Distributed Generation with Biomass:

Opportunities and Challenges in Liberia

Biomass to Electricity

EcoPower Liberia distributes, installs and operates electricity generators that use agricultural waste for fuel:

- Agricultural waste such as nut shells, wood chips and other refuse is plentiful and cheap.

- Electricity for as low as $0.10 kWh. The only other way to generate electricity in Liberia is with diesel, at a cost of over $0.50 kWh, rendering anything made in Liberia prohibitively expensive.

- Because it uses locally-sourced fuel, it enables low-cost mechanized processing right in the village, eliminating spoilage and greatly increasing the earnings of farmers.

EcoPower Liberia offers an end-to-end solution. This includes the generating equipment as well as designing the biomass fuel supply chain.

Situation in Liberia

Country has no conventional fossil fuel

- **Short term:** Extremely limited capacity- heavy diesel: expensive and polluting
- **Mid term**: Mount Coffee Hydro. 60MW when completed- parts of Monrovia
- **Long term**: West Africa Power Pool- not clear where electricity will come from,

  last mile cost and engineering issues not resolved; focus on main cities

Liberia has biomass

Palm oil kernels

Palm oil trees grow profusely in Liberia. The Kernels are the waste by-product of the oil extraction process, and are available in large quantities as rubbish.

Rubber tree removal

Farming

Most farming in Liberia is practiced in subsistence rotation. Farmers cut down a parcel of rainforest to plant food crops. The downed trees are burned to clear the land. These trees would be valuable as lumber, if there were power to process them. The limbs and bark that are currently burned as waste are excellent fuel for the generator.

Distributed Generation with Biomass

Small scale biomass-to-electricity technology offers several critical advantages:

- Rapid deployment – rapid impact – rapid relief
- Low cost transmission: Last mile is a mini grid-
- Ability to rapidly bring power to off-grid locations
- “Active” generation technology: new sources of income in rural areas, distributing technical know-how into rural areas
- Power characteristics: ON-Demand- allows for industrial development

ECOPOWER LIBERIA

Cheap, Reliable, Renewable Electricity from Biomass

High Energy Cost

- Processing and drying with diesel, costs $0.50 kWh (US average is $0.15 kWh), destroying profits

Deploy biomass-fueled power generators

Outcome:

Electricity at $0.10-0.20 kWh

Biomass is by-products, such as nut shells, bamboo, wood chips, milling cake, kernel shells etc.,

➡ Low-cost electricity makes milling operations a profitable proposition.

Using locally-sourced biomass breaks the dependency on the global diesel supply chain. This enables value-added processing near the farm gate, greatly increasing the farmers' opportunity to maximize income, and eliminating spoilage

ECOPOWER LIBERIA

Cheap, Reliable, Renewable Electricity from Biomass

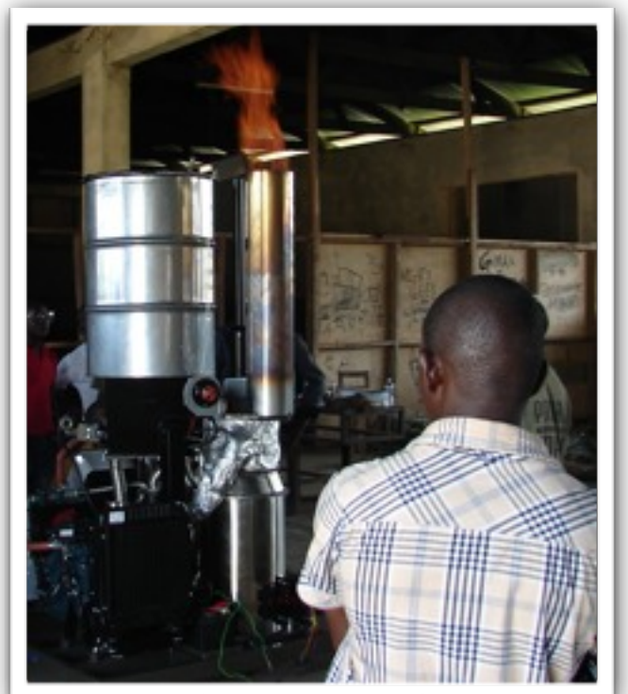
Pilot project

EcoPower Liberia introduced the technology to Liberia in Q1 2013:

- Installed a 10kW demo and training unit at Booker Washington Inst., Liberia's premier vocational school
- Trained 140 students, and identified a core group of technicians, known as the “Biomass Brothers” who now qualify to do O&M
- Tested various local feedstocks
- Demonstrated the machine to senior decision makers and stakeholders

ECOPOWER LIBERIA

Cheap, Reliable, Renewable
Electricity from Biomass



ECOPOWER LIBERIA

Cheap, Reliable, Renewable
Electricity from Biomass

The Biomass Brothers

Next Step:

Liberia Center for Biomass Energy | Booker Washington Institute

Build and commission a 70kW biomass power plant at BWI in Q4 2013

Private - Public Partnership among:

- USAID
- Winrock LESSP
- Booker Washington Institute
- EcoPower Liberia
- All Power Labs
- RREA (Rural Renewable Energy Agency of Liberia)

First such initiative worldwide

Liberia Center for Biomass Energy | Booker Washington Institute

Objectives

Establish a regional center for the study, R&D, training and demonstration of biomass-to electricity technology

- Study local biomass species
- Create the knowledge base
- Refine the mechanics of the supply chain
- Build and refine a mini-grid
- Reduce the school's electricity costs by over 50%

ECOPOWER LIBERIA

Cheap, Reliable, Renewable Electricity from Biomass

Liberia Center for Biomass Energy | Booker Washington Institute

Project already started

- New 24kVa generator installed
- Ran very well on Palm kernel Shell
- Mini-grid will be finished by Thursday

ECOPOWER LIBERIA

Cheap, Reliable, Renewable
Electricity from Biomass

Liberia Center for
Biomass Energy

Booker
Washington
Institute

Liberia Center for Biomass Energy | *Booker Washington Institute*

ECOPOWER LIBERIA

Cheap, Reliable, Renewable Electricity from Biomass

Liberia Center for Biomass Energy | *Booker Washington Institute*

ECOPOWER LIBERIA

Cheap, Reliable, Renewable Electricity from Biomass

Liberia Center for Biomass Energy | Booker Washington Institute

ECOPOWER LIBERIA

Cheap, Reliable, Renewable Electricity from Biomass

Liberia Center for Biomass Energy | Booker Washington Institute

What we learned already:

- Deployments in modular settings
- Each site must be analyzed for key selection factors
- Staffing and management controls critical

Each site is a customized solution

ECOPOWER LIBERIA

Cheap, Reliable, Renewable
Electricity from Biomass

Who will benefit?