Recovery of waste gas/ heat/ pressure for power or steam generation or pre-heating *(from gas turbines, process streams, stack gases, etc.)***

- **Cogeneration of heat and power, total condensate recovery, recycle of waste water**

- **Use of gas processing flares, and refinery gases and flare gases as sources of heat and power.**

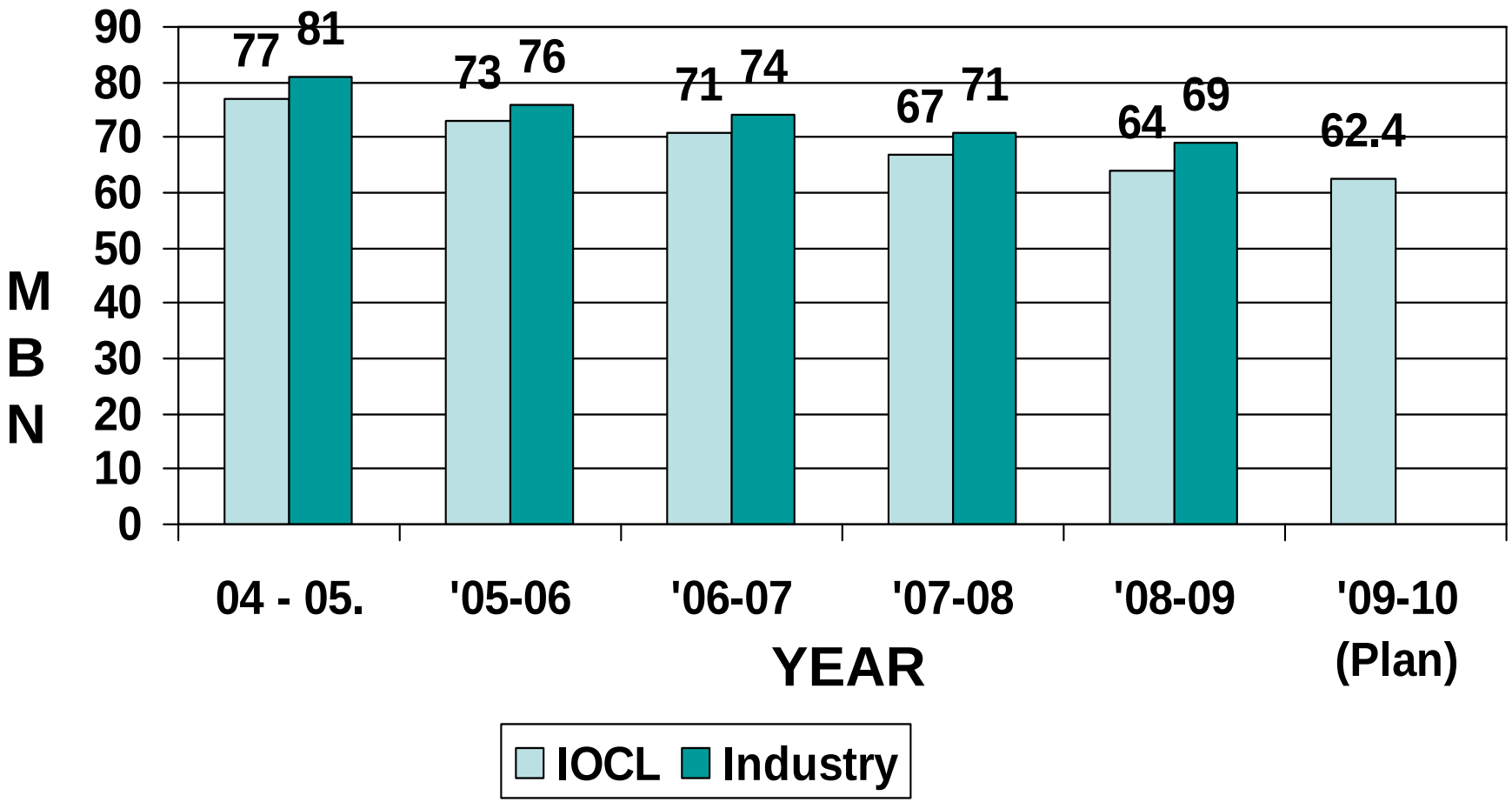
GHG Emissions Mitigation Opportunities (contd.)

- Reducing fugitive methane emissions from various sources and also recovering methane as a useful energy source

- Switch over from solid or liquid fuels to gaseous fuels like NG for power and/or steam generation.

- Optimisation of Marketing & Pipelines operations including optimisation of product transportation through surface

ENERGY CONSUMPTION (MBN) IMPROVEMENT IN IOCL REFINERIES vs. INDUSTRY



LOWER ENERGY CONSUMPTION RESULTING IN CO2 & EMISSIONS REDUCTION IN IOCL

Reduction of Standard Refinery Fuel (SRF) achieved through energy conservation projects in refineries have reduced the GHG emission, mainly CO2 as under:

Year	SRFT / YR saving	Reduction of CO2 emission MT/YR
04 - 05	**48458**	**145374**
05 - 06	**32890**	**98670**
06 - 07	**24326**	**72978**
07 – 08	**27227**	**81681**
08 – 09	**73558**	**220674**

Specific CO2 Emissions reduction in IOCL Refineries in last three years

Year	Crude Thru'put (MT)	CO2 emitted (MT)	CO2 emission/MT of crude thru'put	CO2 emission MT/Hr
2006-07	44001300	13200390	0.30	1671
2007-08	47318470	12775986	0.27	1430
2008-09	51364607	12513564	0.24	930

CDM Projects Journey in IOCL Refineries

- Appreciation training/exposure on CDM:

  - Completed in 2006.
- Selection of Consultant thro' open tender for 1st phase of projects (7 nos.): March,2005
- Selection of DOE through open tender for 11 nos of projects : March, 2007
- Selection of Consultant thro' open tender for 2nd phase of projects (5 nos.): July , 2007
- 1st phase of projects : 7 nos.

  - Projects eligible : 3 nos.

  - Projects dropped : 4 nos.

CDM Projects Journey in IOCL Refineries

- 2nd phase of Projects : 5 nos.
  - Projects eligible : 3 nos.
  - Projects dropped : 2 nos.

- New projects identified : 4 nos.

- Contract for verification/certification of CDM projects : Under process
- ***Wind power project by CO,BD :***

  PDD under preparation by consultant

CDM PROJECT STATUS IN IOCL

Registered Projects:

S.No	Projects registered with UNFCCC	Estimated CER (MT/Yr)
1	**Flare Gas Recovery at Haldia Refinery**	**17610**
2	**AVU Energy Optimisation at Digboi Refinery**	**2610**
3	Flare Gas Recovery at Barauni Refinery	**8320**
4	Flare Gas Recovery at Gujarat Refinery	**27834**
	Total	**56374**

CDM PROJECT STATUS IN IOCL

Projects under registration process:

S.No	Projects	Estimated CER (MT/Yr)
1	Flare Gas Recovery at Guwahati Refinery	3690
2	Fuel Oil consumption ,reduction and avoidance of methane emission in VDU furnace by recovery of VDU vent gas at Haldia Refinery	20750
	TOTAL	24440

CDM PROJECT STATUS IN IOCL

Projects under CDM assessment

S.No	Project	Expected CER
1	Idling of DHDT furnaces at MR	**3800**
2	Pressure Recovery Turbine at FCCU of MR	**33000**
3	Flare Gas recovery system at PR	**14300**
4	Fuel Switch from Naphtha to Natural Gas in Hydrogen Generation Unit at JR	**60000**
	Total Expected CER	**111100**

Utilization of Heat of Reaction

- IndianOil's Mathura Refinery has implemented a first of it's kind scheme in the Diesel Hydro- Treater (DHDT) unit with the following objectives:-
- Stoppage of furnace firing in furnace and maintaining feed and recycle gas preheat by feed preheat circuit utilizing available heat of reaction from the reactors.
- Increasing Refinery profitability by eliminating fuel gas firing and stoppage of FD fan.
- **The Furnace firing is required only during DHDT start up to bring the reactor inlet temperature of feed to 315°C. Paper outlines various changes that were required by refinery in order to meet above objectives.**

RENEWABLE ENERGY EFFORTS BY IOCL

AN EFFORT IN WHICH GHG EMISSION IS NIL

- **WIND ENERGY (21MW) HAS BEEN TAPPED IN GUJARAT.**
- **PLANNED TO TAP MORE WIND ENERGY (50 MW) AT KANDLA**
- **ALTERNATE SITE FOR WIND ENERGY ARE BEING EXPLORED.**
- **USE OF SOLAR POWER EQUIPMENT (LANTERN, COOKER, WATER HEATER, STREET LIGHT) STARTED IN A LIMITED WAY.**
- **USE OF SOLAR WATER HEATER IN REFINERY CANTEEN COOKING**
- **IT IS PLANNED TO USE SOLAR WATER HEATERS IN GUEST HOUSES AND TOWNSHIPS**

Thanks