Opportunities in Energy Efficiency: Green Building and the Industrial Sector

USAID's Energy Efficiency for Clean Development Program (EECDP)

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Opportunities in Energy Efficiency

Quantifying Opportunities Using Best Practices in Benchmarking

Bill Tubbs

Senior Manager – Energy and Climate

Goals

- Which industrial sectors have the greatest opportunities for EE?
- What are the barriers to pursuing EE opportunities within those sectors?
- What intervention strategies will be effective?

→ Program Design

EE Opportunity Assessment

Steps

1. Industry sector selection
2. Industry profiling
3. Target industry selection
4. Participant recruitment
5. Plant assessments
6. Technical savings potential analysis
7. Cost benefit analysis
8. EE investment opportunity

Group Exercise – Industry Sector Profiling

Instructions:

1. Read handout information on your chosen sector
2. Compete your sector profile as a group
3. Present to rest of group to created combined summary

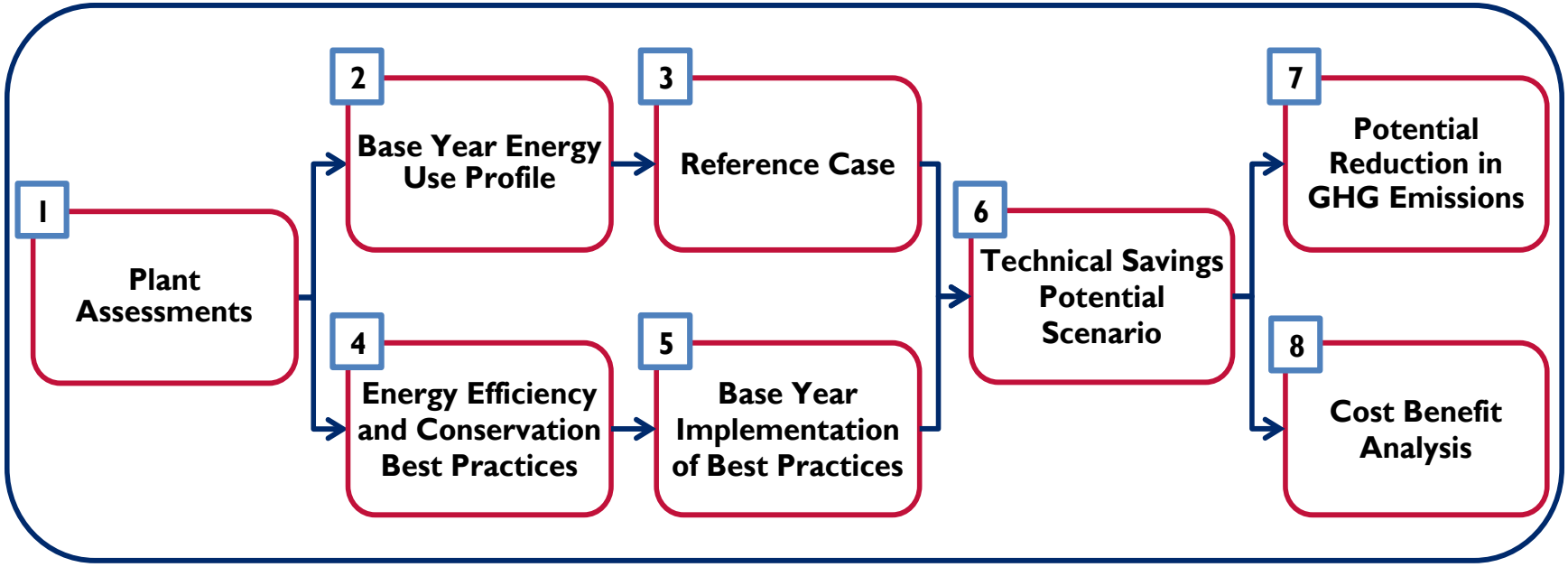
Industrial Sectors

- Textiles
- Jute
- Frozen food processing
- Steel re-rolling mills
- Fertilizer
- Leather and leather goods
- Tea
- Ceramics

Group Exercise – Industry Sector Profiling

Characteristics	Industry 1	Industry 2	Industry 3	Industry 4
Type of activity	Extraction / Refining / Value-add			
Economic impact	High / Med / Low			
Technological sophistication	High / Med / Low			
Capital intensity	High / Med / Low			
Labor intensity	High / Med / Low			
Energy intensity	High / Med / Low			
Total energy consumption	(% of national total)			
Economic projections	Growing / Steady / Declining			
Number of facilities and size	Total #, small, medium, large			
Ownership profile	Foreign / domestic / public			
Industrial association(s)	Yes / no			
Industry priorities/issues	list top 1 or 2			
Potential EE opportunities	list 1 or 2			

Energy Performance Benchmarking and Conservation Potential Analysis Process

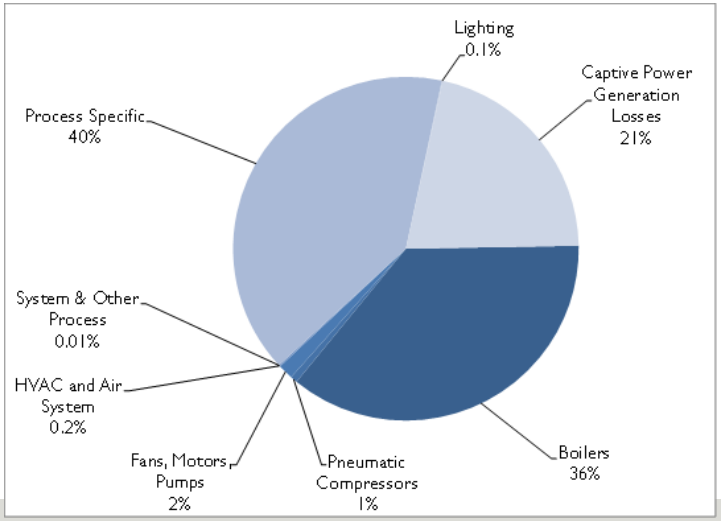


EE Opportunity Assessment

Results: Base Year Energy Use Profile

- Natural gas supplies most of the energy industry needs
- 21% of the total energy use is lost in on-site power generation.

Textile Sector Base Year Energy Use by End Use



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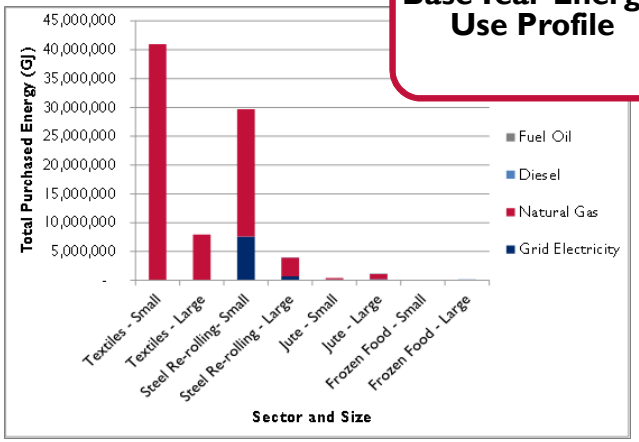
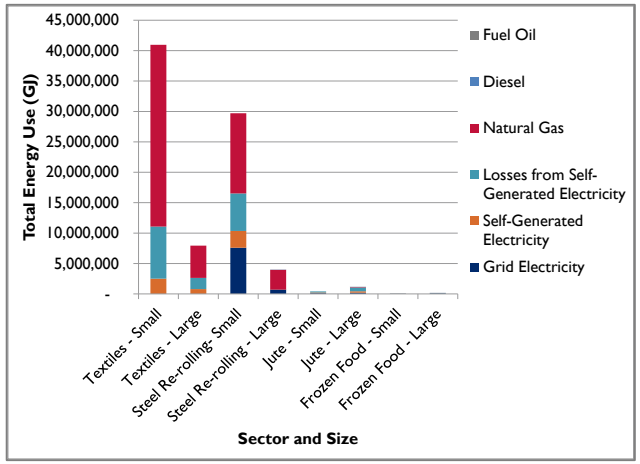
Base Year Energy Use Profile





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EE Opportunity Assessment

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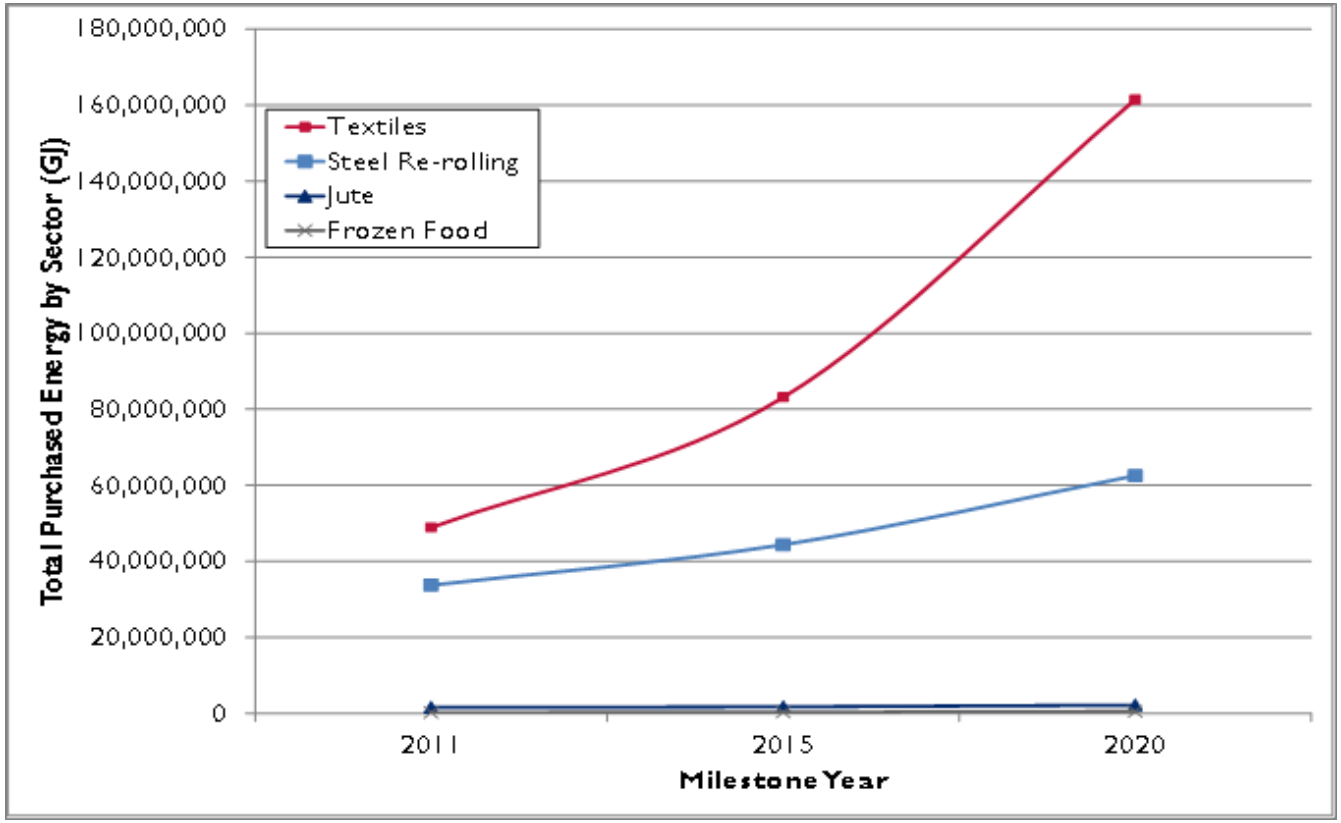
Reference Case

Results: Reference Case Scenario



EE Opportunity Assessment

Technical Best Practices (TBPs)

Exhibit 4.16: Tex

Sub-Process	Tec
Bleaching	Insta mach Inter oper Redu Use supp Heat Use 'Con stear Enzy Use
Drying	Avoi Care Goo stear Use End Make fabri Recc

Utilize mechanical pre drying systems (mangles, centrifuges, suction slots, air knives)	Medium	Medium
Avoid intermediate drying in cylinder dryer	High	High

Exhibit 4.13: Generic Technical Best Practices

End Use	Technical Best Practice	Relative Cost	Difficulty of Implementation
System and Other Process	Power factor correction	Low	Low
	Electricity demand management control system	Low	Medium
	Heat exchanger maintenance and repair	Medium	Medium
	Sub-metering and interval metering	Medium	Medium
	Heat exchanger optimization	High	High
	High efficiency dry-type transformer	High	High
	Integrated control system	High	High
Indirect heating	Insulation	Low	Low
	Load management assessment	Low	Low
	Preventative boiler maintenance	Low	Low
	Steam trap surveys completed within past 2 years and faulty traps repaired	Low	Low
	Minimize de-aerator vent losses	Low	Medium
	Advanced boiler controls	Medium	Medium
	Automated blowdown control	Medium	Medium
	Blowdown heat recovery	Medium	Medium
	Boiler combustion air preheat	Medium	Medium
	Boiler water treatment to remove impurities	Medium	Medium
	Condensate return	Medium	Medium
	Economizer	Medium	Medium
	Flue gas monitoring	Medium	Medium
	High efficiency burner	Medium	Medium
	Process heat recovery to preheat makeup water	Medium	Medium
	Boiler load management	High	Medium
	Efficient boiler system	High	Medium

EE Opportunity Assessment

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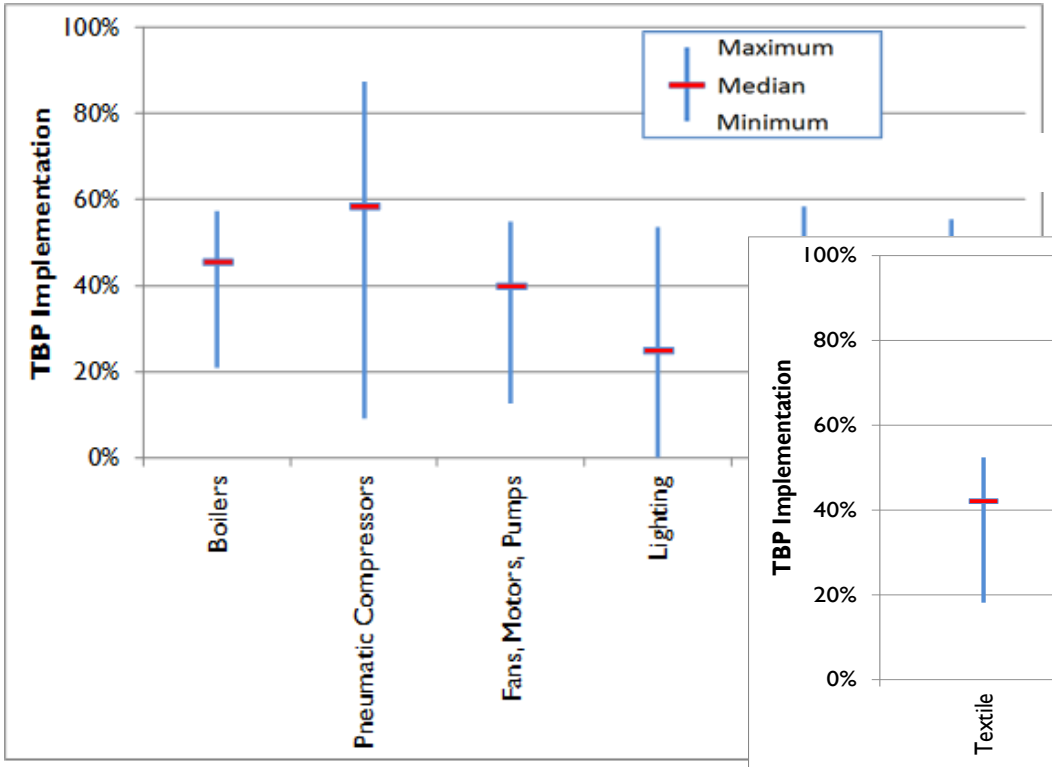
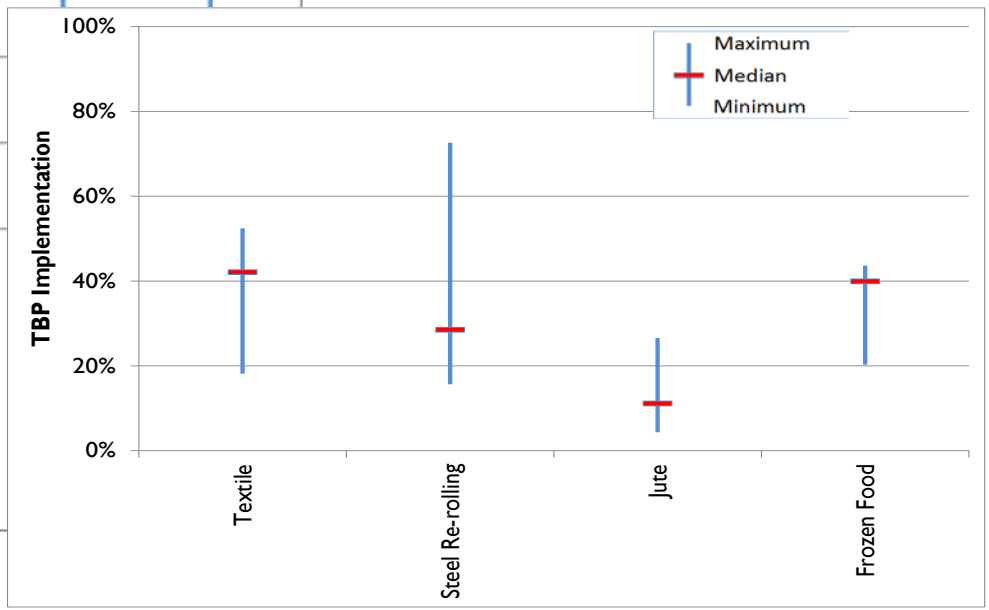
Base Year Implementation of Best Practices

Implementation of TBPs

Textile Sector Implementation of TBPs



Implementation of TBPs by Sector



EE Opportunity Assessment

Results: Technical Savings Potential

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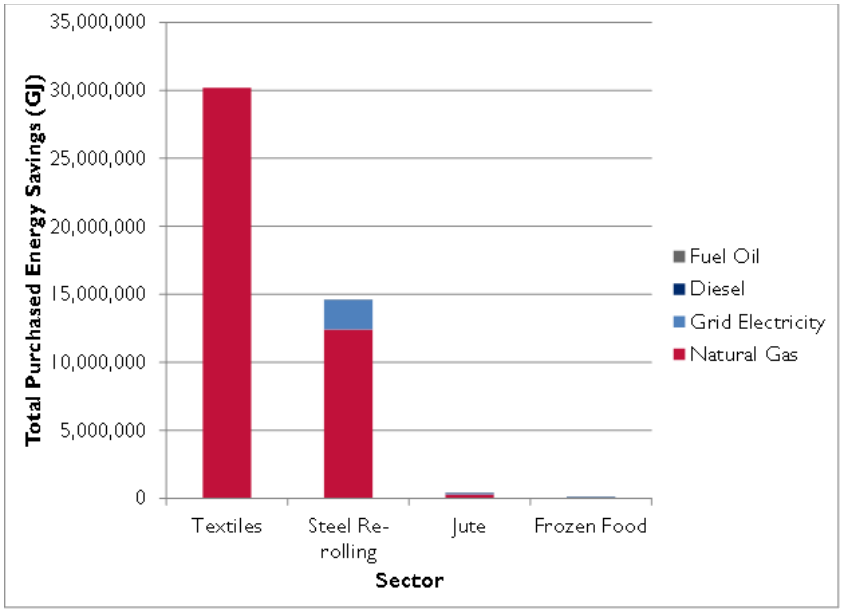
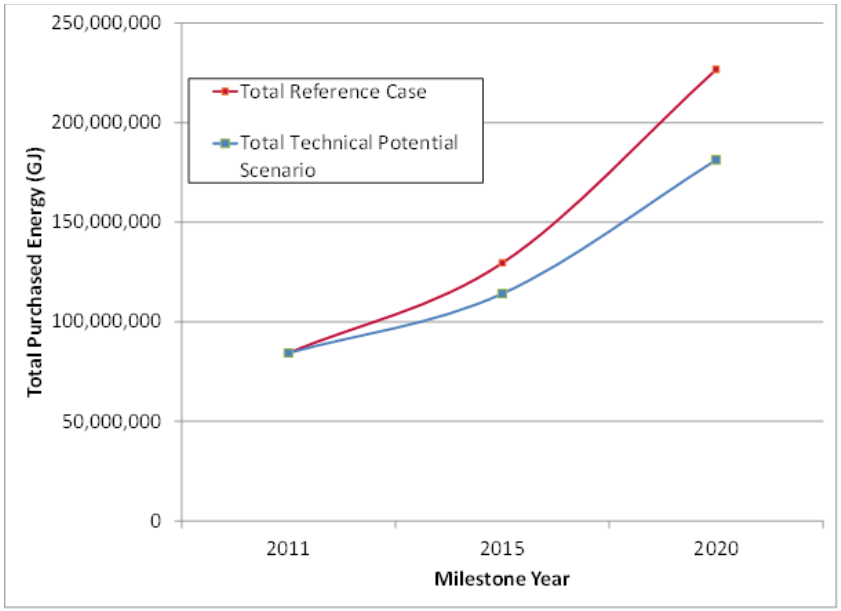
Technical Savings Potential Scenario

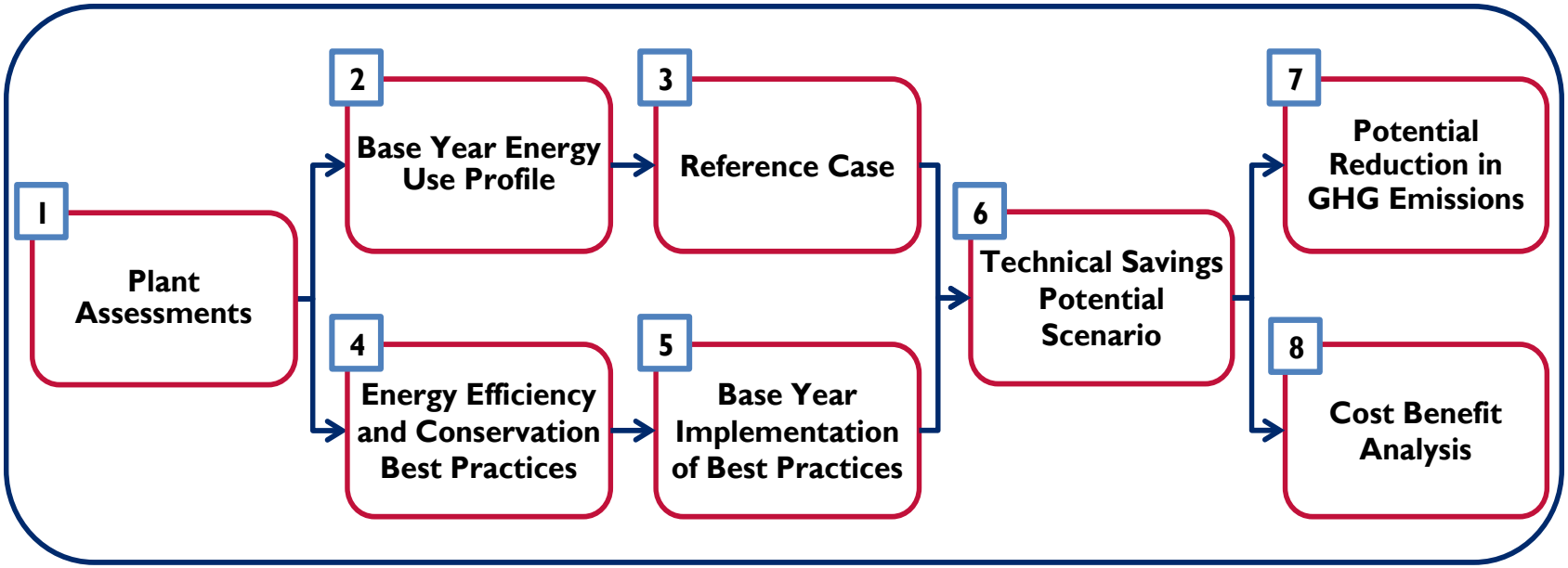
Technical Savings Potential by Sector and Energy Type for 2020



Total Reference Case and Technical Potential Scenario Energy Use



Energy Performance Benchmarking and Conservation Potential Analysis Process

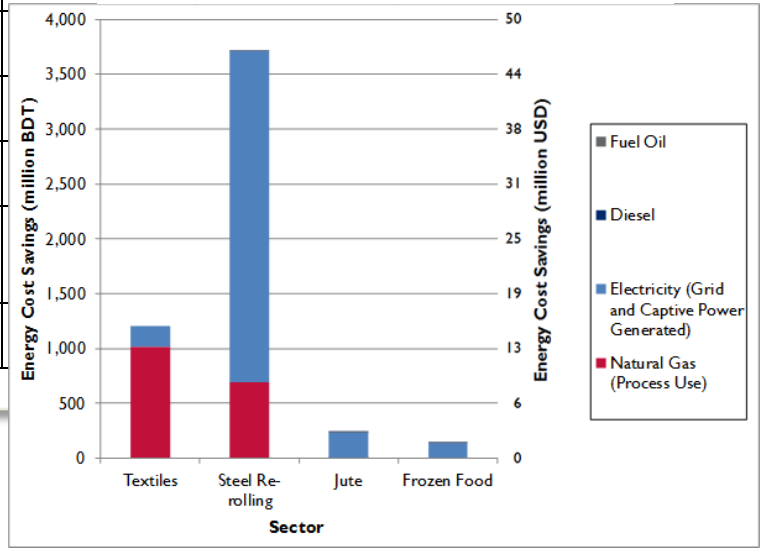


Results: Cost Benefit Analysis

Cost Benefit Analysis for Top Textile Specific Opportunities

Measure	Energy Savings[1]	Capital Cost - including Installation (BDT)	Incremental O&M Cost (BDT/year)	Payback Period (Years)
'Airflow dyeing machine' in place of conventional jet dying machine	60%	15,240,000 (USD 187, 340)	N/A	5 to 9
Heat recovery systems in continuous washing machines	50%	880,000 to 1,900,000 (USD 10,820 to 23,360)	N/A	2 to 3
Use of 'Counter flow current of water for fabric washing' technology	45%	756,000 to 1,080,000 (USD 9,290 to 13,280)	N/A	1 to 2.5
Installation of heat recovery in stenter exhaust for heating air or process water	30%	6,160,000 (USD 75,720)	N/A	
Use of directed air over the drying cylinders	17%	700,000 to 1,400,000 (USD 8,600 to 17,210)		
Use of Mechanical dewatering systems (mangles, centrifuges, suction slots, air knives) in stenters	15%	120,000 (USD 1,480)		
Recover condensate and flash steam in cylinder dryers	12%	320,000 to 400,000 (USD 3,930 to 4,920)		
End panel insulation in cylinder dryer	5%	80,000 to 160,000 (USD 980 to 1,970)		
Close exhaust streams during idle periods in stenter	5%	N/A		

Total Technical Savings Potential in 2015



Is There An Energy Efficiency Gap?

If real (profitable) energy efficiency opportunities exist, why are they not implemented?

Rational Behavior **or** **Market Failure?**

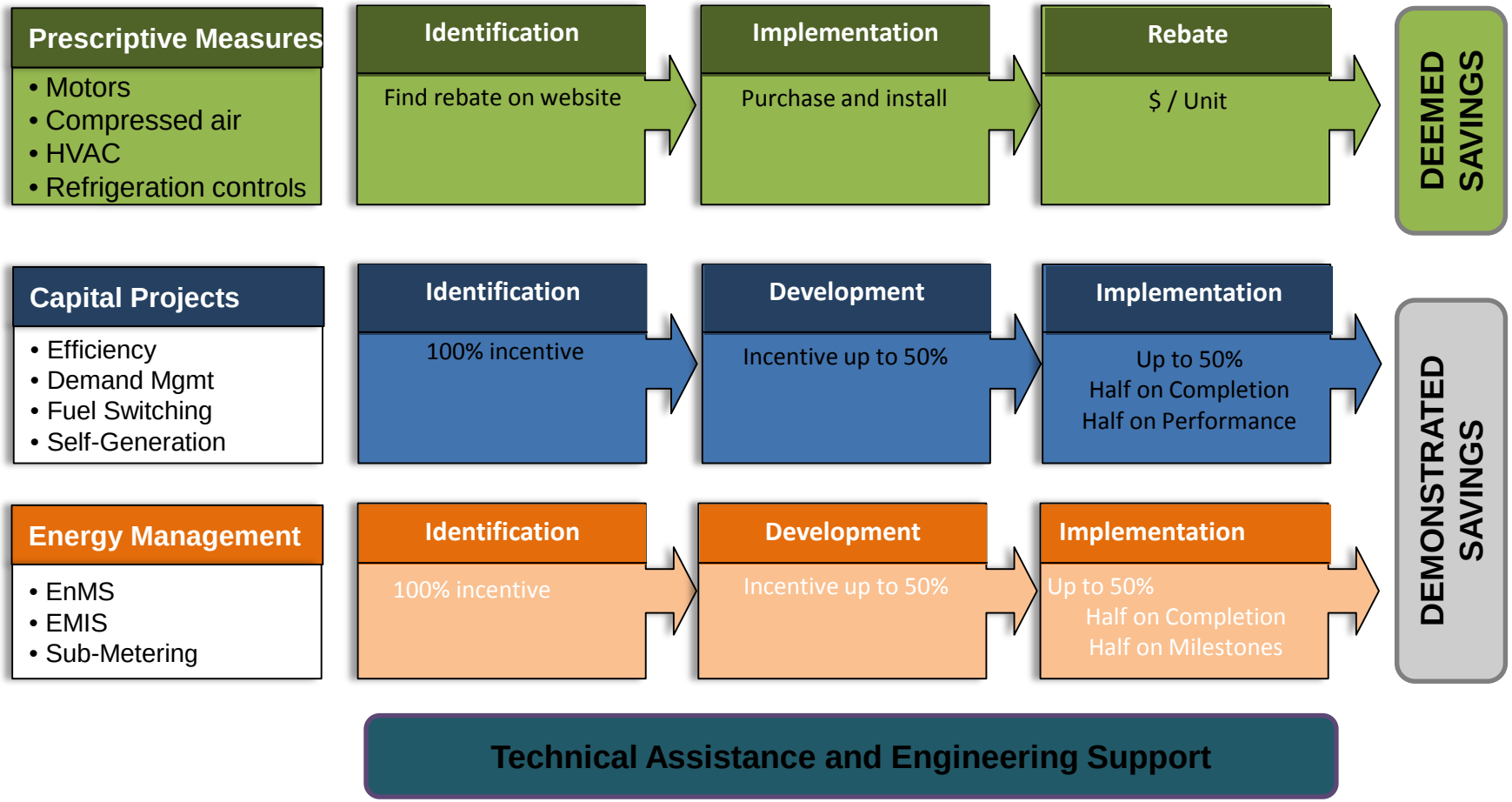
- Unidentified costs
- Risks
- Exaggerated benefits
- Better opportunities exist

- Imperfect information
- Principal-agent problems
- Subsidized energy prices
- Un-internalized externalities

Common Barriers To Implementation

Information	• Lack of data on energy use and costs • Lack of awareness/information on opportunities • Contradictory information
Financial	• Transaction cost • Perceived high risk • Low return or high hurdle rate • Lack of financial services, collateral, etc.
Technical	• Non-existent or immature technology • Equipment or qualified technicians not available locally • Technology risk
Institutional or Cultural	• Regulatory barriers that constrain the market • Principal-agent problem • Low awareness, and/or trust in the end results
Market	• Incomplete coverage of the territory • Technology dumping • Second-hand market

Market Capacity Building

ACTORS	DESIRED OUTCOME
Industry	• Treat energy as a manageable production cost • Accountabilities for energy performance management • Develops capacity to identify and assess EE opportunities, develop business case and sell internally
EE Service Providers	• Understanding of market opportunities • Capacity to develop, sell and implement EE technologies and services to industry • Marketing and sales channels
Financial Sector	• Identify EE as a business opportunity • Develop methods and tools to assess value and risk • Experience in financing EE projects in the industrial sector • EE financial products and service offerings
Government and Utilities	• EE policy • Capacity building • Design and implementation of supporting programs

Industrial EE Program Design