

Introduction to Climate Change Mitigation and Its Importance

Workshop organized by ILO and Waste Concern Consultants

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What is Climate Change Mitigation?

- Greenhouse gases (CO₂, CH₄, N₂O) accumulation in upper atmosphere causes global warming
- CO₂ is emitted by **Industry, Transport and Power Generation** due to combustion of fossil fuels (Oil, Natural Gas and Coal)
- **Landfill** is main cause of CH₄ emission (anaerobic digestion)
- CH₄ emitted from **Rice Production and Enteric Fermentation**; N₂O comes from **Nitrogenous Fertilizers**
- Deforestation causes CO₂ emission; Forests are CO₂ sinks
- Reducing GHG is *Climate Change Mitigation* (**Green Jobs**)

Green Jobs and GHG Mitigation

- Energy Efficiency (buildings, industry,
- Electric Power Grid (T&D loss, smart grid)
- Renewables (solar, wind, hydro, biomass)
- Public Transport
- Water (rainwater harvesting; efficient use)

Bangladesh Government's Commitment to GHG Mitigation

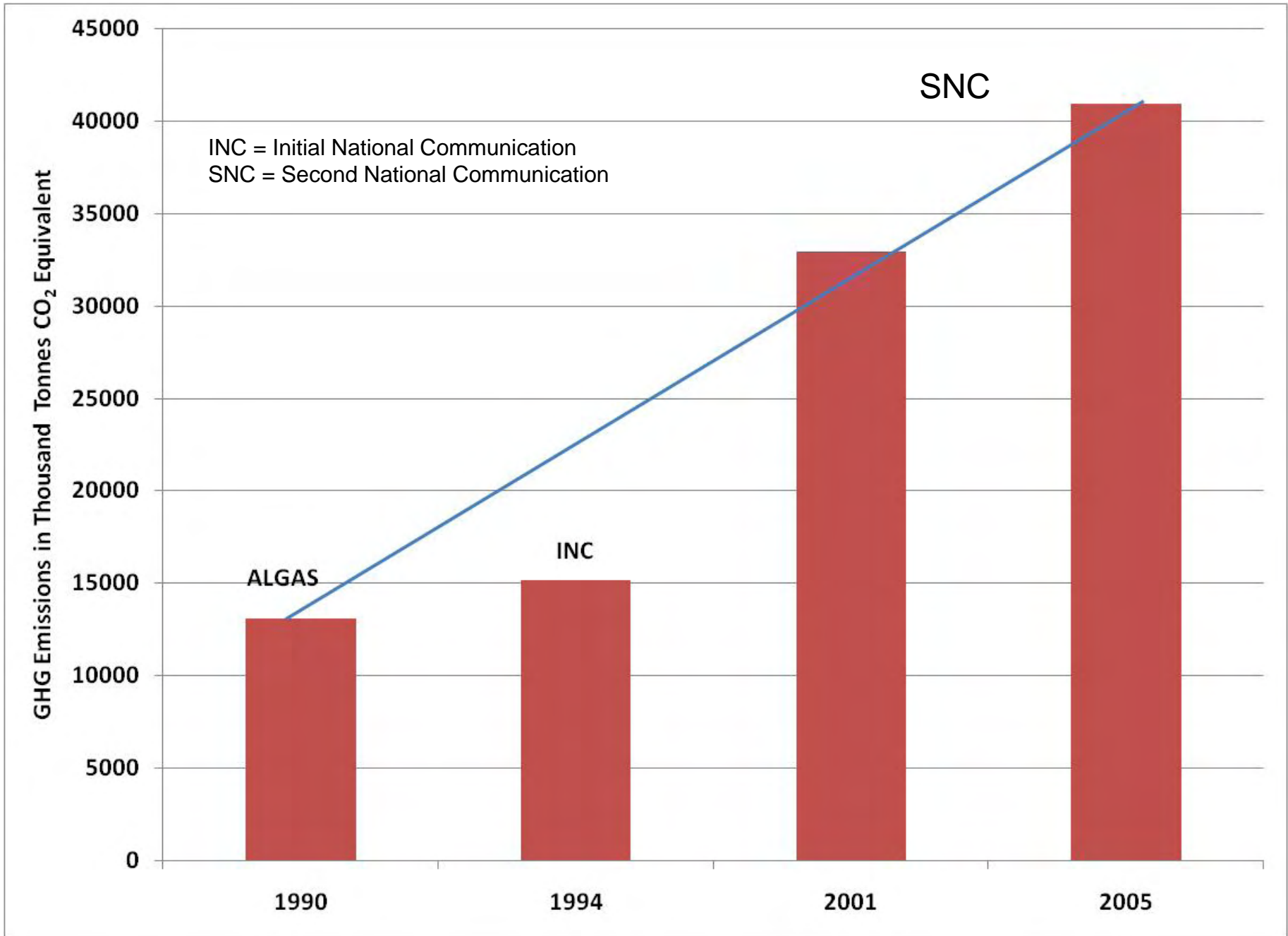
- GoB has formulated the BCCSAP (Bangladesh Climate Change Strategy and Action Plan)
- Approved the Renewable Energy Policy (5% by 2015 and 10% by 2020)
- Strongly promoting Solar PV (mandatory 1-3% to get new power connection)
- Programs in afforestation and reforestation

What this presentation is about?

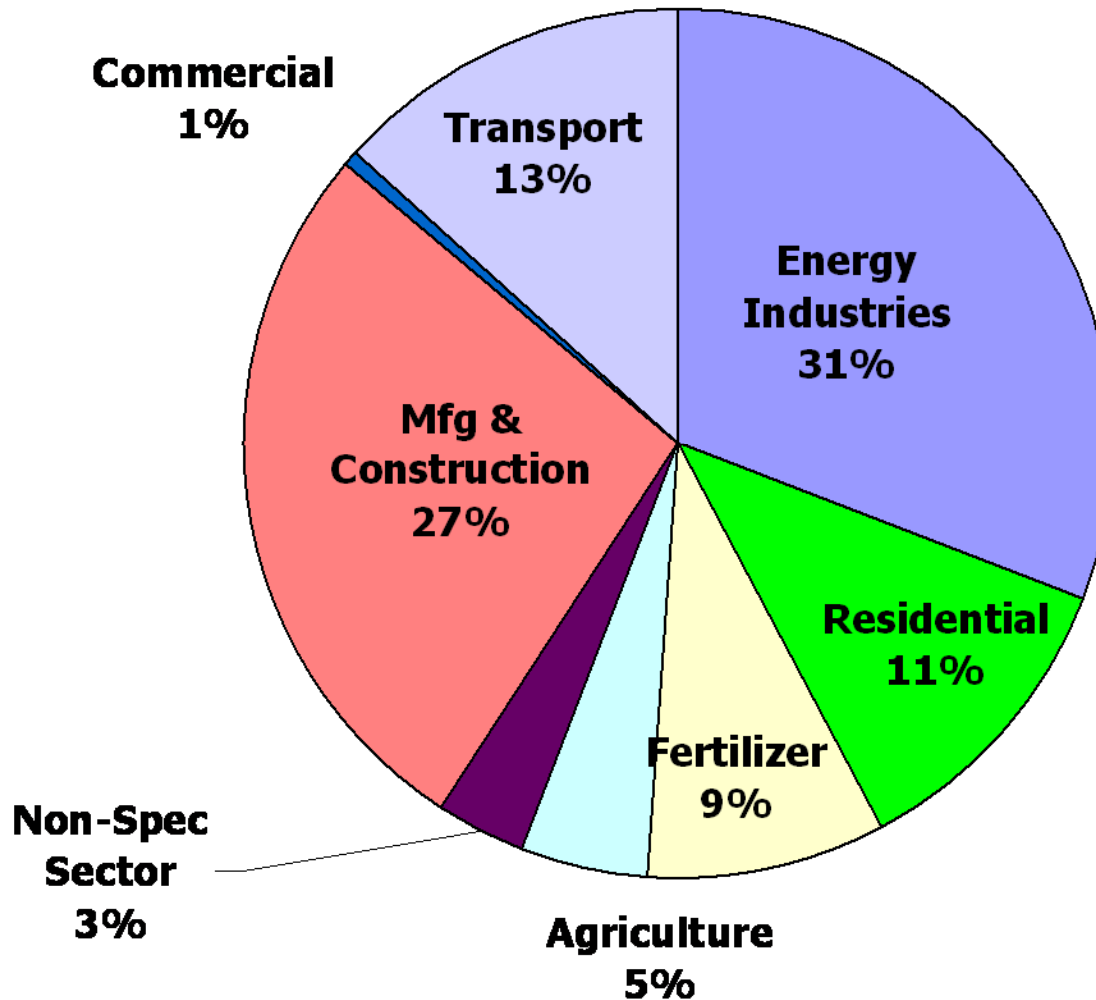
This presentation mainly deals with energy efficiency and renewables GHG mitigation options for Bangladesh

The material presented is derived from the study report of the Second National Communication (SNC)

The SNC will be submitted soon to UNFCCC, and will be available in their website

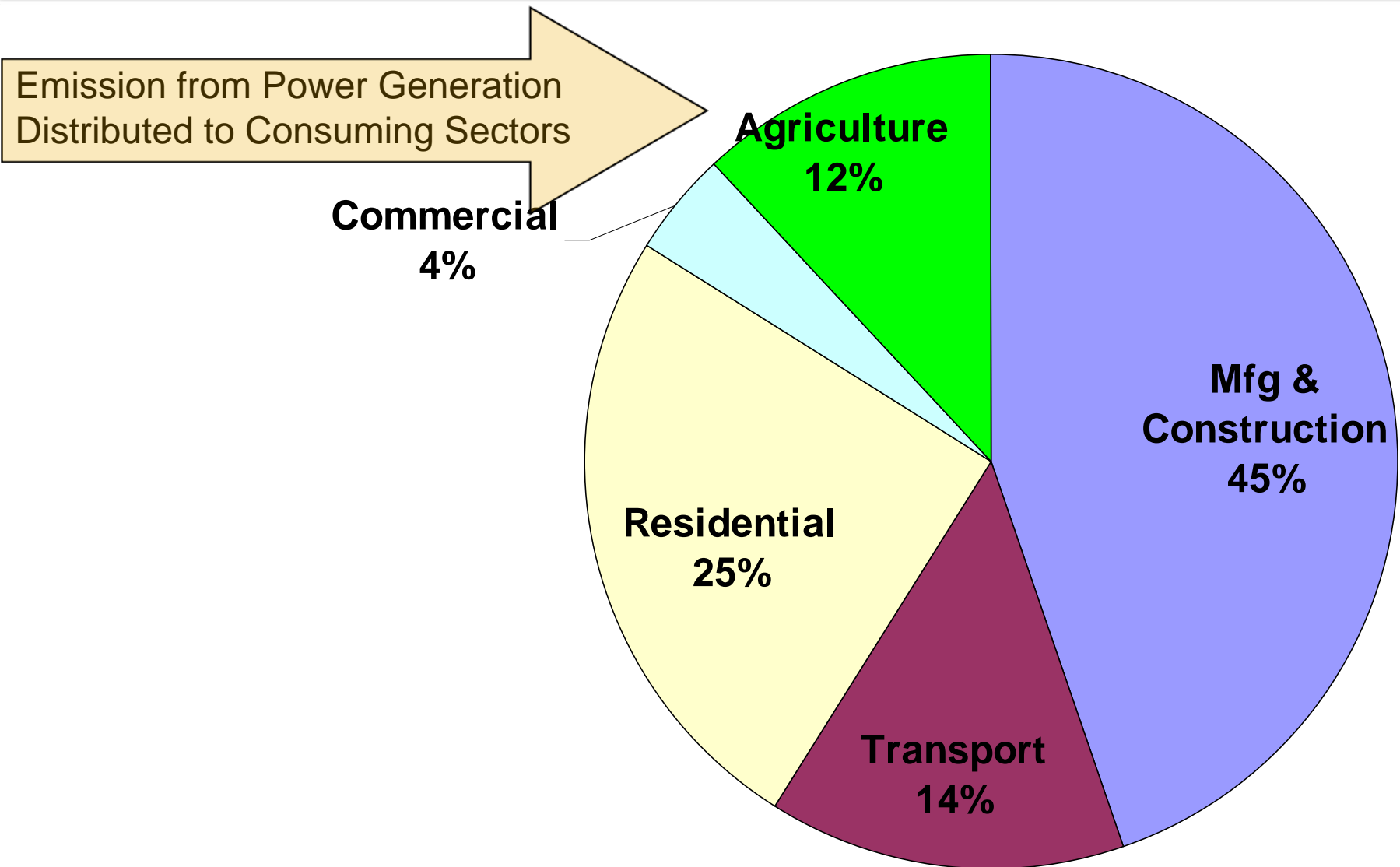


Relative contributions to CO₂ emission 2005

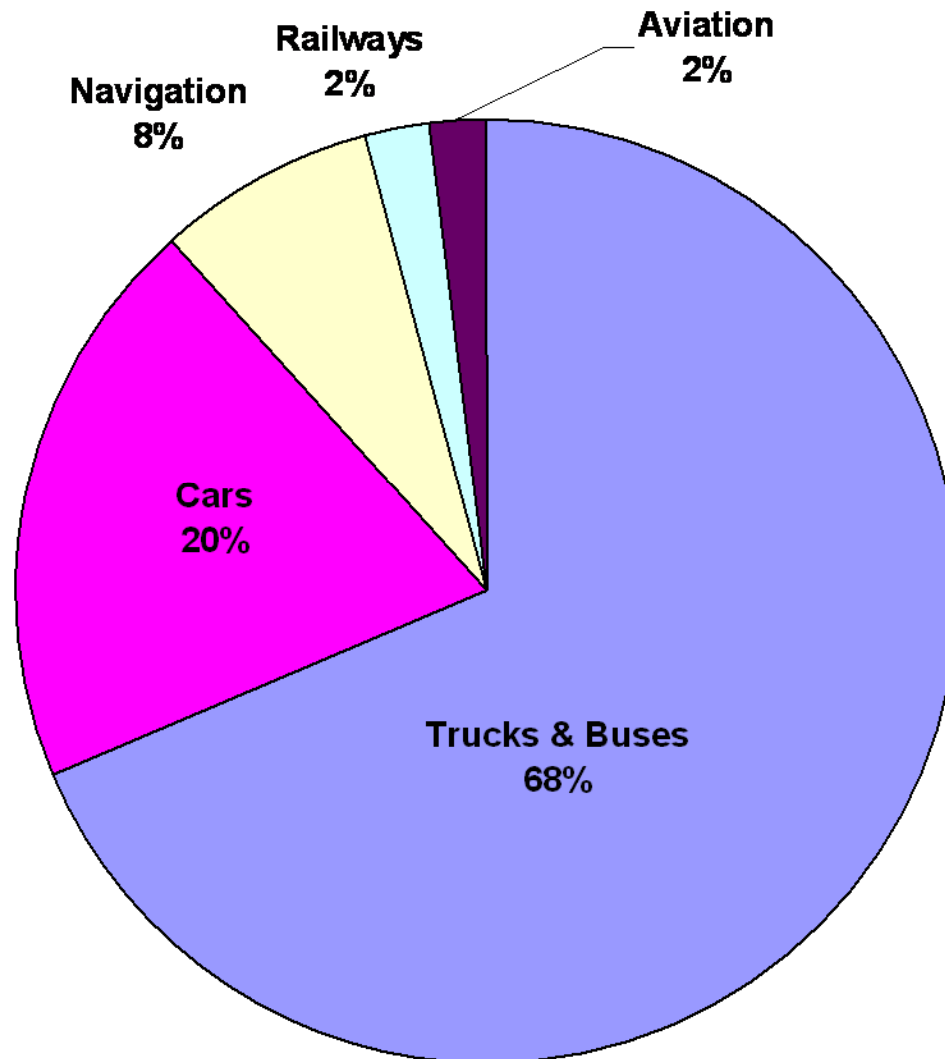


CO₂ Emission by Energy Sub-Sectors

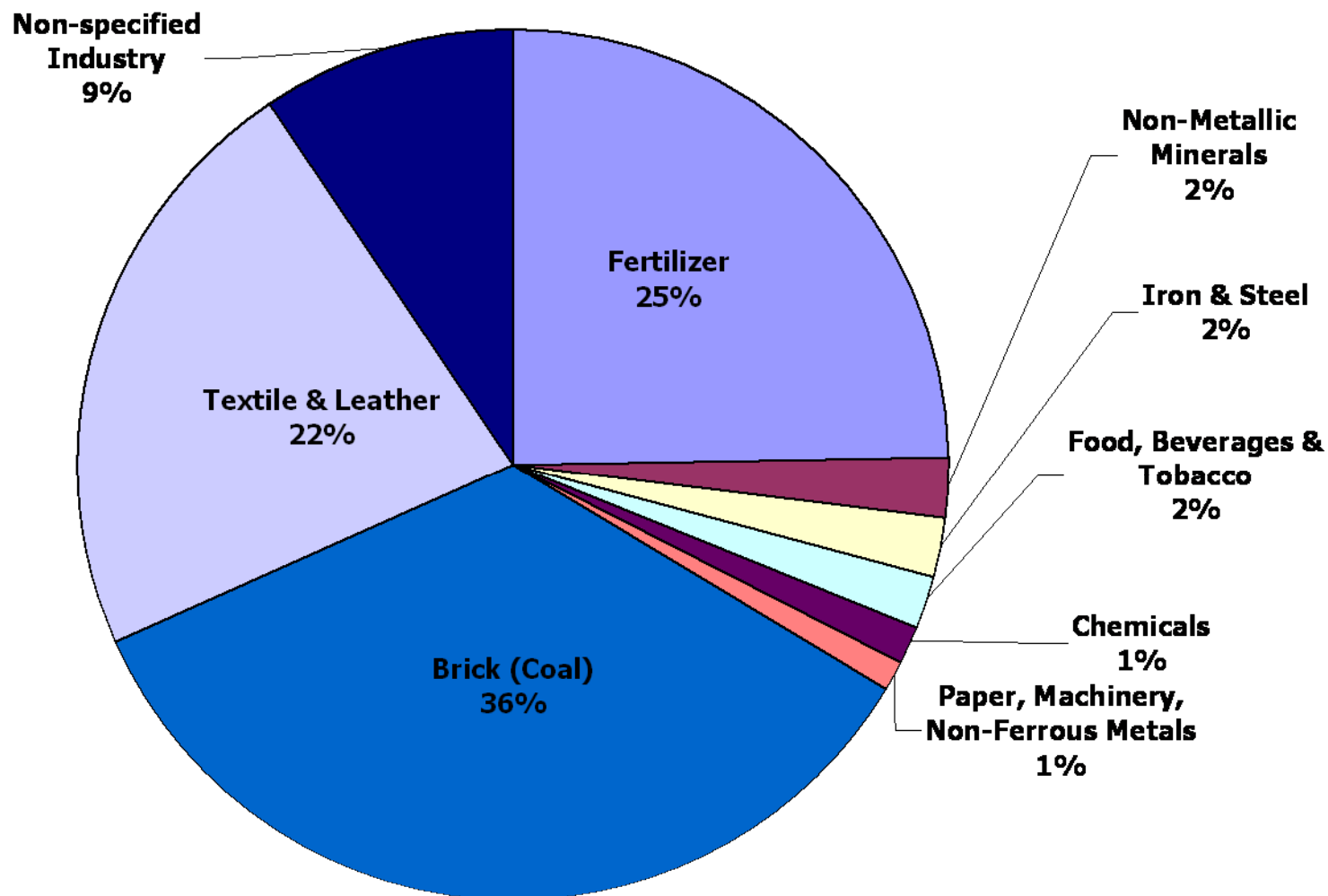
2005



CO₂ from Transportation Sector 2005



CO₂ Emission by Manufacturing & Construction Sub-Sector 2005



Mitigation Sectors/Options Considered for SNC

- Electricity generation and supply
- Transport – rail and water
- Energy Intensive Industries – Fertilizer, Scrap Steel Melting, Re-rolling, Brick, Ceramic, Cement, Sugar
- Selected options in the Residential, Commercial and Agricultural sectors
- Cross-sectoral options (boiler, CHP, motor, fan, light)
- Renewables

MITIGATIONS OPTIONS – I

Transport Sector

- Modal shift from (i) road to railway and (ii) road to waterway

Agriculture Sector

- Solar PV irrigation pumps

Residential Sector

- Metering residential gas supply and Improved gas stoves
- Solar PV lanterns to replace kerosene lamps

Industry Sector (both public and private sector industries)

- New Urea fertilizer plants
- Sugar mills (cogeneration plant efficiency improvement)
- Steel re-rolling mills efficiency improvement
- Brick making – Higher efficiency kilns
- Industrial cogeneration for captive generators
- Boiler efficiency improvement

MITIGATIONS OPTIONS – II

Commercial Sector

- Solar reflective glass for façades and windows
- Use of hollow bricks as partition walls

Energy Sector (Electricity)

- CCGT to replace old Steam Turbine (ST) plants
- Electricity distribution loss reduction
- Supercritical boilers for coal fired power plants

Cross Sectoral Options

- Efficient fans
- Efficient lighting (T8 replaced by T5 fluorescent tube-lights)

Biomass Options

- Efficiency improvement of parboiling
- Biogas plants

Rail Transport

- A passenger-kilometer is 2-3 times more efficient than buses
 - A freight-kilometer is 5-6 times more efficient than trucks
 - Modal shift by expanding and upgrading service
-
- **Share of rail transport has fallen dramatically since 1980**
 - **Road transport is cheaper overall and more convenient**
 - **Cannot withstand competition from road transport**
 - **Government very keen, but lacks funding to promote it**

Water Transport

- Most efficient mode of transport in terms of energy use; more than even railway
 - Passenger-kilometer is **3-4** times and freight-kilometer is **8-10** times more efficient
 - Expand and upgrade service for modal shift
 - Maintain waterways and ensure security
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- **Share has fallen since 1980**
 - **Neglected service and problems of river navigability**
 - **Dredging of waterways critically needed**

STEAM THERMAL

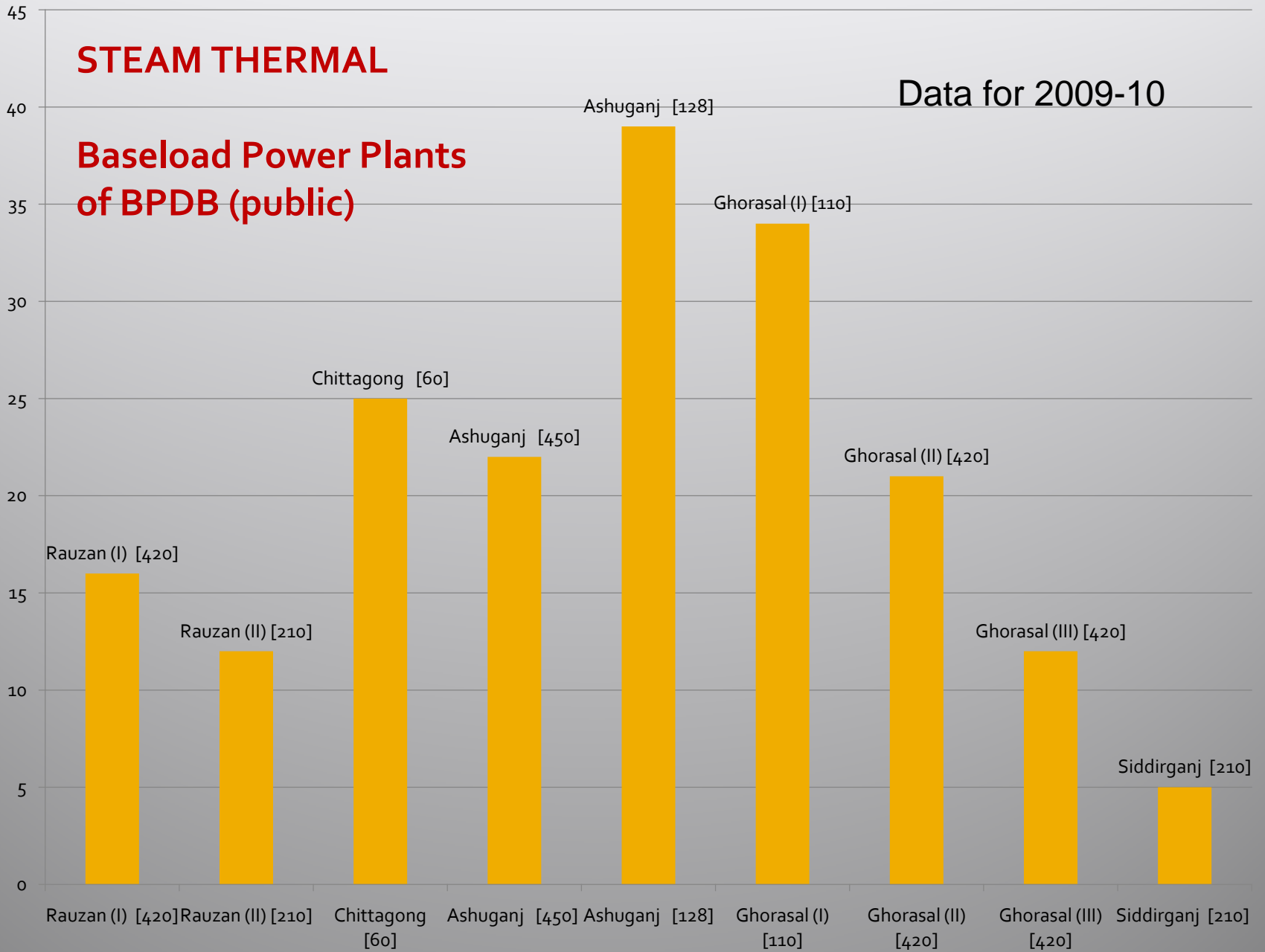
Baseload Power Plants of BPDB (public)

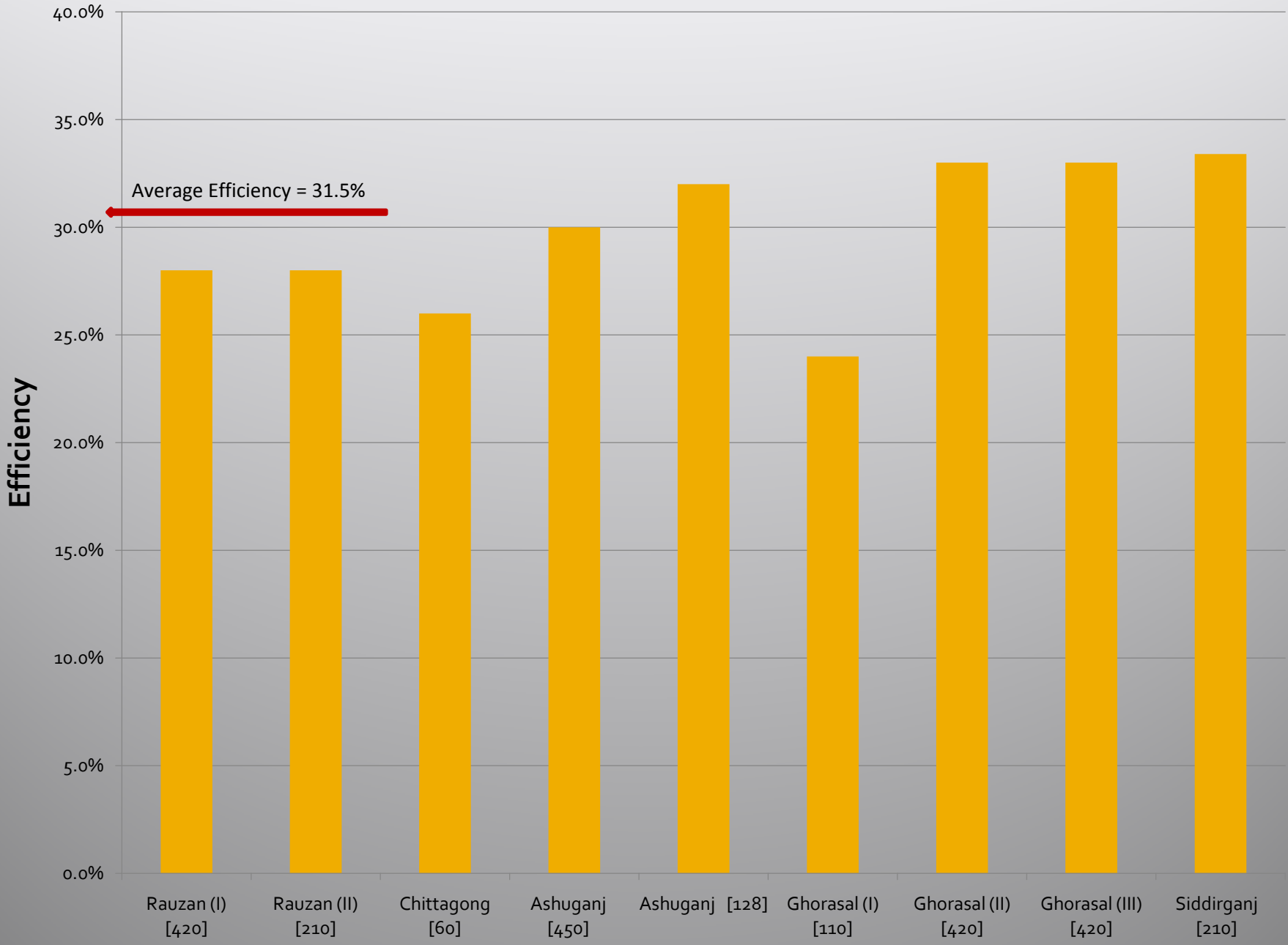
Data for 2009-10

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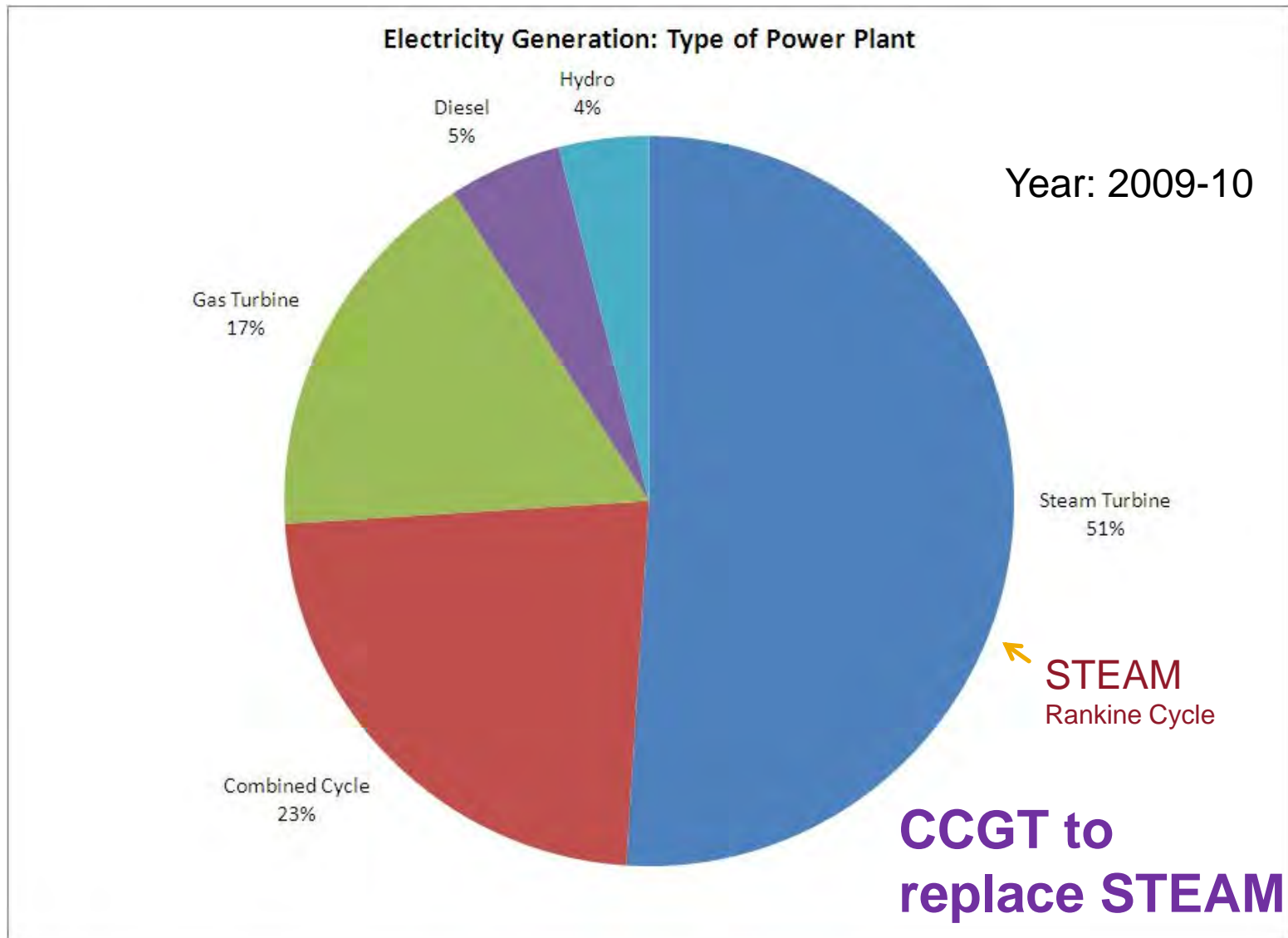
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Electricity Generation



ELECTRICITY SUPPLY

- CCGT to replace steam thermal plants (minimum efficiency of CCGT is 52%)
- Supercritical and Ultra-supercritical boilers for coal-fired power plants (4-8% efficiency improvement possible)
- T&D infrastructure up-grading and rehabilitation (study shows high potential; up to 10% loss reduction in certain urban/rural feeders)

Captive Power Generation

- Because of electricity shortage and unreliable power supply, gas utilities started allowing captive power generation about 12 years back
- 1500+ MW gas-based captive generation exists
- 25% of the gas for power is consumed by this sub-sector
- Plant efficiencies vary from 28% to 42% (average = 35%)
- Waste heat is mostly not utilized
- Ideal opportunity for cogeneration

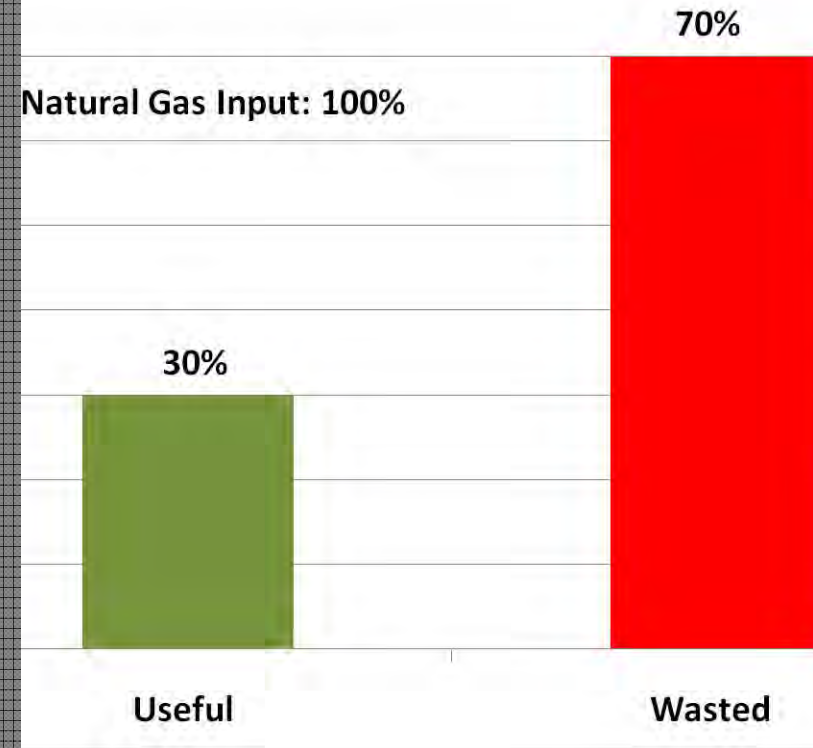
COGENERATION

A waste-heat boiler can recover a good portion of the wasted heat to produce steam

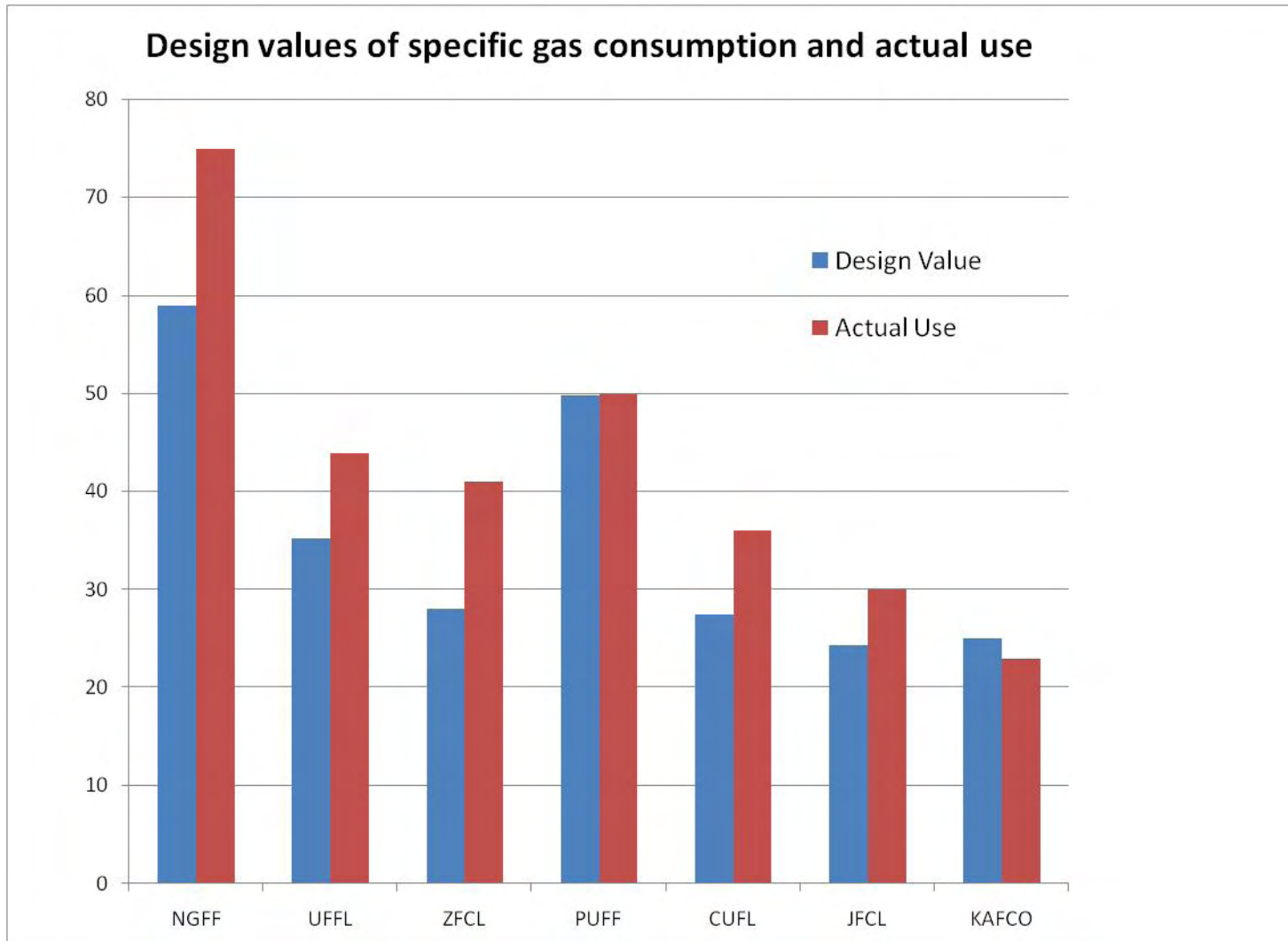
This will replace the existing boiler thus saving the natural gas used to make steam

If the industry does not require steam, then absorption refrigeration can be used for air-conditioning or making ice

Otherwise, the steam can be sold to neighboring industries



Urea Fertilizer: Four plants (NGFF, PUFF, UFFL, ZFCL) consume for 1 ton of urea more than 40 Mcf of natural gas, compared to 23 Mcf and 30 Mcf by KAFCO and JFCL respectively





Mills are so old that simply building new mills can double the energy efficiency



Cogeneration in Sugar Mills

- There are 15 medium sized sugar mills owned by BSFIC
- Most of these mills are more than 40 years old, and use very low pressure boilers for electricity generation
- State-of-the-art bagasse boilers are operating at 82 bar, whereas boilers under BSFIC are operating at 11 bar
- Each mill can export surplus electricity between **3-4 MW** to the grid. A feed-in tariff appropriate for renewable energy is needed to promote this option

Private Industries: Brick Kilns

- 5000+ Fixed Chimney Kilns (FCK) consume 2-3 million Tons of coal - Highly polluting and energy inefficient
 - FCK – Very crude furnace; dugout area in open field
 - Smalltime entrepreneurs run the industry
-
- **Government has taken many measures to improve the present situation both in terms of energy consumption and environmental pollution**
 - **GEF project in 2005-2008; UNDP, WB and GTZ have facilitated**
 - **World Bank pilot project for improvement of FCK**
 - **CDM project using Hybrid Hoffman Kiln have been registered**
 - **World Bank CASE project is ongoing to improve situation**

Fixed Chimney Kiln (FCK)



VSBK: 40-50% more efficient than FCK



HOFFMAN KILN – Coal Fired: 25-35% more efficient than FCK



Scrap Steel Mills + Re-rolling Mills

- Energy component more than 25% of product cost
- Crude Operation and Inefficient Induction Furnaces
- Plant shuts down during peak hours (5 – 11 pm).
Furnaces undergo cyclic cooling and heating
- Load shedding causes significant losses. Scrap melting and ingot re-rolling not synchronized
- Re-rolling: Bad insulation; no heat recovery and inefficient burners
- SEC varies from 25 to 75 m³/ton for modern to traditional re-rolling mills



Demand Side Management

- Metering of domestic gas connections
- Efficient ceiling fans
- Improved gas cookstoves
- Efficient building: Solar Reflective Glass



Traditional Cook Stove
burning attended



Improved Cook Stove with Auto-igniter

Cookstoves (old and new type)



Solar Reflective Glass could have been used



Ceiling Fan

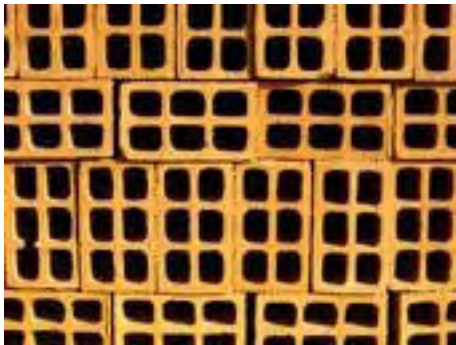


Metering Domestic Gas Connection

Solar Reflective Glass

- Huge tendency to build commercial building with glass façades
- Even though all commercial building are air-conditioned not enough attention being paid to lessen air-conditioning load
- Several measures exist to lessen cooling load in commercial buildings
- One such measure is **Solar Reflective Glass**

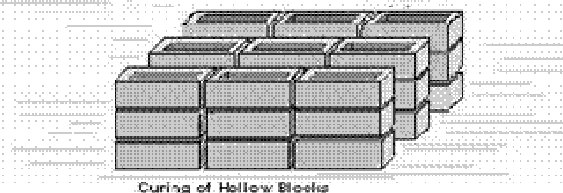
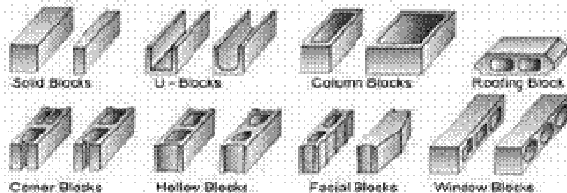
Solid bricks and alternatives



Hollow bricks -
less clay, less coal



Hollow bricks



Cement
Blocks

BOILERS

- According to the Chief Inspector of Boilers (CIB) there are more than 5000 registered boilers in Bangladesh
- Based on preliminary assessment, the CIB believes many boilers are operating in the region of 70% efficiency
- The boilers that are in the most neglected condition are in the Textile Dyeing Sector. Also, many of the Garments sector boilers are not in a good shape
- The most prospective size range for intervention in boiler efficiency improvement is the 1-5 t/h. More than 50% of the boilers are in this size
- **Boiler efficiency should be above 85%**



MOTORS

- Propensity to purchase the cheapest in the market
- Widespread re-winding of burnt out motors practiced
- Motors kept running unnecessarily
- Efficient drives/Intelligent Motor Controllers not used

Renewables: Biomass efficiency improvement

- Improved Cook Stoves(ICS) and Improved Rice Parboiling Systems are two excellent options
- These can reduce biomass consumption by up to 50%, and also reduce environmental pollution
- Up to February, 2012, more than 400,000 ICS have been installed. Grameen Shakti alone has installed more than 150,000. **POA CDM project registered**
- There are 50,000 Rice Parboiling units(GIZ Data)
- Biomass thus saved can be utilized in biomass gasification plants (ongoing GIZ pilot project)

Improved Biomass Cookstove



Improved Cook Stoves (ICS) can easily achieve a thermal efficiency of 20%

If the saved biomass is Non Renewable Biomass, CDM can be used to promote ICS



← ICS →

Village Restaurant



Efficient use of Biomass



Efficiency Improvement of Paddy PARBOILERS

Estimates indicate that
2-3 million tons can be
saved through the use of
efficient parboilers



GIZ
Project

Solar Lanterns

- More than 350,000 tons of kerosene used annually for lighting purpose
- Solar PV lanterns are high quality replacement for kerosene lamps (KUPI)

RE Practices in Bangladesh - Solar PV Technologies

Solar Lantern Programme for Rural Poor Households in Bangladesh (UNDP supported)



DNA has given approval for a PIN for a Solar PV Lantern CDM project

Agricultural: PV Irrigation

- There are more than 0.5 million irrigation pumps of all types in Bangladesh (40% electric; 60 diesel)
- Seasonal demand of 1500 MW from January to April. Solar irrigation can alleviate the problem significantly as well as save fossil fuel
- REB project to install 20 solar PV pumps as a pilot
- Government is very keen on this idea, and is actively looking for bilateral and multilateral funding



Solar Irrigation



	<u>Diesel-Pump</u>	<u>Solar-Pump</u>
Price:	Tk 70,000	Tk 6 lac
Diesel:	Tk 80000/yr	Tk 8000/yr
Life:	10 years	20 years



Improved Biomass Cookstove



Improved Cook Stoves (ICS) can easily achieve a thermal efficiency of 20%

If the saved biomass is Non Renewable Biomass, CDM can be used to promote ICS



← ICS →

Village Restaurant



Biogas can Replace LPG

Biogas Digester



Biogas can Replace
NRB (Non Renewable
Biomass) →



Deforestation

Electricity from Poultry waste

Several projects are underway:

1. GIZ is working with 20 medium to large units
2. Grameen Shakti considering electricity option but presently only developing biogas plants for cooking
3. Local Government Engineering Division (LGED), GoB
4. Owner Driven: at least two large poultry farms have installed biogas based electricity generation

Reforestation of Degraded Forests and Afforestation can be REDD+ Projects



Social Forestry - Lining Roadside

Biogas can Replace NRB (Non Renewable Biomass)



Deforestation

Mitigation Projects with Adaptation Co-benefits can give **GREEN JOBS**

- **Household waste composting – arrest land degradation**
- **Solar/wind water pumping – alleviate drought effects**
- **Organically grown cash crops – alleviate soil degradation**

ORGANIC WASTE

Greenhouse Gas Reduction at Landfills

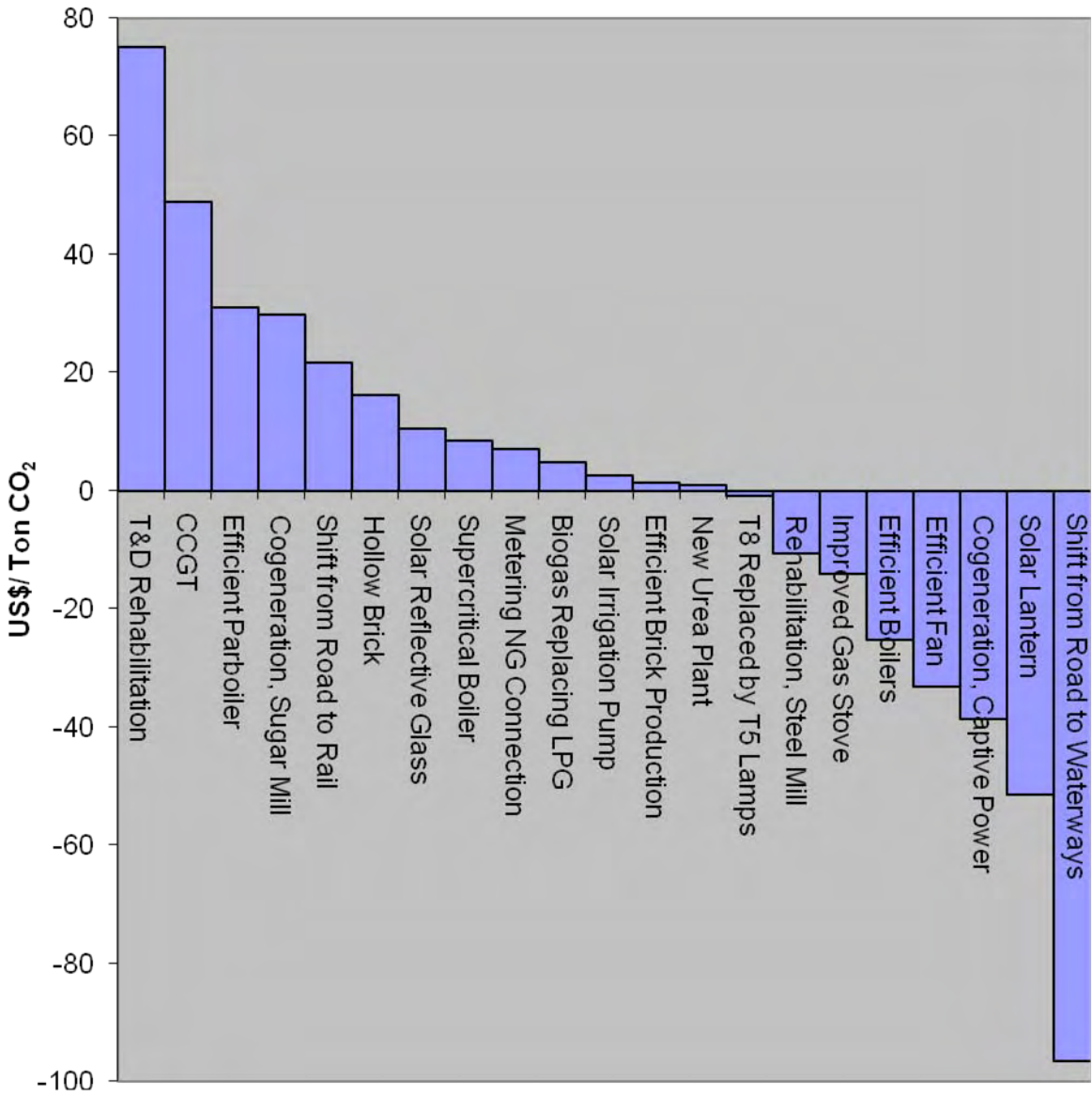
Methane generated in landfills is considered to come from anaerobic decomposition of organic biomass

The collection and combustion of landfill gas can be considered to reduce greenhouse gas emissions by more than 95%

- **WWR BioFertilizer Bangladesh Limited**
- A joint venture company of World Wide Recycling (WWR), Netherlands and Waste Concern, Bangladesh
- **1st CDM Project in Bangladesh**

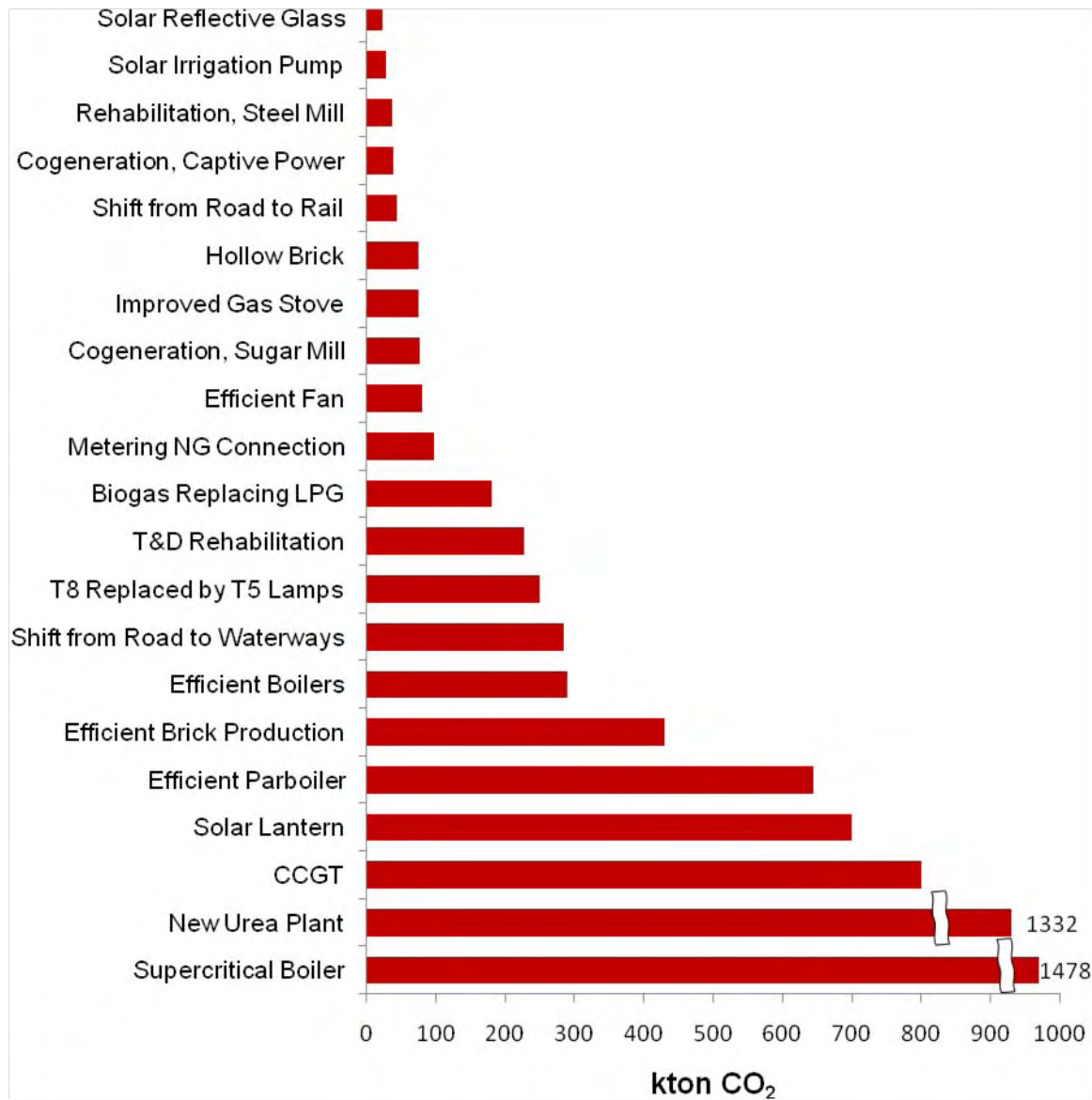


Composting Plant financed by Carbon Credit
Using Dhaka City's organic MSW



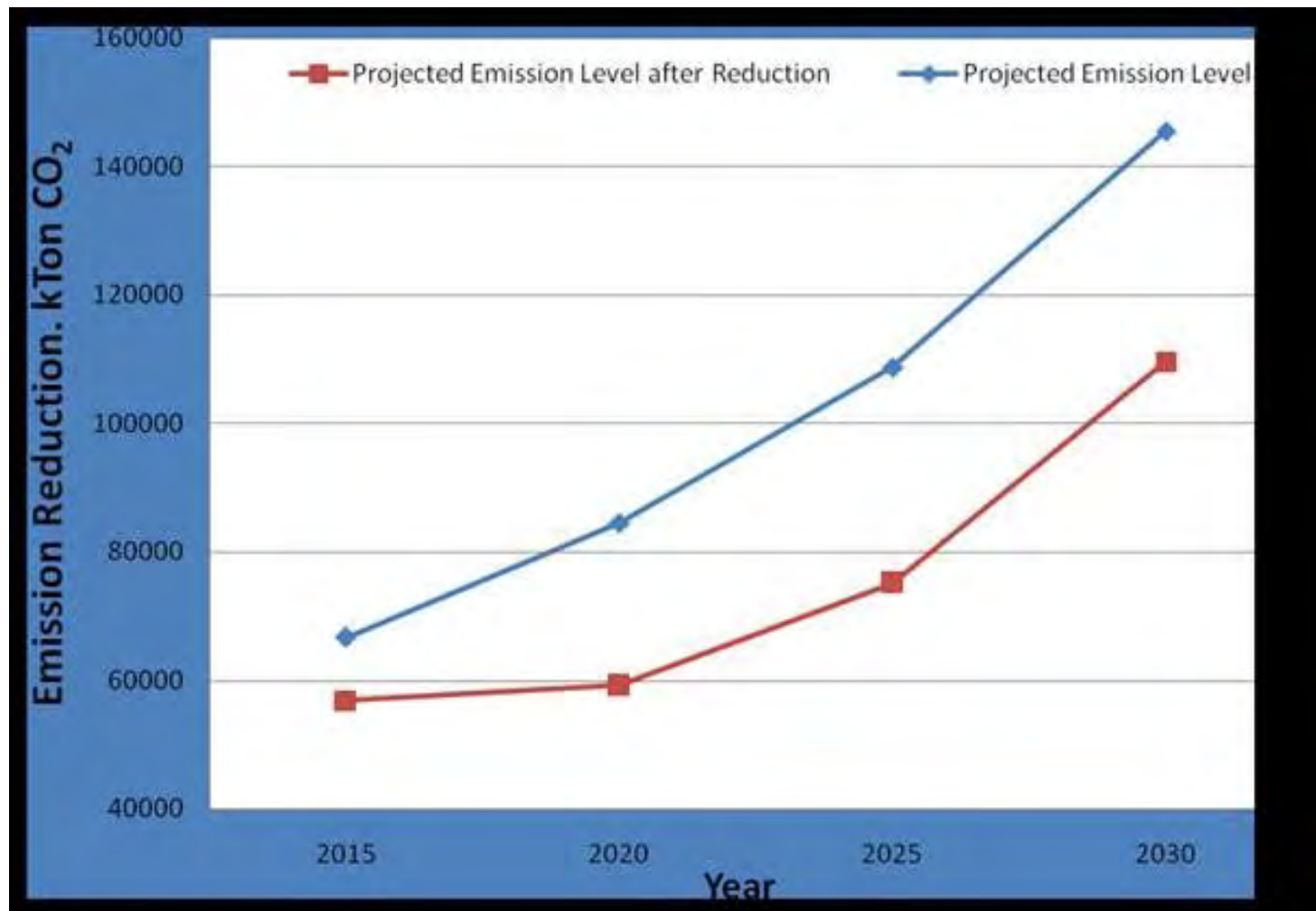
The figure is the study result of the second national communication (SNC) submitted to meet Bangladesh's obligation under the UNFCCC

Cost Effectiveness (\$/ton) of GHG mitigation options



GHG Reduction Potential of Mitigation Options analyzed under the SNC study

GHG Emissions from the Baseline and Mitigation Scenarios (SNC)



Thank You
