Biomass / Waste based Distributed Power Generation for Sustainable Economic Development of Developing Countries
Problem Statement – Rural Areas

- Relatively poor energy access in Rural areas
  - Extensive use of diesel gensets
  - Limited Rural Development due to lack of Modern Energy systems
  - Lack of Employment Opportunities in Rural areas
  - Migration to Urban areas leading to infrastructural stress
Solution?

Decentralized, Biomass / Waste Energy

for

Cheap, Sustainable Power to All
Rural Energy Solution?

Solution should be:
- Simple
- Cost Effective
- Scalable

Sustainable from the point of view of:
- Individual & Community involvement
- Environment
- Health & Safety
Why Biomass or Waste?

- Most abundant & universally available resource
- Perennial in nature
- Relatively low opportunity cost & built-in storage
- Familiarity & high comfort level in handling the resource
- Allows for efficient Distributed Generation
Distributed Power – Huge Advantages

- Systems will be Off-grid or connected to the grid at the tail end thus strengthening the same.

- Electricity will be produced at the rural level, using local resources & manpower.

- Will provide an impetus to local village economy by providing people with employment.

- Money which typically goes out for power purchase will remain inside the village.

- The power will be Green & generation of Wealth from Waste.
Basic Power Generation Options are Combustion and Gasification

Combustion is a well-established technology & is particularly suited at higher power levels (> 5-Mwe)

Gasification is more attractive for Distributed Generation – from small kWe to a few MWe output levels

Gasification is also one of the best options of Off-Grid RE

Can use different available Biomass / Agri-residues / Waste that are available in the specific rural areas
What is Biomass / Waste Gasification?
Gasification is conversion of various biomasses / wastes to a combustible (something that can be burnt) gas called Producer Gas.

This gas can then be burnt in Engine Gensets to produce electricity or can be used for process heat applications.
Charcoal can be used for cooking or any thermal heat application.

Biological ash/char can be returned to the soil as organic fertilizer.
What can be used as feedstock

There are Gasification technologies that can use various different types of Biomass & Agri residues in the different designs.

Gasifier systems have also been developed that can use various other wastes like Chicken / Poultry litter & EFB (Empty Fruit Bunch – Palm waste) etc.
... And now Municipal Solid Waste can also be used
What is Municipal Solid Waste?

Depending upon the source MSW can be:

- Commercial wastes from industries, institutions viz. hotels, malls, offices, schools etc.
- Biomedical wastes from hospitals & healthcare establishments
- Residential waste from house holds
Indicative General Composition of MSW

- **Recyclables 20%**: Plastic, Paper, Syringes, Tablets, Tin Can, Metals, Glass
- **Organics 50%**: Kitchen Waste, Agro-Waste, Vegetable Waste, Garden Waste
- **Inerts 22%**: Sands, Pebbles, Gravel
- **Others 8%**: Other waste materials
Issues with MSW

Hazardous gas emissions – methane, toluene, methylene chloride etc. Methane is highly combustible - responsible for explosion hazards in landfills + Affect the Ozone layer.

Contamination of Surface & groundwater sources. Leachate seeps into groundwater and leading to health issues.

Centralised Landfills lead to huge transport requirements of waste from various parts of the urban areas. This leads to increased environmental and social degradation.

MSW as is disposed today creates ever expanding landfills. These apart from sing valuable and are a huge health hazard for the flora and fauna around.
What could be used?

The fractions of MSW that could be used are:

- Biodegradables like food waste, fruit & vegetable waste
- Paper & card board
- Garden waste
- Leather
- Plastics except PVC
- Textile

To be removed are Non-Combustibles like:

- Glass
- Metals
- Stones
- Building materials

All inert above 100 mm to be removed
Remaining to be sieved through 10 mm sieve
All hard biodegradable above 200 mm to be sized to ~ 100 mm
Solid Waste as received
Solid Waste that could be used
NO ISSUES OF SOLID & LIQUID WASTES OR GASEOUS EMISSIONS FROM THE SYSTEM

- Solid discharge will be about 10% of the feed in.
- Reasonably good CV, could be used for land filling & greening of waste lands.
- No dirty water or liquid discharge. Condensates will be evaporated using own gas.
- Gaseous emissions from Evaporator or Engine exhaust much cleaner and will meet Pollution control limits.
- As such Engine exhaust would be used for drying of feedstock.
Basic Models

Small Power Packs in Stand-Alone Mode

For remote / isolated villages, islands & communities not connected to a grid & not likely to get connected in the near future.

Small Power Plants in Grid Connected Mode

For grid connected rural areas with major problems of power availability & power quality resulting in very limited & poor quality electricity being available.
Small Power Packs in Stand-Alone Mode
Small Power Packs - Features

- Locally available biomass / waste as feedstock;
  Biomass consumption about 1.5 kg / kWhr

- Self-starting with no external start-up power;
  requiring less than 10 minutes start-up time

- Could be operated round-the-clock/on-demand

- Available power ratings from 10 kW onwards

- Highly automated systems with remote start/stop, monitoring and control features also developed for Telecom towers.
Small Power Plants (200-kWe to 2 Mwe) in Grid Connected Mode
Guiding Philosophy

Make the biomass / waste procurement area as small as possible while making the plant still commercially viable.

Allow benefits to pass on to maximum number of people.

Size of power plant such that it can be run like a commercial operation without a very high fixed cost.

Standardize for easy Operation & Maintenance.
## How do we get there?

### Launching in a mission mode with clear targets for capacity addition

- Single window / automatic clearances
- Power feed at 11 KV / 33 KV
- Make such investments allowable under CSR

### Policy initiatives

- Need to make projects bankable through policies like Subsidies, GBI, Tax benefits
- Attractive buy-back tariffs as most of the revenues will flow back to rural communities

### Financing

- FI’s / Banks - overly cautious towards funding decentralized projects
- Need to enhance affordability through Long-term low-interest rates on loans
About Ankur Scientific
Ankur Scientific – The Best SME

Founded in 1986 by Dr. B C Jain, an internationally acclaimed technocrat

Have won many National & International Awards

ISO-9001, ISO-14001, OHSAS-18001 & CE Certified

More than 900 systems installed in more than 35 Countries across the Globe

State-of-the-Art Manufacturing & R&D facilities, with > 200 employees

Bio-Energy Man of the Year in 2013
- Different Gasifier designs for different feedstock
- Till date used more than 50 species of Biomass / Agri-residues
- No other Global competitor would dare to look at

- Feedstock Expertise

After having created a niche in Biomass to Energy solutions since 30 years, now moving to be an Innovative Leader in the space of Waste to Energy

- Waste to Energy

Already developed Technology for converting:
- Chicken Litter
- EFB (Empty Fruit Bunch) – Palm Waste
- Indonesian Coal To Energy – Power or Thermal

- Waste Technology
Thank You!