

Sugar Cane Biomass

**Current and potential use
for heat & power
cogeneration in Cuban
sugar cane industry**

Photosynthesis Potential of Sugar Cane

Energy Production Balance

**Agricultural Yield: 64 t/hectare p.a.
8 kg(fuel oil equivalent) consumed as fuel
and fertilizers + Solar Energy + CO₂ + H₂O
= 0.22 t Dry Matter (88 Kg fuel oil equiv)**

Products & by-products from 70 million mt. of milling cane

• Sugar	7,0 MM mt
• Bagasse (50 % humidity)	19,0 MM mt
• Trash at Cleaning Centre	5,0 MM mt
• Trash in field (70 % humidity)	15,0 MM mt
• Molasses	2,8 MM mt
• Filter Mud	2,1 MM mt
• Water	35,0 MM m ³

CURRENT SITUATION

- ◆ Satisfy total raw sugar production demand for h
(2500 Kcal/Kg raw sugar)
- ◆ Partial supply of the electricity demand of raw s
production process (95%)

(Trash consumed today is 5 % of total availability
at the cleaning centres)

ELECTRICITY BALANCE SUGAR AGRO - INDUSTRY SECTOR

(Sugar and By-Products Production
equivalent to 64 million mt. of cane)
(1992)

◆ Consumption	2,140 GW.h / pa
◆ Production	1,600 GW.h / pa
◆ Supply from grid	730 GW.h / pa

ENERGY DEVELOPMENT PROGRAMME

PRINCIPAL TARGETS

MEDIUM TERM

Co-generation equals Sugar Sector demand

LONG TERM:

**Co-generation exceeds sector demand
Sales to national grid**

STRATEGIC COMPONENTS

- ◆ Increase efficiency of energy use in the industry
- ◆ Increase energy production during crushing season with new boilers (efficiency 85-90%) and steam turbines at steam pressure higher than 28 bar
- ◆ New power plant, connected to sugar mill, running all year round fueled by sugar cane biomass

FUEL SOURCES

	Agricultural Yield mtc/ha-a	Bagasse %	Trash %	TOTAL Biomass %
SUGAR CANE	60	27	6	33
ENERGY CANE	100	58	6	64

**CANE TRASH AT
CANE CLEANING CENTRE**



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INTEGRATED SUGAR MILL POWER PLANTS

TECHNOLOGY

- ◆ Biomass-fired boiler, extraction condensing steam turbine
- ◆ Biomass gasification - gas turbine - combined cycle
- ◆ Biomass pyrolysis
- ◆ Process Steam Consumption \approx 320 kg/tc



NEW CAPACITY (Phase 1)

Consumption

2,230 GWh

(Base Year 1992)

Production

1,726.4 GWh

(Efficiency factor = 26 kWh/tc)

**National Grid Consumption
GWh**

503,6

**Installed capacity all-year generation projects 100
MW**

LONG TERM PROJECTION

39 sugar mills have been selected for investment

24 with adjoining power generation plants

15 with existing installed capacity to be
expanded / upgraded

**Result : installed capacity could increase about
1,015 MW**

GLOBAL CLIMATIC CHANGE IMPACT

◆ Medium Term

- CO₂ abatement

385 MMT/pa

◆ Long Term

- CO₂ abatement
6,175MMT/pa

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