

# NATURAL GAS POWER USING BIOMASS HiRAD REACTORS



## A BRIEF PRESENTATION

from

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## FOOD PROCESSING PARKS (FPP) WITH ELECTRICITY GENERATION PLANT AND LARGE COLDSTORE USING ORGANIC WASTE AS THE PRIMARY ENERGY SOURCE

- The concept is the construction of FPP's starting with HiRAD AD Reactors capable of processing organic waste to produce Methane Gas.
- This is used to fuel an electricity generating plant that could sell part of its output to WAPDA, keeping a guaranteed supply for the FPP
- CNG can be produced if that is considered a better option.
- A large coldstore in the park will use heat generated from the gas engine in its cooling plant.
- Organic fertiliser is created to enable local growers to increase the price achieved for their crops



## PROJECT AIMS



- The projects aim to assist Pakistan achieve an efficient, International standard solids and liquid waste water collection and treatment strategy
- Waste will be sorted into organic waste, and inorganic waste for recycling.
- Any Building debris can be crushed, and combined with Plastic bags and Portland cement, for conversion to building materials.
- To efficiently process the biomass collected using HiRAD Reactors that produce Methane Gas using a natural biological process, removing the need for using the Landfill site in a way that pollutes the land, damages the environment and spoils the surroundings for the local population.
- Separate HiRAD Reactors will process organic municipal and rural solid and liquid waste.
- The Methane Gas can generate electricity for sale to WAPDA on long term contracts or be enriched and marketed as CNG for local use
- The process provides Organic fertiliser and liquid soil conditioner.
- The inorganic, non building waste will be converted to RDF to fuel further electricity generation.
- Significant electrical Capacity can be generated subject to the type and volume of wastes available.

## ENVIRONMENTAL BENEFITS

- This solution removes the need for landfill, and produces organic fertiliser, Electricity and process heat
- The HiRAD Reactor uses a completely natural biological process requiring input of biomass only, mainly vegetable and fruit and plant waste, (and is also productive with Sewer waste)
- Biomass use reduces the depletion of scarce oil, gas and coal and other fossil fuels, and the energy used to extract and utilise them
- Use of the CO<sub>2</sub> for covered crops ensures minimum damage to the Ozone layer, as per Kyoto principles and guidelines. .



## HEALTH & WORK BENEFITS

- The collection area benefits from a significant reduction in waste related disease and carriers such as birds and rodents, reducing pressure on public health services
- There will be a significant reduction in losses of working days through illness.
- The sealed reactor ensures a safe working environment for employees, and those in the surrounding area.
- Monitoring and PH adjustment is computerised and involves no human contact with the biological processes



## MANUFACTURING & OPERATIONAL ECONOMICS

- The use of waste reduces fuel costs to collection and sorting of wastes only. In Pakistan most metal, glass and plastics are removed by scavenging prior to reaching the plant, leaving mostly the organic waste that it actually needed.
- The assembly and eventually the manufacturing of some of the larger Reactor components, can be undertaken using local engineering companies and materials, saving time, and transport costs.



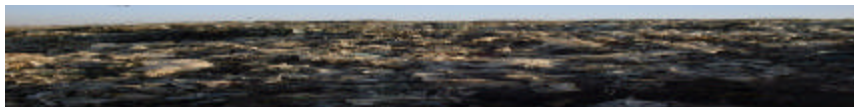
## **EMPLOYMENT & SKILLS OPPORTUNITIES**

- The sorting of wastes provides local unskilled employment
- The Generating Plant operation provides professional and semi-skilled employment
- The Laboratory to monitor PH and assimilate biomass composition data, provides graduate waste and scientific employment.
- The plant can be remotely monitored from anywhere in the World



## **INVESTMENT & PROFITABILITY**

- The investment in the combined plant depends on the output
- Return on Investment is higher than some other Alternative energy projects.
- The project has a number of income streams.
- The output is dependent on regular supplies and volumes of MSW, so the project will require close co-operation with Municipal authorities .



## **The HiRAD REACTOR**



- **The prime advantage of HiRAD Reactors is that they process biomass in less than 24 hours biologically**
- **The Gas fuels large Gas engine driven electricity generator.**
- **Waste contents vary and the actual outputs can be determined by analysis and trial feeds.**

### **Potential of Biomass waste for fuel and energy in Pakistan**

Pakistan has a population of over 150 million people who on average produce biomass waste of around 0.25-0.50 Kg per person per day. This averages out at around 20 million tons per annum. Biogas can also be extracted from Waste Water for electricity generation This would allow Generating capacity of 50GW to be installed

FAO estimate 25 Millions tons of crop production with crop residue available of 40%

Even if only 20% were used Generating capacity of 20-25GW to be installed

Around 1.4 Million tons of Organic Fertiliser could be produced as a by product of the Waste

Utilising the CO<sub>2</sub> already produced by industry and power generators in Pakistan with Algae could produce enough bio-fuel to operate every vehicle in Pakistan

Wind, Solar and Hydro could provide more power still

Pakistan could be self sufficient with ZERO oil and gas imports with Renewable Energy

## CARBON TRADING

- Because of the high incident of carbon emissions in normal waste disposal and electricity generating plants, such a green scheme would generate “Certificates of Emission Reduction”
- These are a tradable asset. This trading would be carried out under the Clean Development Mechanism (CDM).

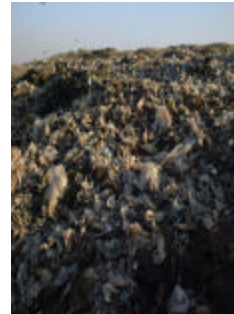


## CLEAN DEVELOPMENT MECHANISM

- *Minister of State for Environment, Malik Amin Aslam.*
- Pakistan has immense opportunity in this market place owing to the availability of a host of indigenous options for clean and renewable energy development.
- Solid waste management as well as enhancement of transport and industrial efficiency, all of which can be potentially capitalised through the carbon financing business.

## CO-OPERATION

- **World Bank is specifically mandated to support Renewable Energy projects in Pakistan**
- **Asian Development Bank is developing specific financial products to enable Renewable and Alternative Energy projects to proceed.**
- **Federal and Provincial Government Agencies, are able and willing to support these types of win-win projects.**



## Merits of HiRAD

- All the biomass is processed in hrs
- All the waste emerges as useful product
- The process is totally biological
- The process does not pollute the air, groundwater, surface water, or soil.
- The Project is commercially viable
- Organic Fertiliser is produced
- Methane Gas is produced and used to generate electricity
- CO<sub>2</sub> is produced that can be fed in to greenhouses to accelerate the growth of high value cash crops
- Excess heat is generated that can be used to operate refrigeration equipment in Cold stores on site.
- CNG Stations could be set up on site to compress and store the methane
- Protection of public health
- Minimisation of epidemics, plague
- Building debris can be processed and combined with Portland cement, to create low cost building materials
- Where a large proportion of the waste is inorganic, but not rubble, clean incineration techniques can be combined with HiRAD to extract energy from both waste streams
- Employment is significant
- The HiRAD reactors are closed and so emit no odours or emissions.
- No Chemicals are used in the process
- Drastic reduction in pathogens
- No fly or mosquito breeding problems
- Land use is small
- No release of greenhouse gases to the environment

The power is essentially local from local sources to power local needs reliably.

HiRAD can enable some basic infrastructure needs like a reliable electrical power supply to hospitals, schools, for refrigeration, for clean water from wells, and for offices and computers. This can enable local economies to prosper and can inhibit, even reverse, the move from rural areas to the towns.

There can be major local employment and health benefits, all of which are the reason HiRAD is welcomed by those governments around the World we have introduced the technology to.