Renewable energy generation
Biomass

Renewable energy generation
Alternative fuels for Gen-Sets

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- Engine Generators can operate regardless of weather and time of day resulting in less need for batteries
- Engine generators have far superior cost to power than solar etc.
- While often powered by diesel, which is expensive, GenSet fuels can be derived from biomass which is cheap and available nearly everywhere a mini-grid would be considered
- Some biofuel technologies are easier to implement than others and some have operational problems

Renewable energy generation
Alternative fuels for Gen-Sets

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Gasification

- Dense, low ash, low moisture biomass
  - Wood, maize cobs, nut shells, rice husks
- Evening peak loads
+ Cheap waste biomass
+ Simple to store lots of fuel
- Several systems have design issues
- Long start-up times
- Poor part load operation

Biogas

- Evening peak load and backup
- High moisture, low density biomass
  - Dung, straw, bagasse, food waste
+ Cheap waste biomass
+ Fertiliser co-product
- Hard to store gas
- Dispersed feedstocks
- High capital cost

Vegetable oil

- Oleaginous crops
  - Rapeseed, sunflower, jatropha
- Backup generation
- Better to preheat than to blend or transesterify
+ Stores well
+ Low capital cost
- Emissions
- Fuel cost

Ethanol

- Sugary and starchy crops
  - Sugarcane, sorghum, maize, cassava
- Backup generation
+ Stores well
+ Low capital cost
- Fuel cost
- Efficiency vs. diesel
- Rare fuel

Renewable energy generation
Biofuels

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Feasible fuels:

- -Bioethanol- blends up to 20% feasible with no engine modifications.
- -SVO from non –edible crops grown on marginal land, eg: Jatropha, Castor
- -SVO from WCO/WVO – limited feedstock. SVO can be used neat, preheated and filtered.
- -Animal fats – neat, preheated. No engine modifications.
- -Biogas from AD- better to run using a dual fuel engine.
- Syngas from Biomass and wastes

Renewable energy generation
Gaseous fuels

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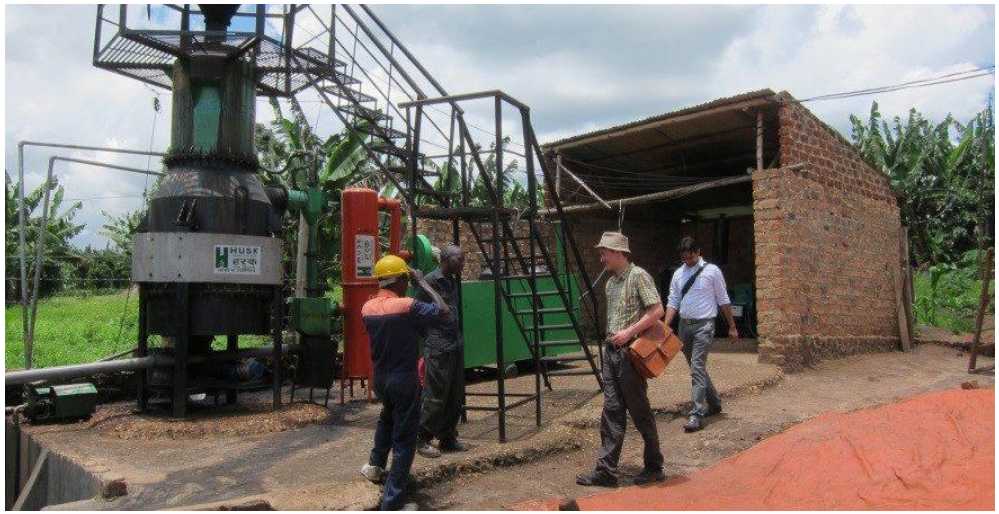
- Mainly gasification, some biogas systems
- Often over-sized
- Fail to source biomass
- High capital costs
- Poor technical capacity



Pamoja Gasifier, Uganda

- Corn cob fed (100kg a day)
- Oversized for the demand
- Minimum load greater than peak demand
- Wet scrubbing, toxic waste

Renewable energy generation
Factors effecting fuel choice

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The type of alternative fuel that can be used instead of fossil diesel in small scale electricity generation in a developing country is dependent upon:

- Natural reserves
- Road/transport infrastructure
- Existing emission legislation / air quality concerns.
- Political climate/stability
- Strength of governance
- Economics (v FD)
- Household income
- Security of supply
- Sustainability
- Electricity supply

Renewable energy generation
Biomass Supply Chain issues

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- Seasonal power demand
- Will demand increase in the next few years?
- Biomass supply
  - Harvest times
  - Type available at different times of year
  - Are there alternatives?
- Transportation likely to be biggest contributing factor to feedstock cost
- Fewer problems if tied to a productive use