CONTRIBUTION OF SUGAR SECTOR

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>1993</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers Employed</td>
<td>10290</td>
<td>7970</td>
</tr>
<tr>
<td>TO EMPLOYMENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>As A Percentage of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working Population</td>
<td>12.2</td>
<td>11.6</td>
</tr>
<tr>
<td>As A Percentage of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment in Agriculture</td>
<td>44.3</td>
<td>38.6</td>
</tr>
</tbody>
</table>
CONTRIBUTION OF SUGAR SECTOR TO ECONOMY

- Sugar Industry Revenue as % of GDP: 2000 - 6.2, 1993 - 9.8
- Sugar Industry Revenue as % of Total Agricultural Production: 2000 - 49.4, 1993 - 68.8
## CONTRIBUTION OF SUGAR SECTOR

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>1993</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FOREIGN EXCHANGE EARNINGS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USD (Million)</td>
<td>37.6</td>
<td>42.7</td>
</tr>
<tr>
<td>% of Value of Domestically Produced Exports</td>
<td>18.9</td>
<td>37.5</td>
</tr>
<tr>
<td>% of Value of Agriculture Exports</td>
<td>21.4</td>
<td>48.3</td>
</tr>
</tbody>
</table>

*NB: Average Foreign Exchange Earnings 1991-2000 USD 44.3 Million*
Why Cogeneration?

- Mitigate the Impact of External Shocks
  - While the Sugar Industry in Belize is still strong, it is stagnant
  - Declining Cane Production
  - Increase cost as a result of being import dependent especially shipping and insurance
  - Threats to Existing Markets
External Market Threats:

- WTO challenge to EU Regime by Australia, Brazil, and Thailand
- EPA Negotiations set 2008 deadline to dismantle present market access
- EU CAP Reform - reduce quotas & price but increase quality demand
- EBA Initiative – LDC’s market preference reduced SPS access by 33%
- Continued Oversupply of Sugar to the World Market
Why Cogeneration?

- Provide opportunity for Sugar Industry Expansion to Increase Throughput and further value added such as a Sugar Refinery and Ethanol Production

- Provide Steam Capacity

- Provide Power & Energy
Why Cogeneration?

- Provide for Value Added Income To BSI
- Provide Investment Opportunity and Security of Market To Farmers
- Provide Fossil Fuel Displacement and Import Substitution
- Provide Needed Power to the Grid
Why Cogeneration?

- Environmental Benefits
- 6400 tons/yr to be reduced to 240 tons/yr of Fly Ash
- Reduce Air pollution to below 100 mg/normal meter cube
- No water Pollution from Cogeneration and provide additional power to BSI for Water Treatment
Cogeneration Models

- Island economies: Guadeloupe, Reunion, Mauritius
  - Growing energy demand (from tourism)
  - Generally power utility as developer; (power plants are power stations)
  - Strong preferential sugar markets
  - Reliance on imported fossil fuels
  - Government support
Cogeneration Models

- **In-house**: owned and operated by sugar factory (India, Brazil, Guatemala)
  - Low cost and rates
  - Interrupted power supply contracts
  - Incremental revenue
  - Unattractive to third party investors (IPPs)
  - Some government support
Cogeneration Models

- Biomass IPP: BELIZE, Kenya, Guyana
  - Attractive to third party investors
  - Long-term, guaranteed base load supply
  - Minimal fossil fuel
  - “Green” Credentials which attract Carbon Credits
## TECHNICAL COMPARISON

<table>
<thead>
<tr>
<th>Industry</th>
<th>No of factories</th>
<th>Annual export energy</th>
<th>Ratio kWh/tc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bagasse GWh</td>
<td>Coal GWh</td>
<td></td>
</tr>
<tr>
<td>Mauritius</td>
<td>10</td>
<td>360</td>
<td>420</td>
</tr>
<tr>
<td>Guatemala</td>
<td>^1 6</td>
<td>242</td>
<td>179</td>
</tr>
<tr>
<td>Hawaii</td>
<td>^2 12</td>
<td>n/a</td>
<td>60 ^3</td>
</tr>
<tr>
<td>Belize</td>
<td>1</td>
<td>80</td>
<td>12</td>
</tr>
</tbody>
</table>

Notes:  
1: Concepcion, Magdalena, Madre Tierra, Pantaleon, Santa Ana, La Union  
2: 1980 - 89 data  
3: Gross energy (including factory usage)
CARBON CREDITS

- Carbon market undeveloped
- Opportunity to Access Dutch Clean Development Mechanism (CDM) Funds
- Baseline Study to Quantify Carbon Credits
- Valuation uncertain
- Carbon Credits will largely be channeled to consumers through the PUC
OVERVIEW OF COGENERATION PROJECT

- Development, Construction & Operation of a 30MW Installed Capacity Cogeneration Power Plant
  - Capital Cost of the Cogeneration Plant: US $ 34 M
  - Capital Investment to upgrade Tower Hill Factory: US $ 8 M

- Owned and Operated as a Private Sector Commercial Operation by
  - Belize Cogeneration Energy Limited (BELCOGEN)
    - Supply approximately 20% of the National Capacity Demand by 2007
    - Generate Power and Steam to Supply Tower Hill Factory

- Project is the initiative of BSI as Project Promoter
- BSI has engaged Booker Tate as the Project Developer
- Commencement of Full Commercial Operation December 2006
Project Description

- **Power Plant Design - key elements**
  - Parallel 15 MW turbo-alternator for an installed capacity of 30 MW, generating at 13.8 kV and then transformed to 115 kV
  - Powered by
    - Parallel 125 - 135 t/h boiler (bagasse and oil)
      - Steam quality: 82 bar A, 540 °C
    - that will utilize
  - 390,000 tonnes of bagasse
  - Annual storage of approximately 86,000 tonnes.
Project Description

Key Project Technical Parameters

- 1.22 M tonnes of cane
  390,000 tonnes of bagasse to IPP

- 6000 tonnes of Bunker “C” fuel oil

- 13.5 MW power to BEL (year round)

- 9 MW power to BSI

- 465,000 tonnes of process steam to BSI
Projected Allocation of Capacity and Energy Production

<table>
<thead>
<tr>
<th></th>
<th>Grid</th>
<th>IPP</th>
<th>BSI</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capacity</strong></td>
<td>13.5</td>
<td>2.5</td>
<td>9.0</td>
<td>25.0</td>
</tr>
<tr>
<td><strong>Energy Supply</strong></td>
<td>90.4</td>
<td>15.8</td>
<td>39.2</td>
<td>145.4</td>
</tr>
<tr>
<td><strong>Time Utilization</strong></td>
<td>90</td>
<td></td>
<td></td>
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</table>

Represent 20% of grid demand by 2007 and therefore must be efficient, reliable, stable base load and environmentally sound.
This has been a presentation of Cogeneration in Belize

By
Robert Tillett
Chief Plant Engineer
Belize Sugar Industries Limited

Thanks for Your Attention!!!