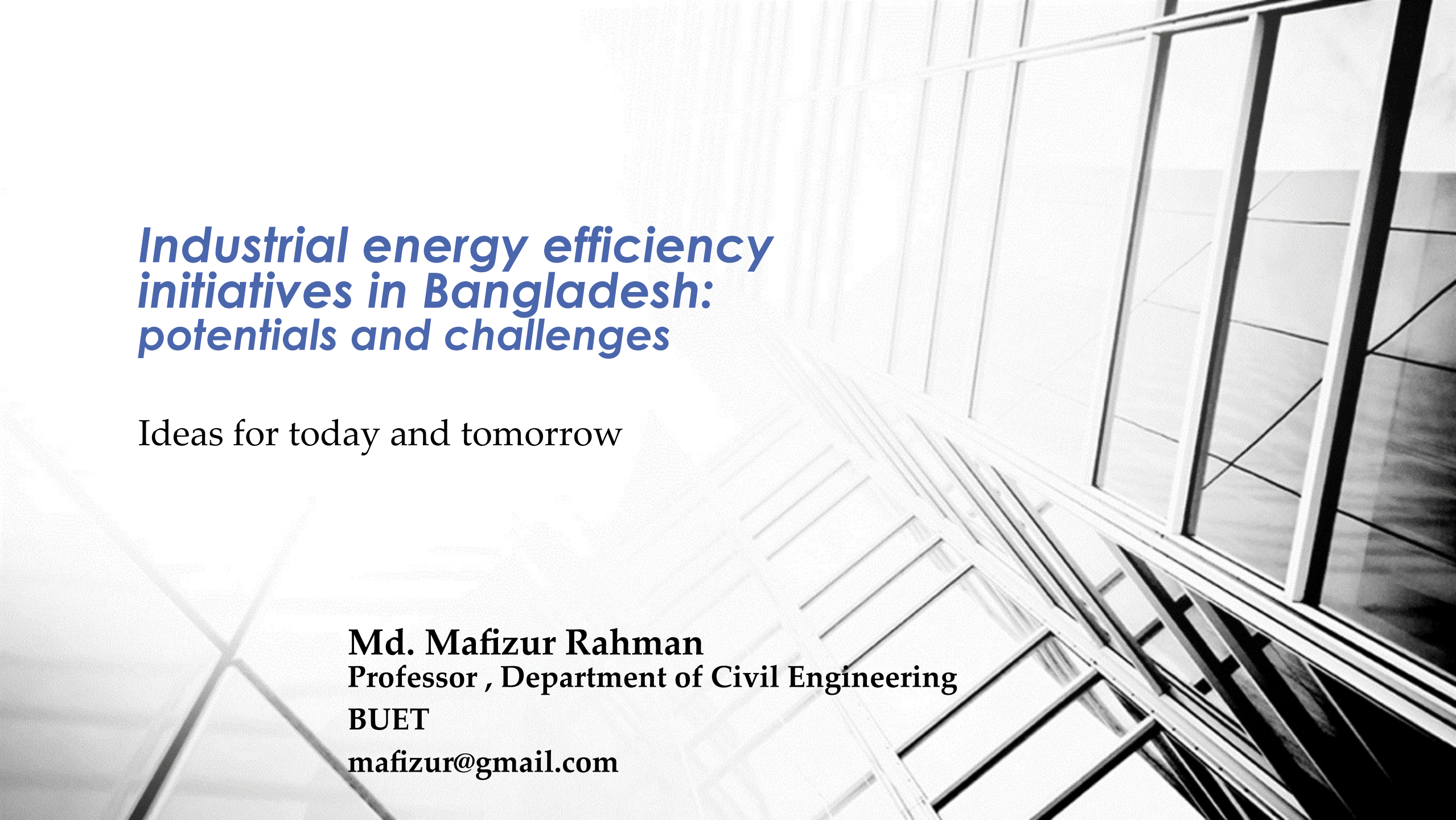
Industrial energy efficiency initiatives in Bangladesh: potentials and challenges

Ideas for today and tomorrow



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Bangladesh at a glance

Bangladesh at a glance

Location	• Northeastern part of South east Asia • Surrounded by India, Myanmar & Bay of Bengal
Area & Terrain	• Area: 147,570 square km • Low flat land consisting of alluvial soil
Climatic Condition	• Hot summer with high humidity (March-June) • Monsoon (July-October) • Dry winter (November-February)

Bangladesh: Demographic Info

Total Population: 166.3 Million		
0-14 years 34.3%	15-64 years 61.1%	65 years and over 4.6%

Economy of Bangladesh

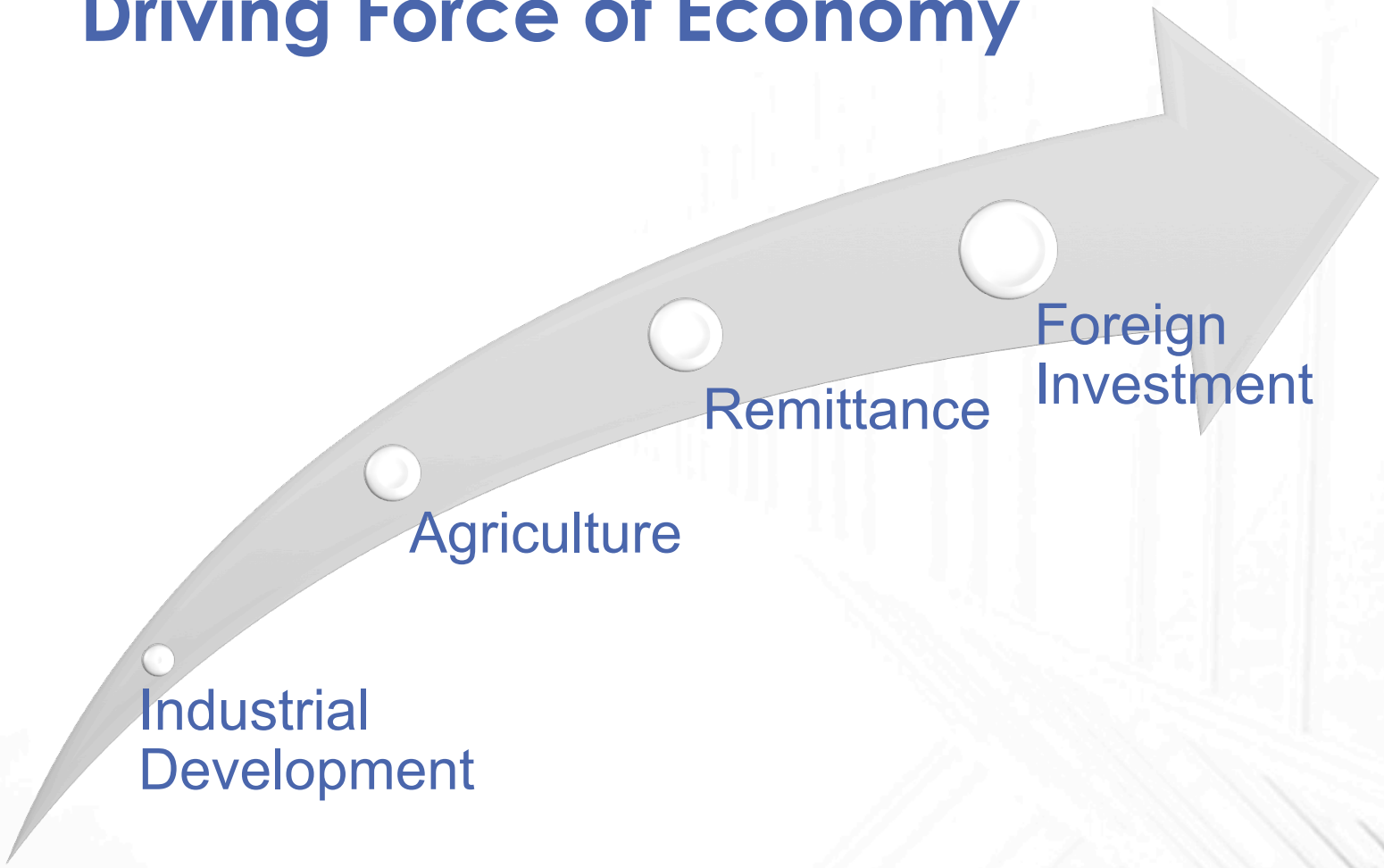
- The country is classified as next eleven emerging market
- Potential member of frontier five
- Entering into golden era as more than 60% of population is in workable condition (age 15-65)
- Constant GDP growth of more than 6% has been observed throughout last 10 years

Economy: Parameters in a nutshell

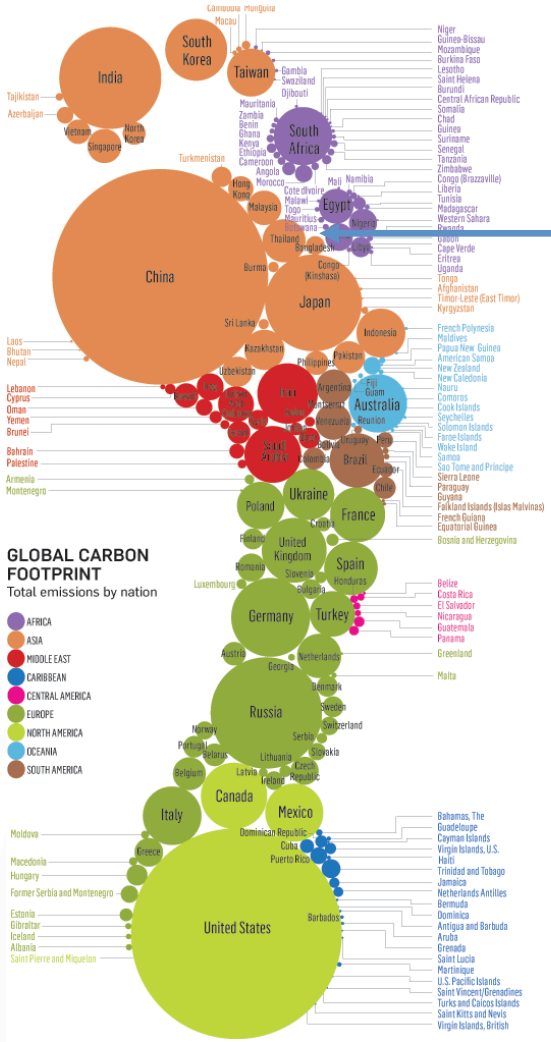
Indicators	FY11		FY12		FY13		FY14		FY15
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual	Plan
Real GDP Growth (%)	**6.7**	**6.7**	**7.0**	**6.2**	**7.2**	**6.0**	**7.6** **7.2***	**6.5** **(6.1)**	**8.0** **7.3***
Gross Domestic Investment (% of GDP)	24.7	25.2	26.8	26.5	29.6	26.8	31.0	26.5 (28.7)	32.5
Private Investment (% of GDP)	19.5	19.5	22.2	20.0	22.7	19.0	23.8	18.9 (21.4)	25.0
Public Investment (% of GDP)	5.3	5.6	6.6	6.5	6.9	7.9	7.2	7.6 (7.3)	7.5
National Savings (% of GDP)	28.4	28.8	26.7	29.2	29.4	29.5	30.7	27.8 (30.5)	32.1

Constant GDP Growth 6%

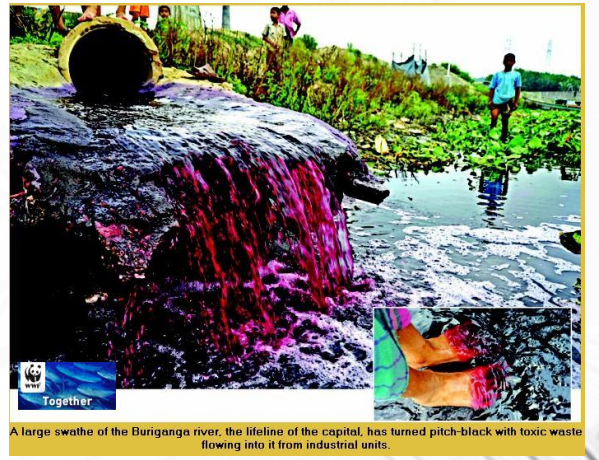
Driving Force of Economy



Carbon Footprint



Contribution of Bangladesh **0.14%**

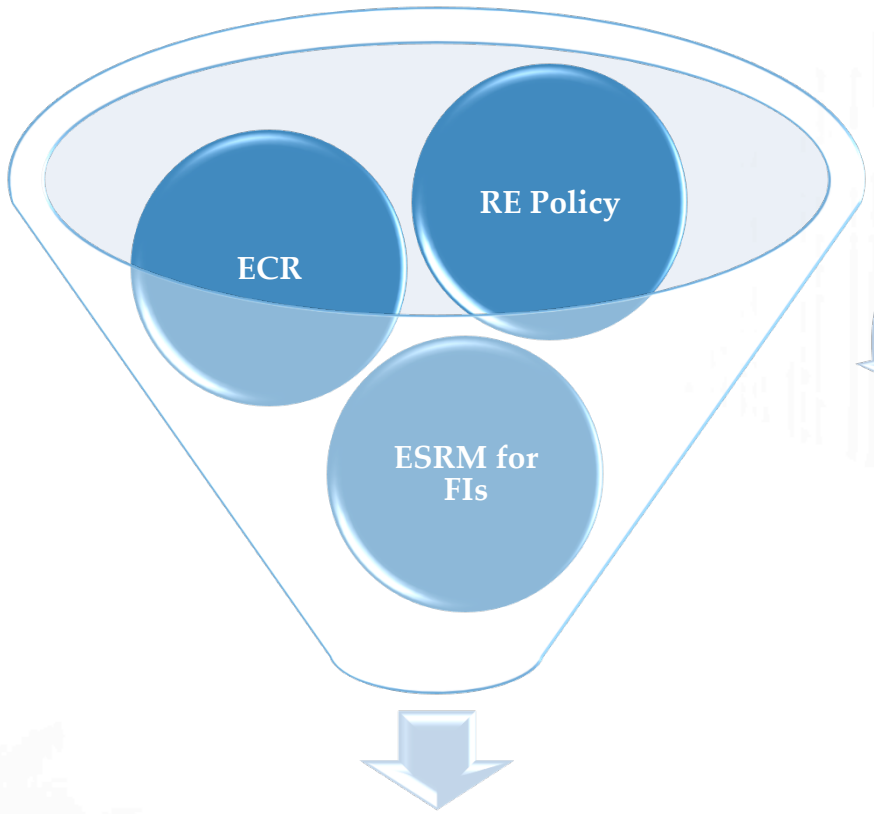


A large swathe of the Buriganga river, the lifeline of the capital, has turned pitch-black with toxic waste flowing into it from industrial units.

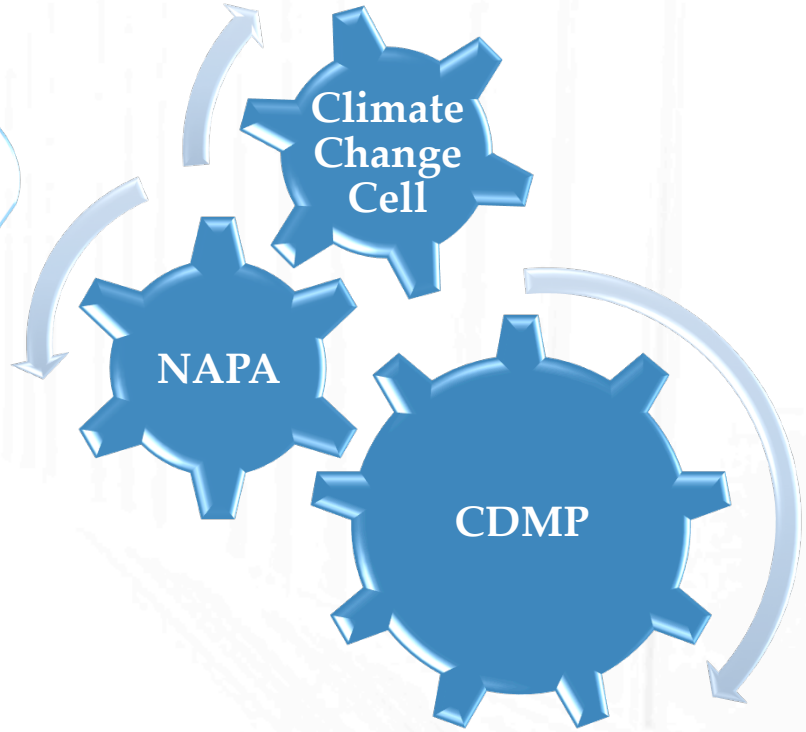
Environmental Degradation

Impact Visualized

Responses so far



Policy



Framework

Government action towards Green Initiatives

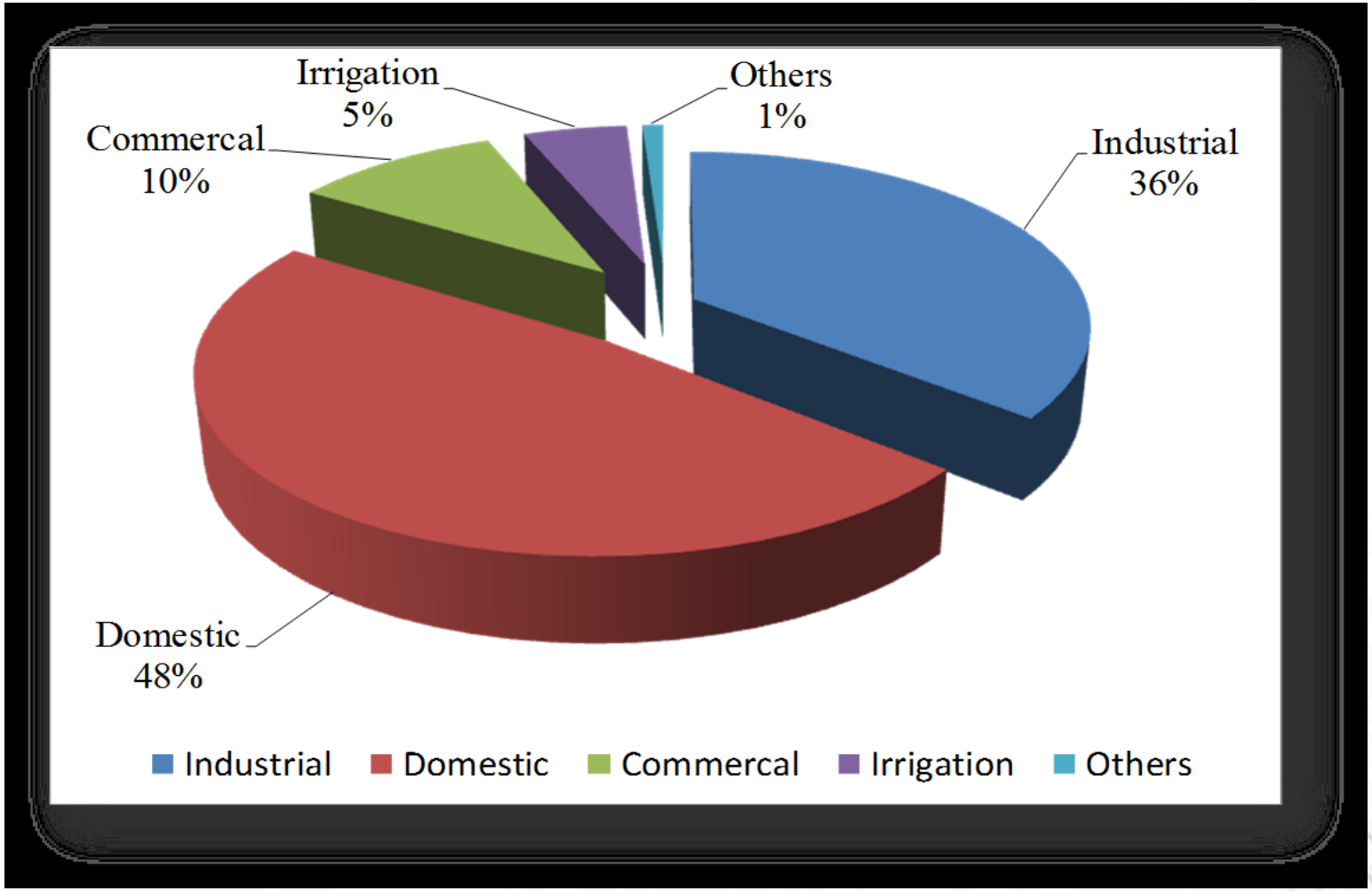
- Policy on RE and EE is already in place
- Targeted contribution of RE is 5% of total power generation by 2015
- By 2020, Government is planning to enhance it to 10%
- 6th Five year plan creates opportunity to save 10% of energy through EE

But Bottlenecks are still dominating

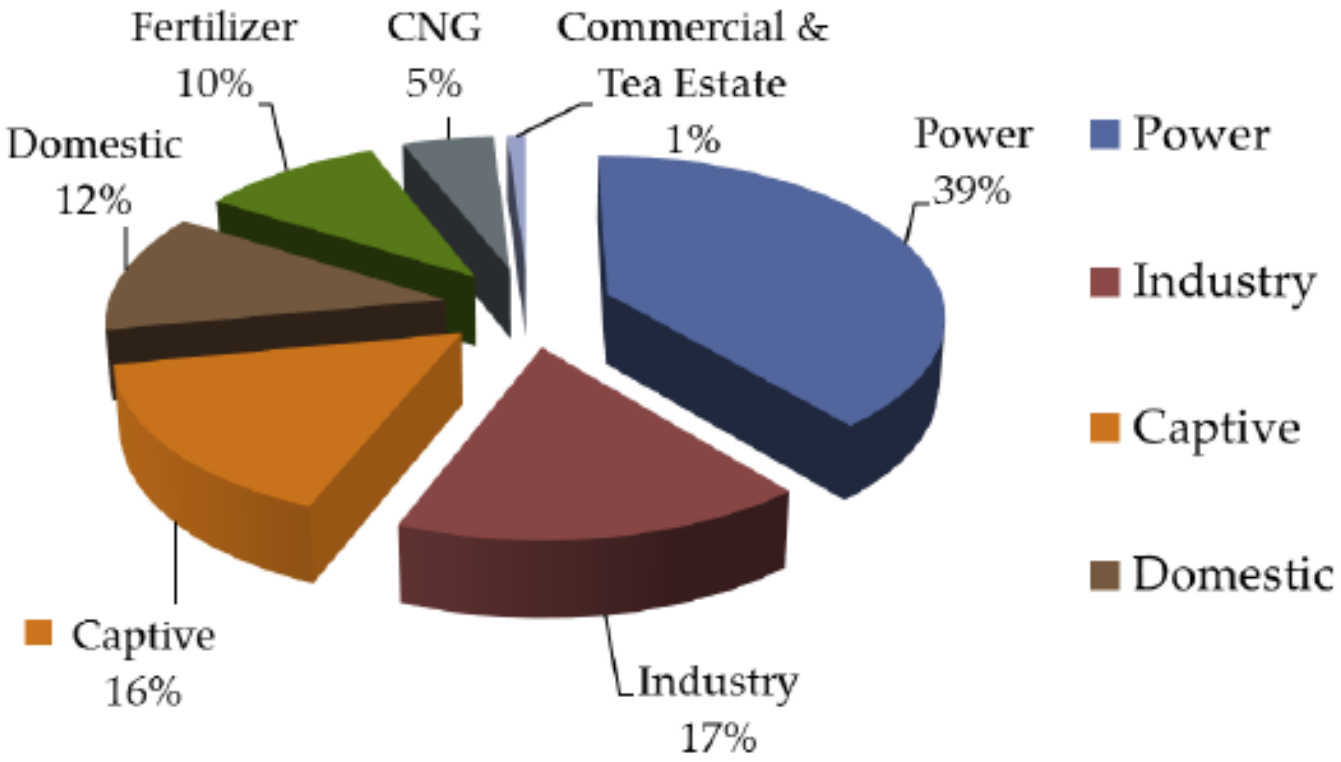
Bangladesh Power Sector: At a Glance (Sep 2015)

- ♣ Electricity Growth : 7%
- ♣ Max. Generation : 7817 MW
- ♣ Generation Capacity (installed) : 11,534 MW
- ♣ Total Consumer : 17.80 million
- ♣ Transmission Line : 9695 km
- ♣ Distribution Line : 3,26,000 km
- ♣ T&D System Loss : 13.55%
- ♣ Per Capita Generation : 371 kWh/ annum
- ♣ Access to Electricity : 74%

Category wise electricity consumption



Category wise gas consumption

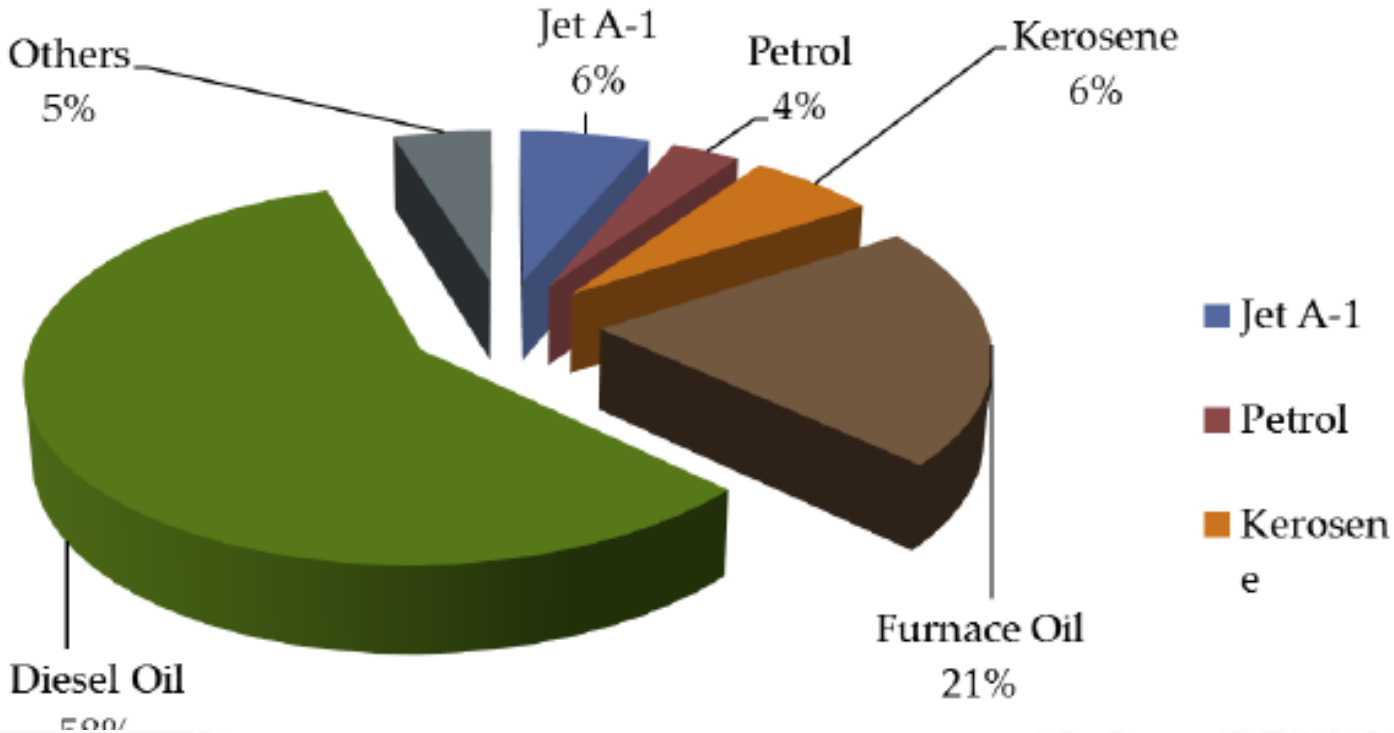


Total Gas Consumption in FY 2013-14: 820 BCF

Sale of Petroleum Product

FY 2013-14

Total – 5.45 million MT



Energy Demand & Supply in Bangladesh

- Present Demand for Natural Gas = 2500 mmcfd
- Present Production of Natural Gas = 2000 mmcfd
- Shortage of Natural Gas = 500 mmcfd

- Present Demand for Electricity = 8000 MW
- Present Generation of Electricity = 7000 MW
- Shortage of Electricity = 1000 MW

Impact on Environment

In 1896, the Swedish scientist Svante Arrhenius predicted: "Human activities would interfere with the way the sun interacts with the earth, resulting in global warming and climate change."

Environmental Issues:

- Ozone layer depletion
- Global warming
- Loss of biodiversity

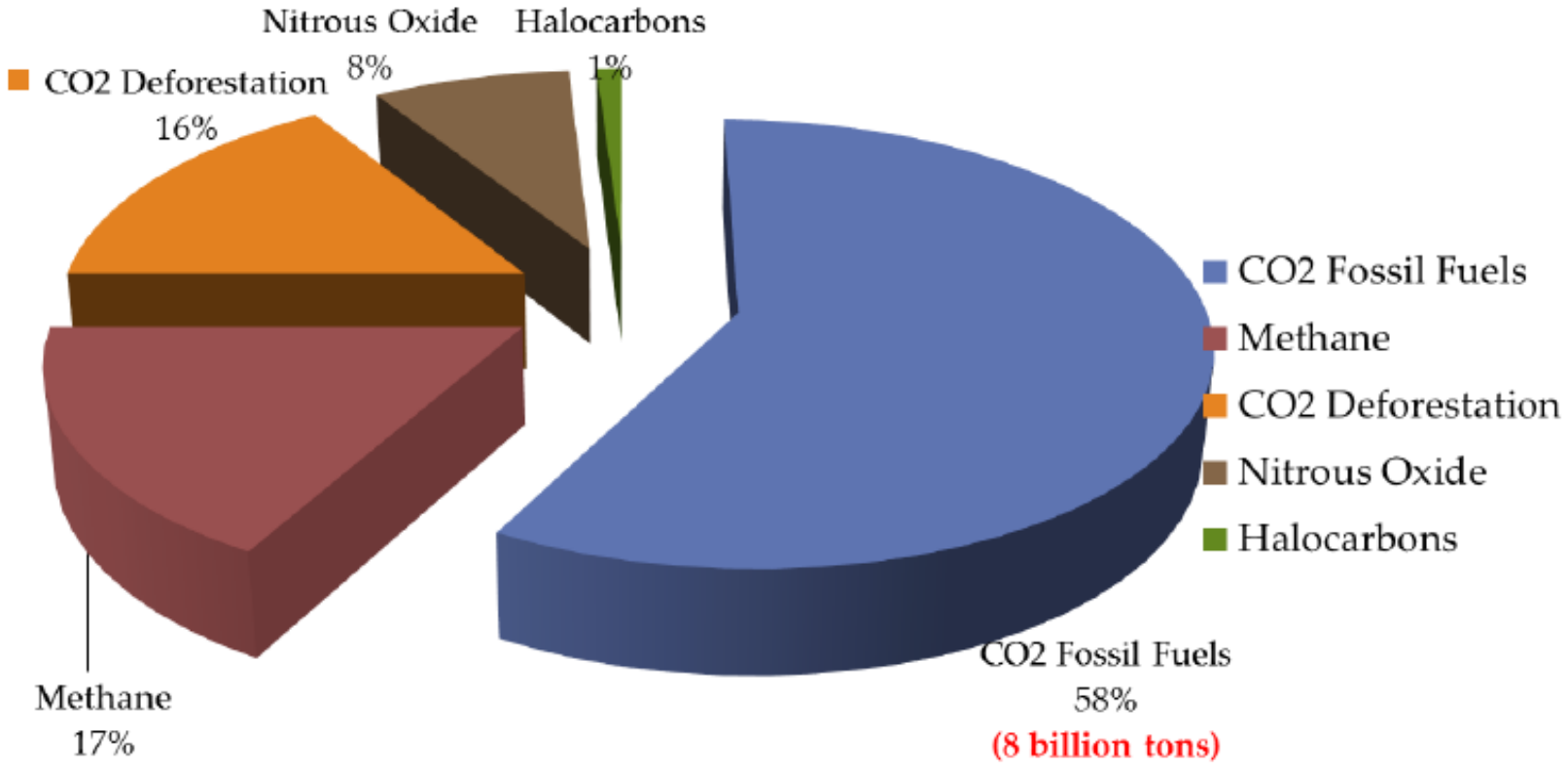
Global Warming & Greenhouse Gases:

- CO_2 is released when solid waste, fossil fuel & wood are burned
- CH_4 is emitted during production & transport of coal, NG & oil

Global Warming (Climate Change) Implications:

- Global temp. will rise about 6°C by 2100
- Sea Level will rise to 9 to 88 cm by 2100
- Food shortages and hunger

Share of Greenhouse Gases



Adoption of Most Efficient Energy Conservation Measures: Why??

- Rising Costs of Energy
- Limited Availability of Energy Resources
- Global Competitive Market of Products
- Global Warming & Climate Change

Energy Efficiency Programs in Bangladesh

- Energy Monitoring Unit was initiated by the M/o Power, Energy & Mineral Resources and World Bank in 1984
- Renamed as Energy Audit Cell (EAC) and attached with the office of Electrical Advisor & Chief Electric Inspector in 1999
- US & UK consultants worked with EAC for eight years
- EAC conducted energy audits in more than 200 plants of all industrial & power sectors
- Sustainable & Renewable Energy Development Authority (SREDA) Act enacted in December 2012
- CCEB has been working in EE Programs since 2013

Why is Energy Conservation Program Important?

- Energy Is Now too Expensive to Be Wasted
- A kWh Saved Is Better than a kWh Generated
- Energy Conservation Is Now Considered as a 5th Fuel
- Reduction of Air Pollution

National Natural Gas Savings By Boiler Efficiency Improvement Only

Year	Total Gas Production in the Country	Total Gas Used in Power Plant, Fertilizer sector & other Industries	Total Gas Used in Boilers of Power Plants & all Industries	National Annual Savings Due to 5% Improvement of Efficiency in Boilers of the country	
				Gas Savings	Financial Savings
	BCF	BCF	BCF	BCF	Crores Tk.
1	2	3 = 2 x 0.80	4 = 3 x 0.7	5	6
2013-14	820	656	459	27	516

Note :

Gas price (Industrial) = 6.74 BDT/m^3

= 19.09 Crores BDT/BCF

EE IMPROVEMENT OPTIONS:

1. Control excess air input to boiler
2. Insulate bare steam pipes
3. Repair steam leaks
4. Maintain steam traps
5. Improve condensate reovery

National Electricity Savings by DSM

Year	Total Electricity Generation			Technical System Loss	Net Total Sale	National Annual Savings (5% of Total Sale) By DSM	
	By BPDB	By IPP	Total (BPDB+IPP)			Elect. Savings	Financial Savings
	GWh	GWh	GWh	GWh	GWh	GWh	Crores Tk.
1	2	3	4 = 2+3	5	6 = 4-5	7 = 6 x0.05	8
2013-14	23926	21900	45836	900	44936	2247	1701

Note :

Considering average elecricty price = 7.57 BDT/kWh
= 0.757 Crores BDT/GWh

SOME OPTIONS FOR DEMAND SIDE MANAGEMENT:

1. Proper load management
2. Installation of intelligent motor controller
3. Use of CFL
4. Use of electronic ballast
5. Day light savings
6. Reducing use of electricity in peak hour
7. Close shopping malls by 7.00 PM
8. Separate billing system for air-conditioners
9. Standardization of all domestic & commercial electrical appliances
10. Restriction for single cycle future power plants should be enacted

Efficiency vs. Conservation

Efficiency

- Energy efficiency involves the use of technology that requires less energy to perform the same function.
- Focuses on the equipment or machinery being used
- One example is installing LED light bulbs throughout the house

Conservation

- Energy conservation includes any behavior that results in the use of less energy.
- Focuses on the behavior of people
- One example is using daylighting through windows rather than turning on the lights

Benefits of Energy Efficiency

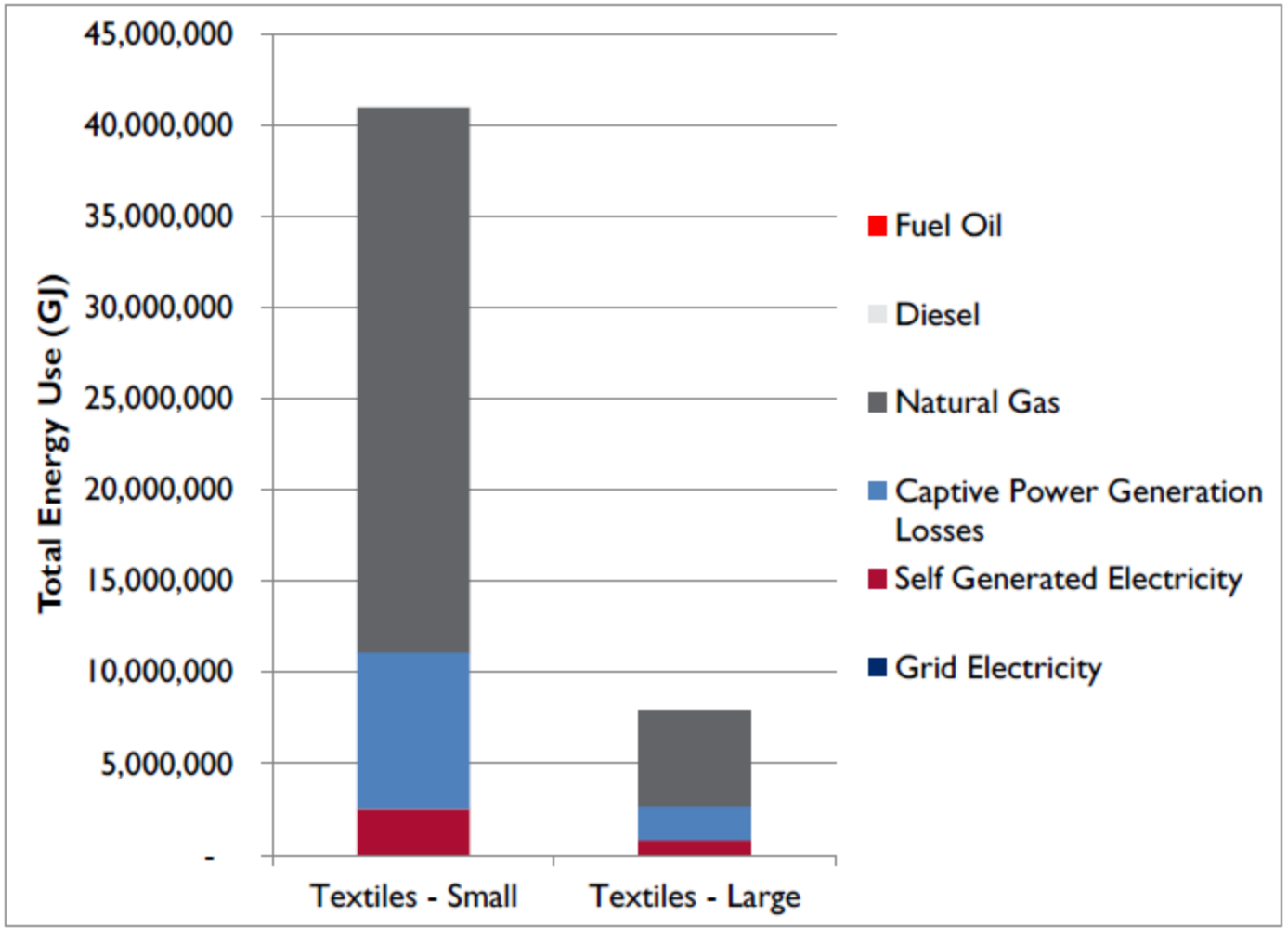
International	• Reduced GHG emission • Energy prices • Resource management • Development goals
National	• Job creation • Public budget impacts • Macroeconomic effects • Energy security
Sector Specific	• Industrial productivity and competitiveness • Energy provider and infrastructure benefits • Asset values

Barriers Towards Industrial EE

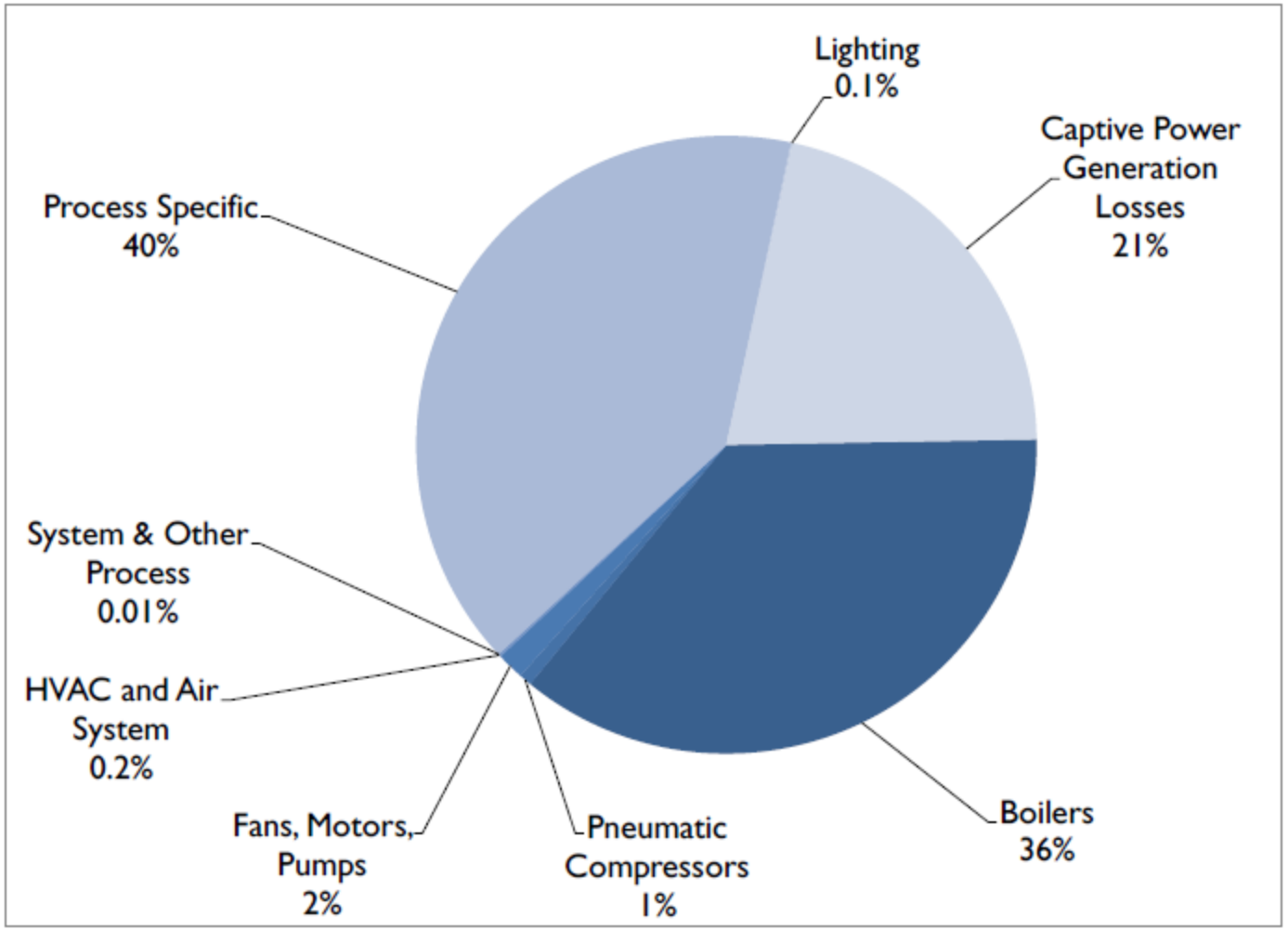
- Lack of Access to Information on Energy Use
- Lack of Awareness in the Industry
- Lack of Investment Capital
- Financial Institutions not properly educated with EE financing
- Perceived Risk of EE Investments
- Lack of Industry Energy Policy
- Lack of Access to Modern Technology

Case Study: Energy Audit Report of Textile Industry

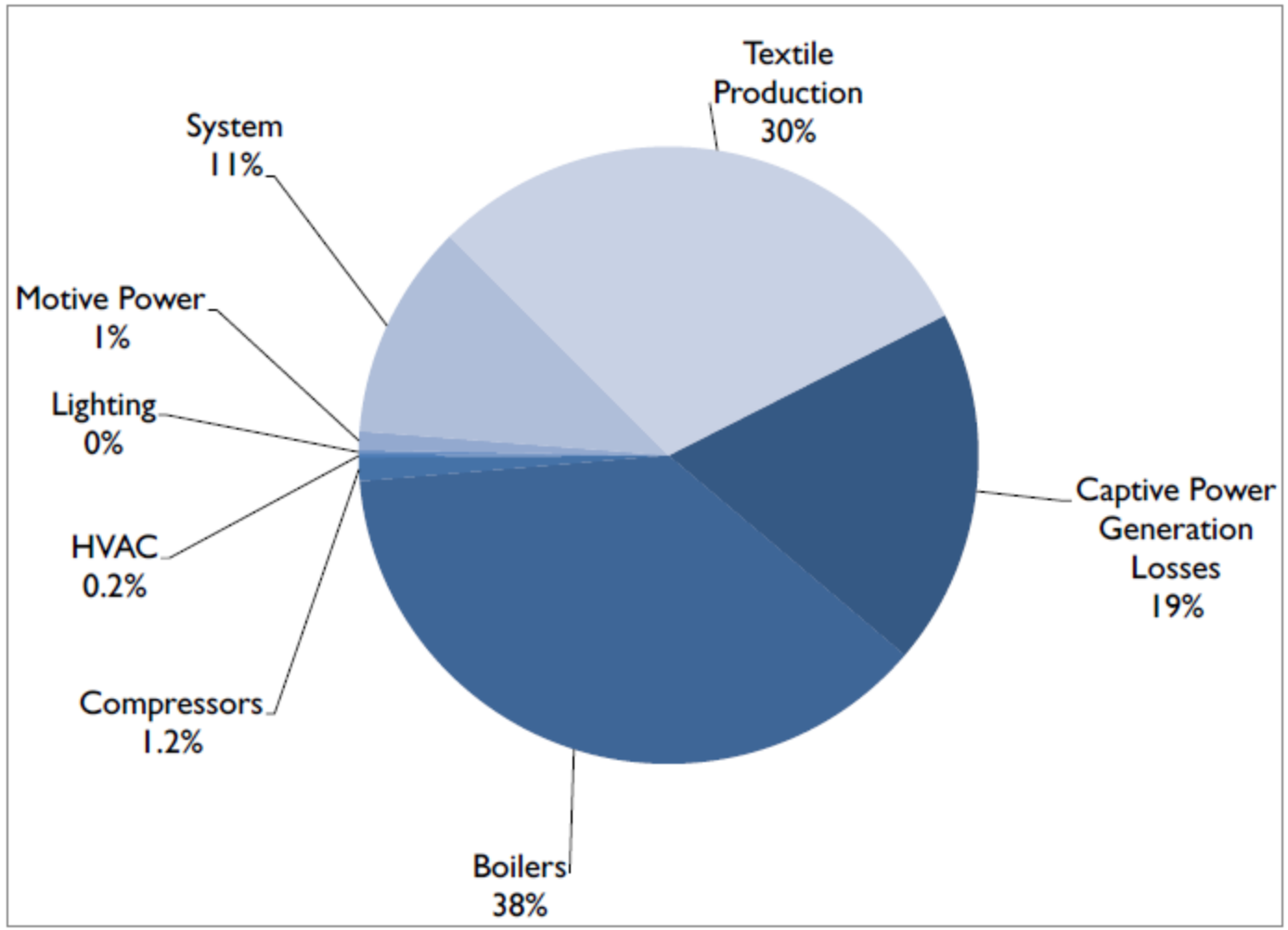
Case Study: Textile Energy use



Textile energy consumption



Textile: Potential source of savings



Case Study: Textile

Type of Business	Textile & Hosiery
Location	Gazipur
Products	T Shirt, Polo Shirt, Jacket, Trouser etc
Turnover	205 Crore
Business experience	20 years
Purpose of financing	Energy Efficient Initiatives
Project cost	3.21 Crore
Proposed security	Land mortgage, PDC, PG
DSCR	1.5

Case Study: Key Issues

- Replacement of old boiler with a new high efficiency boiler
- Utilization of Exhaust Gas from GEG in Process Heating
- Compressor Motor Control by Variable Frequency Drive (VFD)
- Old low efficiency motors are to be replaced by energy efficient inverters
- Replace existing dyeing machine with cold pad batch (For cotton fabrics only)
- Stenter Exhaust Recovery to Produce Hot Water
- Installation of New Energy Efficient Lights replacing the old T-8 lights

Case Study: Projected Financials

EE Options (To be implemented)	Investment (in Million BDT)	Annual Savings (in Million BDT)	NPV (in Million BDT)	IRR (%)	Payback (in Months)
Replacement of old boiler	19	8.5	44.5	76	26
Utilization of Exhaust Gas	5.4	1.8	7	74	24
Use of Variable Frequency Drive	0.3	0.16	0.45	57	28
Replacement of old motor	3.8	5.66	20.4	80	22

Few Projects: Energy Efficiency

Going Forward