

Bio-energy in service of “Green Fuel Revolution”

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Considerations

- National economy is **currently** more affected by fuel related issues rather than food, even though food productivity is considered poor.
- Issues of fuel import and rising prices of fossil fuels have almost been accepted as an inevitable imposition with inadequate “quality and quantity” of thinking for native action.
- And when thinking ever takes place, bio-fuel is simply understood to be liquid fuel and solid bio-fuel is ignored.
- Much can be accomplished if native thinking and action are relied upon sooner than later.
- What is called for is **“Green fuel revolution”**

Bio-fuels and other renewables

1. Wind and Solar PV systems have 30 % availability and suited to grid-synchronized mode or specific limited use.
2. Wind power systems are commercially exploited; Solar PV systems are excellent at small power levels.
3. Mini-hydel systems have availability of 50 to 75 %. They are being exploited where available.
4. Bio-fuels give both liquid fuels and solid wastes (0.3:0.7)
5. Solid bio-waste – based systems have the ability for 24 x 7 *service on demand*; biomass is stored solar energy.
6. Biomass systems can be designed for captive or grid linked use; grid when available can be kept as stand-by.

Derivative from crude oil	Amount MT/yr	Nature of use
High speed diesel	40	Heavy vehicle transport
FO/LSHS (Furnace oil/Low sulfur heavy stock)	14	Stationary power generation Combustion in furnaces
Naphtha/NG	12	Stationary power generation
LDO(Light diesel oil)	2	Stationary power generation
Total	68	Transport and stationary power
LPG	10	Domestic cooking and Vehicle transport
Gasoline (petrol)	9	Vehicle transport
Kerosene	12	Domestic cooking/power
Total	31	Domestic / transport /stationary power

MT/yr = Million tonnes per year (2005 data)

Replacing Diesel has the greatest benefit to the economy

Biofuels?

- Some seeds give oil that can replace diesel – Palms produce **5 t oil/Ha**; Jatropha, Pongamia **1 t oil/Ha** (Note the wide variation in oil productivity . Industries can be motivated to work for the higher productivity options)
- Oils constitute 30 to 40 % seeds. Other wastes are solid and constitute about 5 to 7 t/Ha dry matter including tree droppings.
- **Culturable waste land** area in India is 33 million Ha (NRSA document for MRD, GoI, 2005)
- Other solid wastes – plantation, agricultural constitute 250+ million t /year of solid biomass and urban solid waste of 40000+ tonnes per day (as a reference, the solid bio-fuel used for cooking in the country is ~200 million tonnes/year)

Waste Summary

- 100+ million tonnes of agricultural wastes
- 20+ million tonnes of plantation waste
- 33+ million Hectares of waste land that could lead to 33 + million tonnes of non-edible oil (equivalent of 25 to 27 million tonnes of HSD) and 130 million tonnes of solid biomass
- 40000+ tonnes per day of Urban solid waste

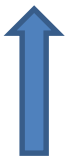
Only a few % has been capitalized upon. Much can be done and needs to be done to help the economy straighten up.

Biomass Technology availability?

- They are more recently available; solid bio-fuels to electricity systems at 10 to 1000 kWe with fuel-to-electricity efficiencies of 20 to 26 % are currently available with manufacturers.
- Modern technology for cooking is available in the form of battery driven gasifier stoves. Availability in the market is independent of Govt. and is already under service; More aggressive pursuit of commercial goals is to take place.



1KgPH DINJAM PLANT



1 kg/h ~ 0.5 kWe

**System cost ~
165000 Rs/kWe
Currently used for
demonstration,
training and
research**

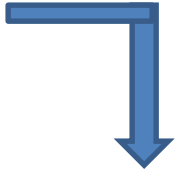
**1.2 MWe plant
Investment ~ 55 million Rs/MWe**

Fuel cost : 1.5 to 2 Rs/kWh

O & M ~ 1.0 Rs/kWh

Financial cost ~ 0.5 Rs/kWh

Cost of energy ~ 3.00 to 3.50 Rs/kWh



BMC GASIFIER PLANT(1700Kgph)

- Biomass stove –fire and forget except to vary power as desired
- High efficiency (50 %) and low emission stove
- Technology being marketed by BP, India



Commercialization of these technologies?

Distributed biomass based electricity generation is **limited** by

(a) assured availability of biomass

(b) *impediments from state with varying norms for electricity purchase (both temporal and spatial) even with a noted inability to service the demand,*

(c) awareness for investment and commercial exploitation with needed boldness. Changes outside the Govt. are taking place, but slowly.

There appears to be a need for bigger players; there is continued interest that is yet to flower.

Liquid bio-fuels - technology

- The issue of liquid bio-fuels has been researched extensively overseas and in India
- The progress on the use of these depends on the strategy to utilize the waste land

..... *The strategy*.....

Strategy for waste land - 1

- This is the key issue of great concern and should be handled with great care.
- Land is a property of the States. Encouraging their productive use should be centrally planned with a well structured arrangement.
- One of the principal planned outputs should be non-edible oil seeds.
- To encourage this, it is vital that procurement of the oil should be well defined.
- The principal owner of the output should be a large oil company – IOC, HP or Reliance.

Strategy for waste land - 2

Success of this initiative is strongly related to wide partnership base –

- Involve industrialists and others who can invest panchayats in whose domain, the land is located to enable help various actions including labor availability.
- Industrialists who can be leased the waste land for its development using incentives, perhaps on tax basis.
- Involvement of local panchayats for support and helping settle labor and payment terms for the development of the land under the leadership of the local government.
- The package design should be such that everybody in the chain should financially benefit in a rational way.

Summary

1. Bio-fuels include liquid generating seeds, their wastes after oil extraction, plantation residues, and urban solid waste (USW)
2. The exploitation of their potential **has been waiting for some time**
3. Tested conversion technologies await commercial use
4. Exploitation has multiple benefits –
oils for transportation,
distributed complementary power generation,
clean up of environment with USW,
huge job potential in the case of greening the waste land,
and CDM benefits