CUBAN ENERGY REVOLUTION
AND FUTURE ROLE OF
RENEWABLE ENERGY

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Contents

- Cuban development and energy use
- Cuban energy revolution
- Drivers of CO₂ emissions
- Future energy scenarios for Cuba

Cuban development

- Prior to the Cuban revolution in 1959, about half of the households were connected to electricity grid.
- By 1989, this number had risen to 95 per cent.
- Trade with Soviet Union essential for Cuban economic development.
Cuban energy use

- Reduction of Soviet oil import 1991
- Import of Venezuelan oil
- Reduction in sugar production reduced biomass use (bagasse)
Cuban energy production

Fossil fuel production, import and export in Cuba, 2009

- Crude oil
- Oil products
- Natural gas

Production
Imports
Exports
Cuban energy production

Oil and gas production in Cuba

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Oil

Gas
Cuban energy problems

• In the early-2000s Cuba’s energy situation was bleak
• Cuba had centralized and inefficient power plants
• 11 thermoelectric plants that functioned about half of the time.
• Use of poor quality fuel with high content of sulphur.
• There were frequent blackouts and high transmission line losses
• In 2004 hurricanes in Cuba, a million people without electricity for 10 days
• Decision to start energy revolution
Revolución Energética
Energy Revolution

(i) Energy efficiency and conservation;
(ii) Increasing the availability and reliability of the national grid;
(iii) Incorporating more renewable energy technologies into its energy portfolio;
(iv) Increasing the exploration and production of local oil and gas;
(v) International co-operation.
• Change over to energy efficient appliances.
• Households switched incandescent light bulbs to more efficient compact fluorescents free of charge.
• 2 million refrigerators and one million fans were replaced,
• 3.5 million rice cookers and
• 3 million pressure cookers were bought
• New residential electricity tariff was introduced to encourage electricity saving
Efficiency improvement

Switch from kerosene to electric cooking
Energy efficiency

- Reduction in LPG use
- Rice cookers
- Pressure cookers
Rivolució́n Energé́tica
Energy Revolution

Residential energy consumption in Cuba

- Oil products
- Biofuel
- Electricity

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Solar development

- Solar PV development
- Two large scale solar PV plants
- 1 MW + 1 MW
Wind power capacity 12 MW in 2014
Revolución Energética
Energy Revolution

- Not much impact on industrial energy use
- No special measures in industry

![Graph showing fuel and electricity consumption in Cuban industry](image)
Electricity
Electricity production in Cuba

- Oil
- Gas
- Hydro
- Biofuel
- Solar
- Wind

GWh

Electricity is increasingly used in the residential sector.
Renewable energy target

- Target of supplying 24% of electricity needs from renewables by 2030
- Plans for rapid increase in wind power and solar PV
- Bioenergy has large potential, but not much investment plans
- Energy efficiency improvements are seen as one means of reducing the demand
Decomposition of CO₂ emissions

Cuba, factors affecting CO₂ emissions

1. Shift to more fossil fuel use
2. Decreasing transformation efficiency
3. Improving efficiency of economic production
4. Increasing GDP
5. Increasing population
Share of electricity of final energy consumption in Cuba
Future scenarios for Cuba

- Scenarios constructed with LINDA model
- Business-as-usual with fossil energy

Value added (GDP) Cuba

Electricity consumption in Cuba
BAU scenario with fossil fuel

- Increase in CO₂ emissions

**Fuel use in Cuba**

- Natural gas
- Fuel oil
- Coal
- Oil and Petroleum products
- Biofuels

**CO₂ emissions from fuels**

- Natural gas
- Fuel oil
- Coal
- Petroleum products
Scenario with renewables and improved efficiency
Similar economic development

- Lower growth in electricity demand (35 TWh instead of 40 TWh) due to improved efficiency
- Large increase in wind power and solar PV production
- Considerable increase in bioenergy production
• Considerable reduction in CO₂ emissions from 45 Mton to 32 Mton
Conclusions

- There is considerable potential in renewable development in Cuba
- Large investments are needed with increasing energy demand in order to reduce CO$_2$ emissions
- Development of domestic oil and gas resources may hinder renewable development especially if import substitution or export revenues are possible
Thank you

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