# Opportunities in Energy Efficiency: Green Building and the Industrial Sector

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

**January 12-13, 2015**

**Washington, D.C.**

USAID FROM THE AMERICAN PEOPLE

ICF

Opportunities in Energy Efficiency

# Industrial Energy Efficiency: *Exploring Opportunities*

Bill Tubbs

Senior Manager – Energy and Climate

# Industrialization

**From Subsistence Agriculture**

**+ cottage industry…**

*Low Productivity*

Capital

Skilled Labour

High Quality Energy

**To Modern Industry**

*High Productivity*

# Energy Quality

**Attributes**

- Energy density
- Reliability
- Storage cost
- Transportation cost
- Safety
- Environmental impact

**Applications**

- Mechanical drive
- Heating
- Cooling
- Lighting
- Transportation
- Communications

1 GJ Steam

1 GJ Heat

1 GJ Natural Gas

1 GJ Diesel

1 GJ Electricity

1 GJ Biomass

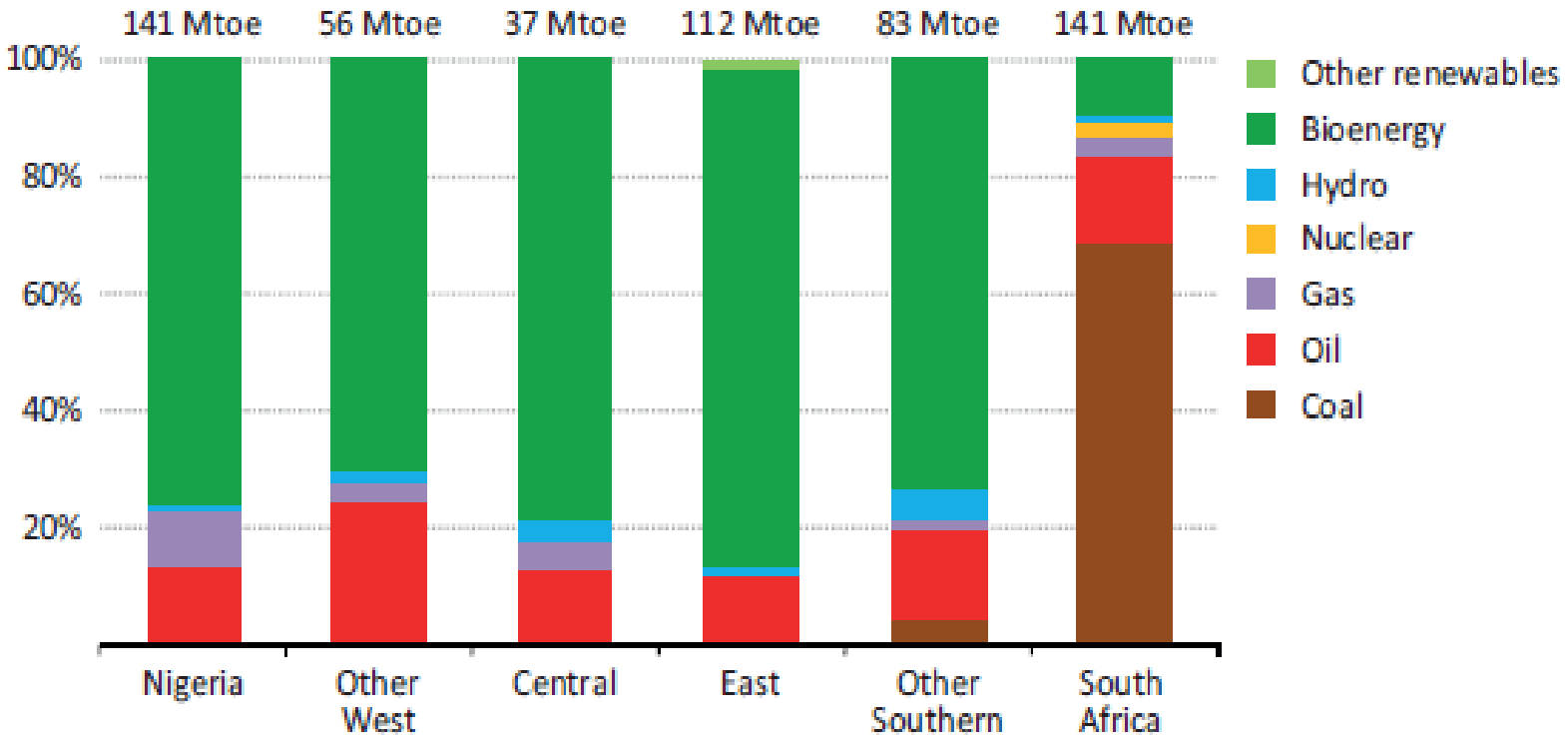
1 GJ Coal

1 GJ Crude Oil

1 GJ Hydro

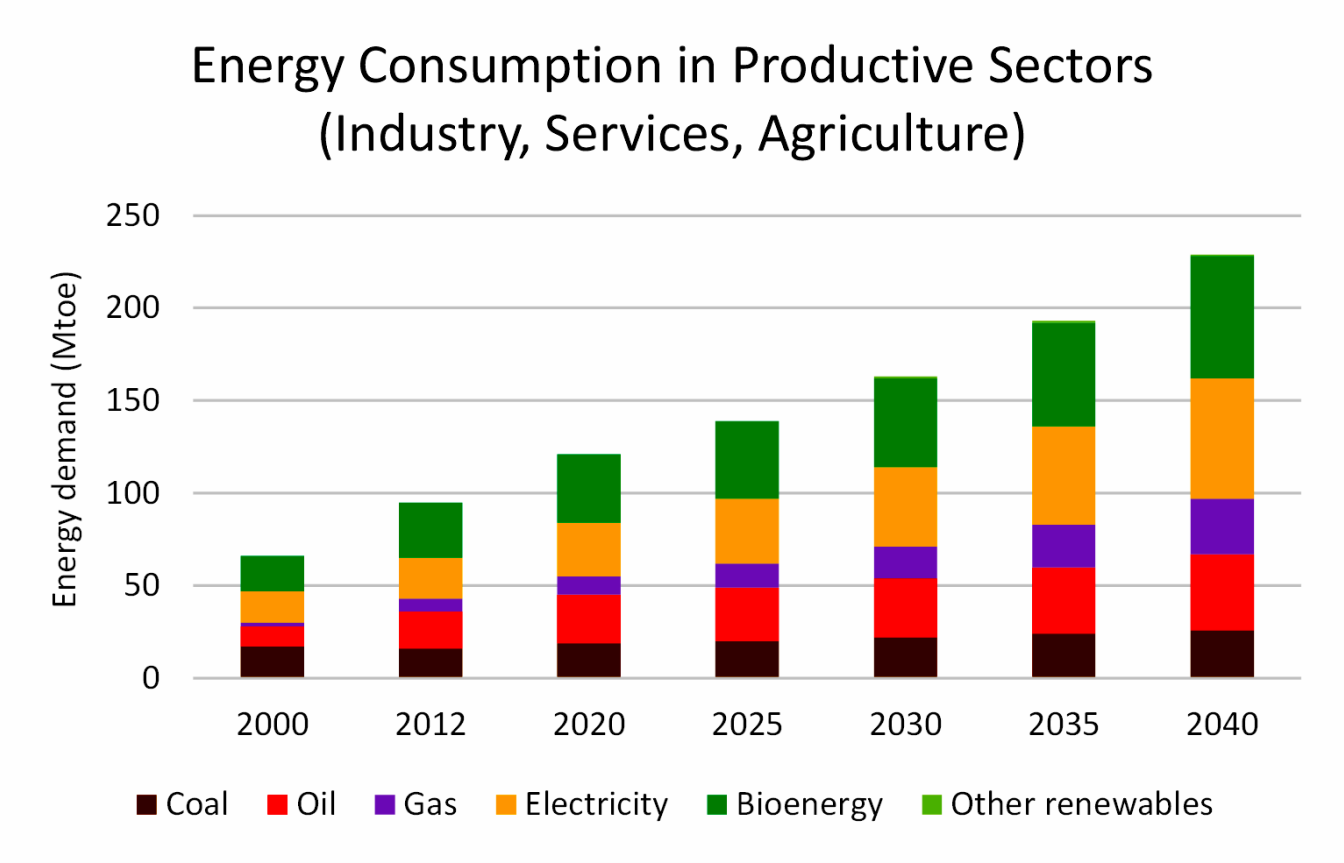
# Sub-Saharan Africa Context

**Figure 1.12 ▷ Sub-Saharan Africa primary energy mix by sub-region, 2012**




Data source: Africa Energy Outlook, Special Report, International Energy Agency, 2014.

# Sub-Saharan Africa Context




Data source: Africa Energy Outlook, Special Report, International Energy Agency, 2014.

# Industry Priorities

**Return on Net Assets (RONA)**

## Major Risks

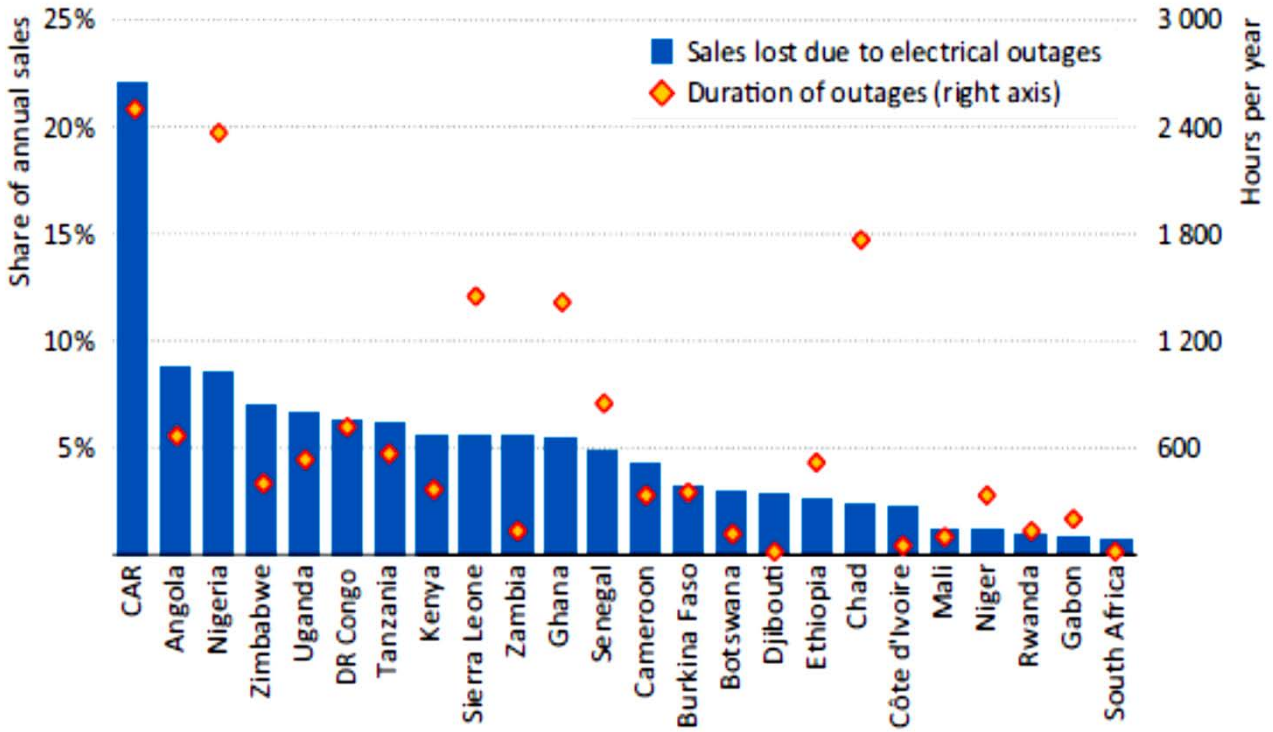
- Markets (prices, access)
- Supply base
- Asset performance
- Availability of skilled labor
- Operating costs (incl. energy)
- Technological obsolescence
- Regulation
- Functioning institutions
- Political stability

## Business Priority

- Minimize upfront capital
- Use proven, low-risk technology
- Operate continuously over full asset lifespan (reduce outages)
- Spend minimum on maintenance
- Avoid costly upgrades
- Reduce fixed costs
- Reduce variable costs
- Supply chain management

# Impact Of Energy Supply Reliability

**Figure 1.5 ▷ Duration of electrical outages and impact on business sales in selected countries**




Data source: Africa Energy Outlook, Special Report, International Energy Agency, 2014.

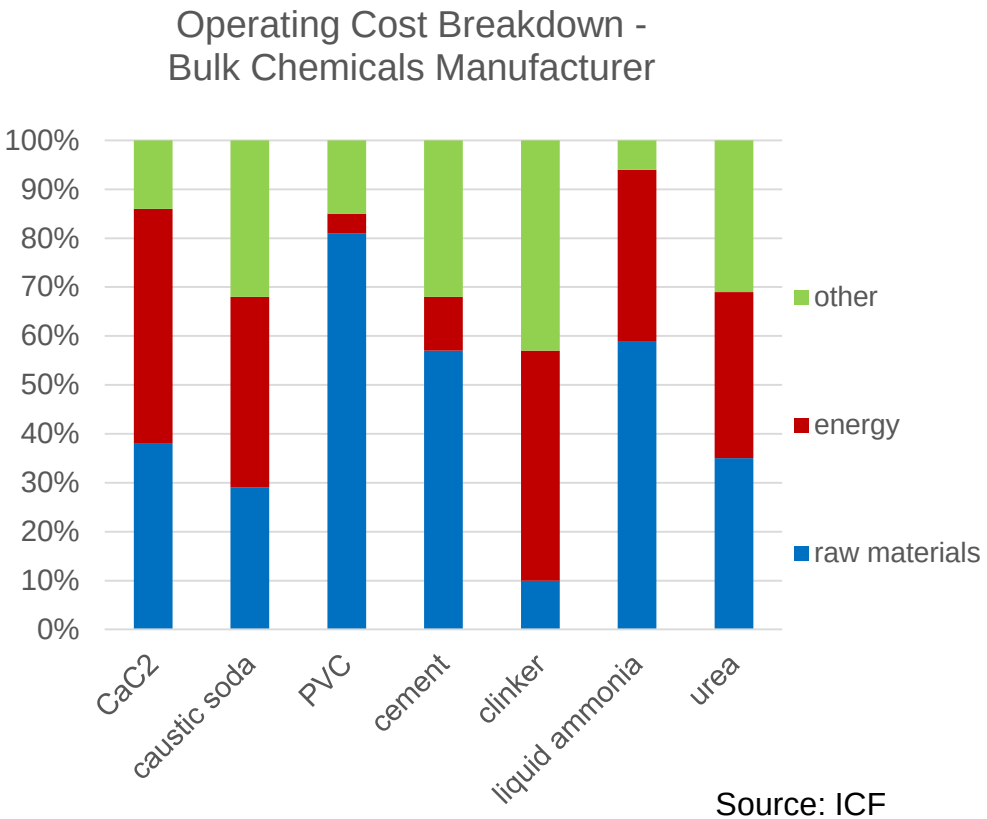
# How Important Is Energy Cost To Industry?

The relative importance of energy costs varies significantly:

- By industry type
- By process technology
- Due to local factors

Local factors:

- Energy prices
- Raw material costs
- Labor costs

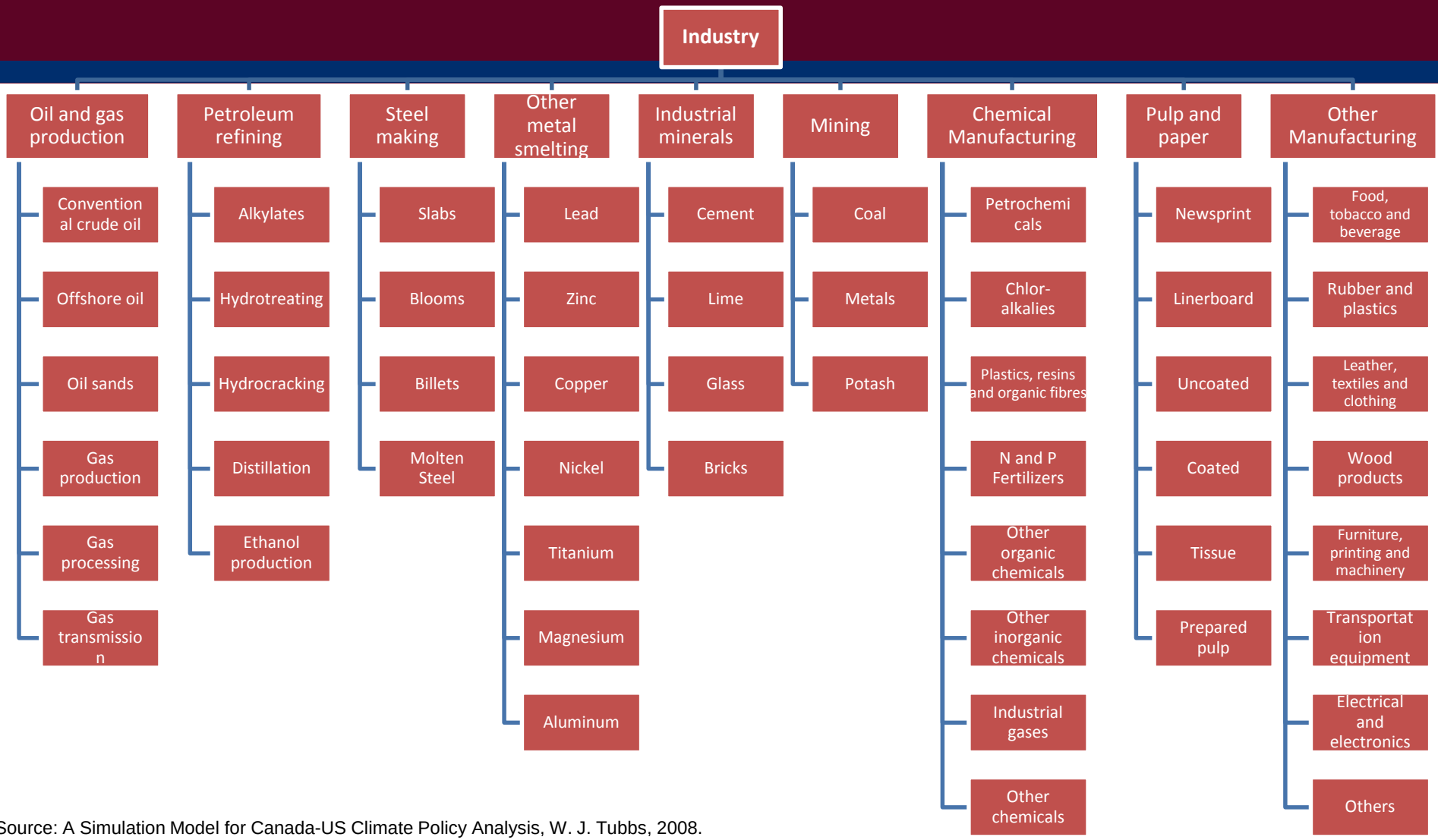



Source: ICF

# Heterogeneity In Industry

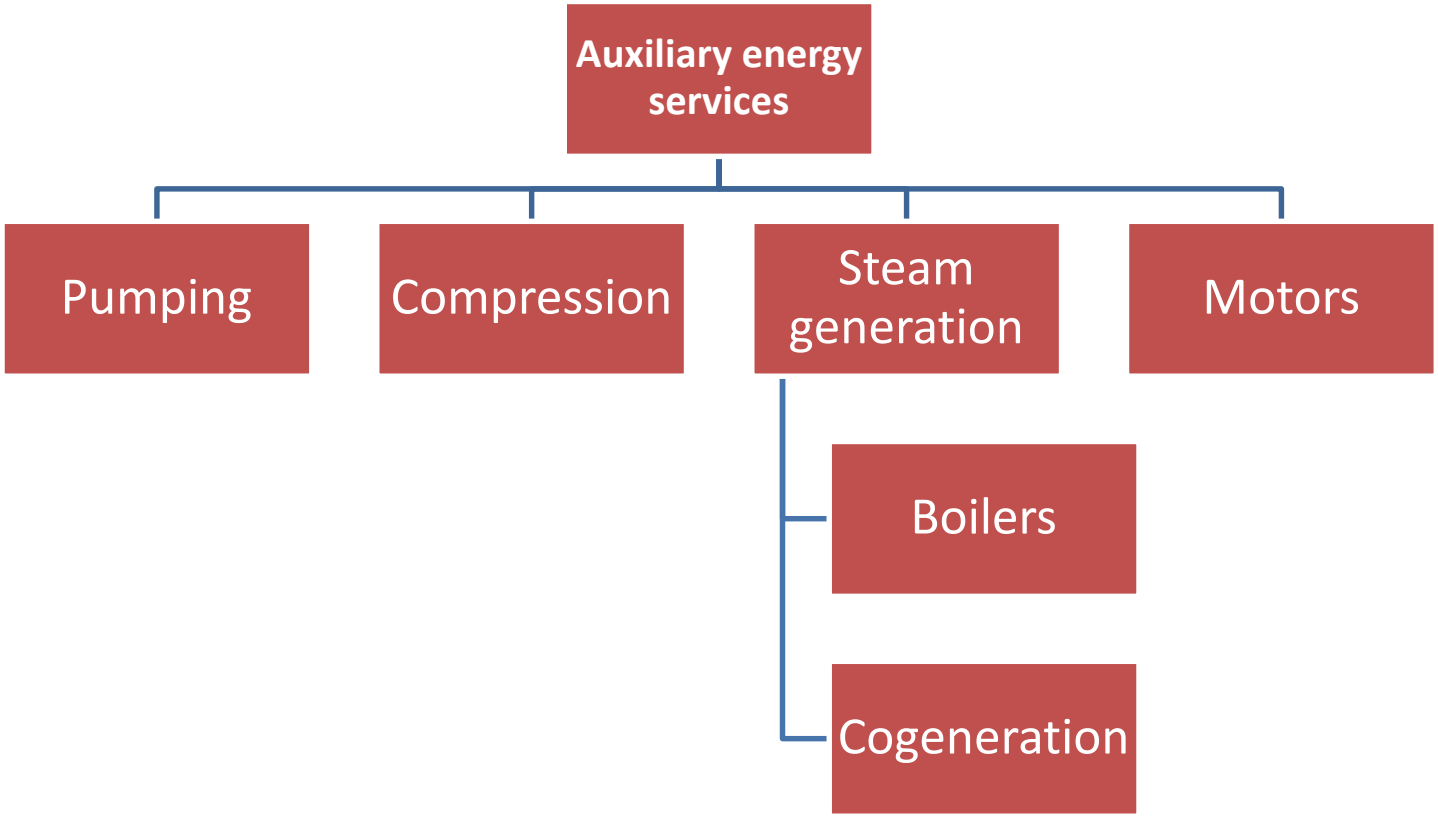
| Dimensions | Primary resources | Commodities | Consumer products |
|---|---|---|---|
| Type of activity | Extraction | Refining | Value-adding |
| Volume | Very high | Medium | Low |
| Product complexity | Low | Medium | High |
| Technological sophistication | Low | Medium | Medium/High |
| Capital intensity | High | High | Medium |
| Energy intensity | Medium/High | High | Low/Medium |
| Labor intensity | Low | Medium | High |
| Facility size | Varies | | |
| Company size | Varies from small local to multi-national | | |
| Ownership | Public/private | | |

# Heterogeneity In Industry




Source: A Simulation Model for Canada-US Climate Policy Analysis, W. J. Tubbs, 2008.

# Common Energy Services In Industry




Source: A Simulation Model for Canada-US Climate Policy Analysis, W. J. Tubbs, 2008.

# Bangladesh - Industry Profiles

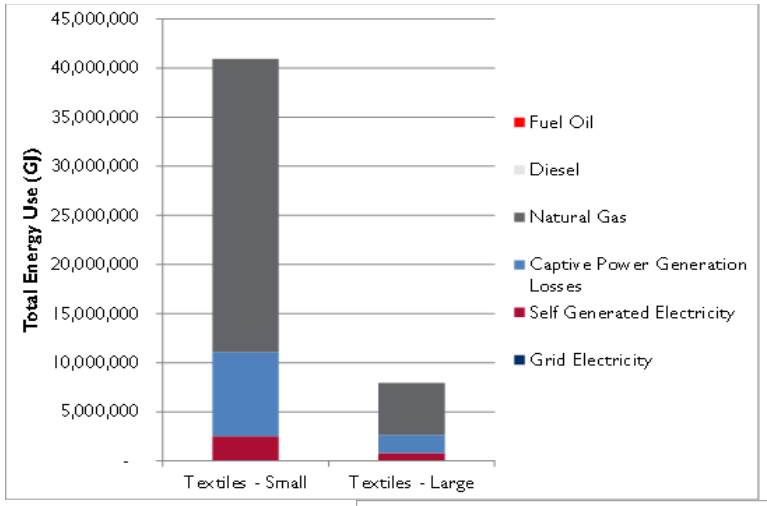
**Contents:**

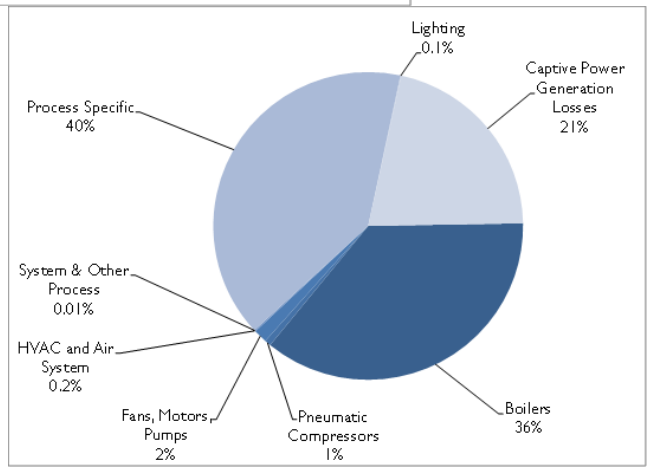
- Textile Manufacturing
- Jute Manufacturing
- Steel Re-Rolling Mills
- Frozen Food Processing

# Bangladesh - Industry Profiles

## Textile Manufacturing

- 79% of national exports
- Labor force: ~ 3 million
- Company ownership: 95% local
- Number of facilities: 1,400
- Almost all energy from natural gas
- Generates its own electricity - almost no electricity purchased from the grid
- Energy used mostly in process specific end-uses and boilers
- 21% of the total energy use is lost in the power generation process

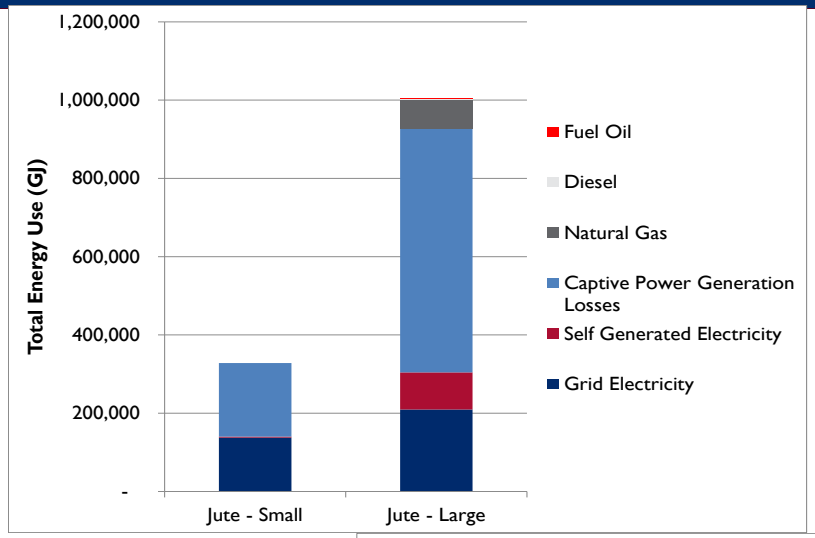


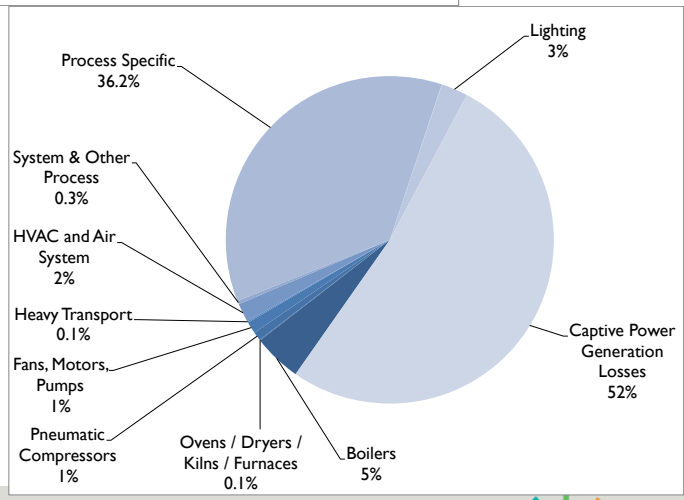



# Bangladesh - Industry Profiles

## Jute Manufacturing

- 4.6% of national exports
- Labour: >150,000
- Ownership: 13% publicly owned, all local companies
- Number of facilities: 205
- Energy use: Natural gas, electricity and fuel oil (detailed data is not available)
- Significant losses in captive power generation
- Remaining consumption is mostly by process-specific technologies

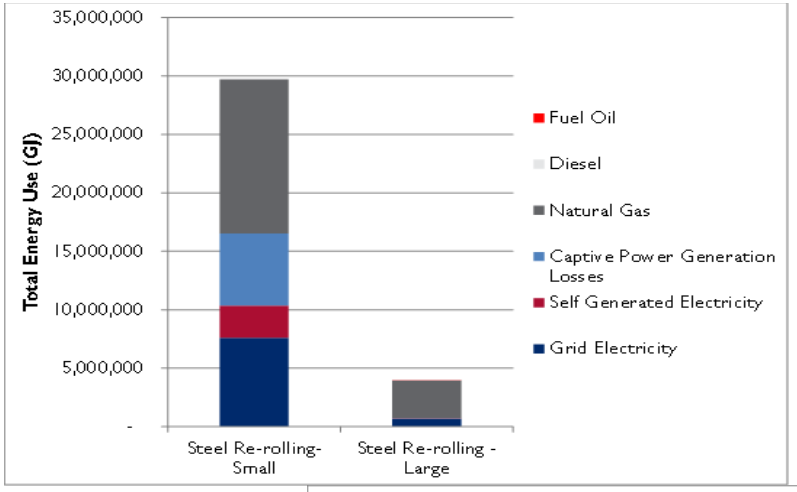


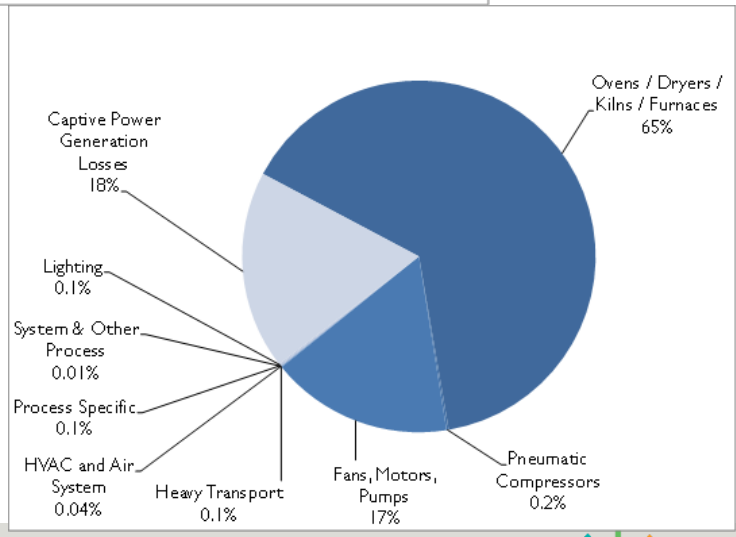



# Bangladesh - Industry Profiles

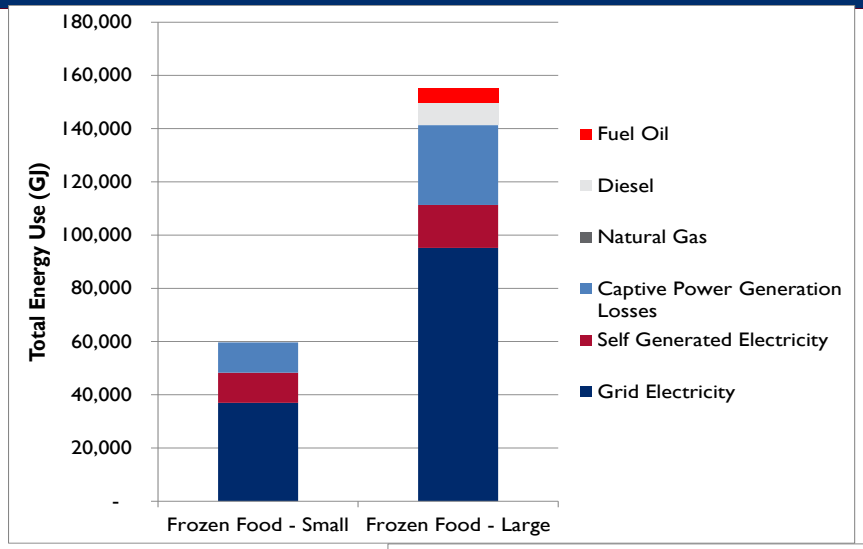
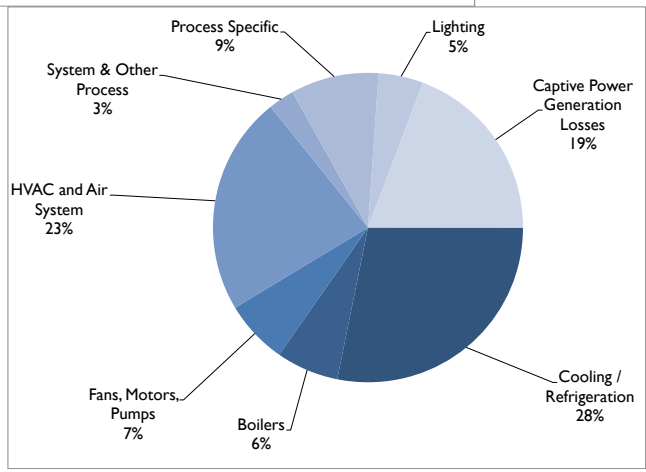
## Steel Re-Rolling

- Export earnings
- Labour: >150,000
- Ownership
- Number of facilities: 250
- 50% of capacity is from big and medium size plants
- Energy use: Natural gas, grid electricity (detailed data is not available)
- All big plants have captive generation
- Energy intensity ranges from 30 to 90 m3 gas per ton of steel depending on how modern the plant is



# Bangladesh - Industry Profiles

## Frozen Food Processing

- 2.8% of national exports
- Identified by government as a focus for foreign investment
- Labour: >1 million
- Ownership: mostly domestic, 90% private
- Number of facilities: 149
- 75% of energy use is purchased electricity
- Remainder is mainly natural gas, diesel and fuel oil, for on-site electricity generation
- Energy is mostly used by refrigeration (28%) and HVAC and air systems (23%)