THE PROJECT

GENERATION OF ELECTRICITY AT VILLAGE LEVEL THROUGH 32 KWT GASSIFIER

BACKGROUND:

The Biomass- based Gassifier technology carries an environment- friendly and sustainable solution to meet the power requirement in rural India. It can reduce the use of fossil fuels in village applications. It also provides livelihood opportunities to the local population through various activities – generation, processing, and operation of the plant. The electricity produced from a Biomass- based Gasifier system can be used for lighting of houses, powering irrigation pumps, and operating machines such as milk chillers, Atta Chakki Oil expeller Rice Huller etc.

POTENTIAL OF BIOMASS:

The most important advantage of biomass is that it exists everywhere in rural areas. In agriculture industry, residuals like bagasse (fibers) from sugarcane, straw from rice, hulls and nutshells, as well as manure lagoons from cattle, poultry and hog forms are usable. Similarly, the timber industry has a lot to offer. Wood wastes like sawdust, timber slash and mill scraps are considered organic materials. Even in cities, paper and yard wastes are usable. Fully utilized biomass reduces pollution in underground water bodies by offsetting the amount of waste in landfills. Methane and other poisonous gases containing hydrocarbon calorific contents from dead organic matters can be found in landfills and water treatment plants. These can be captured and converted in to fuels suitable for generating electricity.

ECONOMIC BENEFITS:

Rural economies will grow because of the development of a local industry to convert biomass to either electricity or transportation fuel. Because biomass feed stocks are bulky and costly to transport, conversion facilities will be located where the crop is grown. That means more people have chances of getting employed. Farmers will see their income rise. Thanks to these new markets for both agricultural wastes and crops that can be grown sustainably on marginal land. As new markets are created, the rural economy will become more diversified.

ENERGY BENEFITS:

Energy producers and consumers will have an available renewable energy option with uniquely desirable characteristics. Biomass has the greatest potential of any renewable energy option for base load electric power production. It is also the renewable resource with the most promise for producing economically competitive liquid transportation fuels. Co-production facilities will allow the production of electricity when it is needed and ethanol when it is not acting, in effect, as'' seasonal peaking'' facilities. The energy security of a nation will be significantly enhanced.

With sustainable agricultural practices, Biomass- fuels could replace half or more of the nation's entire current level of gasoline consumption. Burning new biomass contributes no new Carbon dioxide to the atmosphere because if we replant harvested biomass, carbon dioxide is returned to the cycle of new growth. Bioconversion and thermal conversion techniques for transforming biomass into fuels are currently under development at energy research laboratories. These new technologies will reduce our reliance on oil and coal with no net addition of carbon dioxide to the atmosphere. New thermal conversion techniques coupled with chemical catalysis are making it possible to exploit the previously discarded lignin fraction by converting it into valuable chemicals that we now get from non-renewable fossil sources.

ENVIRONMENTAL BENEFITS:

Agricultural land that might otherwise be converted to residential or industrial use because we will need fewer and fewer acres to meet the market demand for food can be used to grow biomass crops that will restore soil carbon, reduce erosion and chemical runoff, and enhance wildlife habitat. Perennial energy crops can be harvested without damage to the root structure and thus continue to serve as a soil stabilizer and stream buffer and habitat for wildlife. The use of biomass will greatly reduce greenhouse gas emissions. Fossils fuels remove carbon that is stored underground and transfer it to the atmosphere. In a combustion system, biomass releases carbon dioxide as it burns, but biomass also needs carbon dioxide to grow thus creating a closed carbon cycle. In a Gassifier-fuel cell combination, there is a net reduction of carbon dioxide. In addition, substantial quantities of carbon can be captured in the soil through biomass root structures, creating a net carbon sink.

The problem of poor quality & low availability of electricity supply to remote villages is preventing the growth of common peasants who are producing food for us and are themselves devoid of it for want of a remunerative technical solution. Therefore this project has been conceived to mitigate this problem with the support of Govt. funding and continuous effort of NGOs. The non- conventional sources of energy through use of biomass have a macro benefit of producing small power at diverse loads without increasing the production of CO_2 and simultaneous use of waste generate in the village. It will serve the overall purpose at national and regional level.

BRIEF PROJECT DESCRIPTION

The Biomass comprising of crop residue cattle excreta, garbage & agricultural waste/trash are the source for energy production through pilot plant. This raw material is available in abundance in the proposed village either free or on modest cost above Re. 2.00kg inclusive of collection/transportation to the project site.

The above raw material has to be sun-dried by spreading on a plot attached to plant. The drying takes place in 2-3 days attains a calorific value of 1400-1800 kcals/kg. The raw material is enriched by manual separation of ruble, stones, plastic, glass & metal before laying down in ground for sun drying. The biomass is then manually fed into the gassifier at the rate of 60 kg/hr through baskets, wherein the incineration takes place. The hot gases produces will run prime mover and rotate the generator which will directly produces 3 phase LT power. The LT power is transmitted through an overhead distribution network. The project will be implemented at a village in the block where there are incidents of Parali burning, which has a population of 3500 approximately and 700 houses. The villages in the area have been electrified quite some time ago but till recently there has been no economic growth due to erratic power supply. Electricity is available hardly for 2 hours in the evening at very odd hours and 6-8 hours during the day and the timing is not very certain. Due to odd hours of power supply children are not able to pursue their study properly nor there is any sustainable economic development in the village.

This problem can be solved by exploitation of locally available crop residue (Parali) which can be used as fuel for power generation. The plant can cover 700 households, for domestic & Street Lighting during dark hours. Considering the benefit of light for education of the children, convenience of the housewives in the kitchen and domestic work, it is estimated that certain number of households which have not been connected would certainly go in for power connection for lighting purposes. Further taking average 13 watt CFL connection

per house hold at a payment of Rs 5/- for five hours a day equivalent to the cost of kerosene oil presently used for lighting purposes the proposal is very much feasible. To this if load of village commercial Shops, Schools, Panchayat, Establishment, Atta chakkies, and Pumps is added in that case 32 kwt Biomass based Power System would be sufficient to sustain all these activities.

PROJECT OBJECTIVE:

The Project is highly beneficial for villages in off grid areas and other village getting electricity supply from grid but having restricted supply for a few hours at night and 6-8 hours during daytime that too at no fixed time. It helps in running irrigation pumps, Atta Chakki & Rice hullers to meet basic requirement of the villagers.

The villagers en-mass have favored the idea of utilizing the available biomass and village garbage for generation of electricity in contrast to any other renewable source of energy. The proposed project will supply electricity for lighting load during dark hours i.e. 7pm to 4am & to the collective need based load of the villagers for Atta Chakki, irrigation pumps during day time and commercial establishment.

The energy management from the biomass plant will be better managed by promoting the use of LED bulb of 13wt instead of 40wt incandescent lamp. The load projections during dark hours and day hours are given in **Table – I.** The 32 kwt capacity of the Gassifier is calculated as per load projection given in above Table.

Table - I

Since the total capacity of the plant will be 32 KWT, the load catering will be as under:

Dark Hour Lighting

700 Households load @ 13 wt LED bulb per house will cover kw load amounting to 43% capacity utilized of the pilot plant at night.

Commercial load during day time as per table given below:

ESTIMATES OF LOAD IN A MODEL VILLAGE:

Non- Commercial / Dark hours

LIGHTING LOAD	**No. S**	**QUANTITY**	**Total**	
Households*	**400***	**Bulb 13wt LED - 2 Fan 100 wt -1 Per House hold**	**25.2 kwt**	
Street lights	**30**	**15wt LED Bulb Per Street Light**	**0.45 kwt**	**DURING DARK HOURS**

50percent Households will avail Power Connection.

Commercial/ Day Hours

Shops	10	2 LED Bulb of 15 wt 1 Fan of 100 wt	1.30kwt	**During Day Hours**
Saw mill	01	2.0 kwt	2.0 kwt	DO
Atta-chakkies	02	5.0 kwt	10.0 kwt	DO
Schools	02	2.0 kwt	4.0 kwt	DO
Pumping Sets	2	50 kwt	10.0 kwt	DO
		TOTAL	**27.30 kwt**	**Per load Diversity 32 kwt Generator**

Table - II

CAPITAL COST OF 32 KWT POWER GENERATION UNIT

1. Cost of 32 kwt Electricity system based on 100% crop residue, village combustible agricultural waste and home generated waste.

Suitable for village of around 700 households inclusive of GST		Rs. 25,00,000
Transportation cost		Rs. 100,000
Installation & Commissioning		Rs. 100,000
Shredder machine		Rs. 200,000
Briquette making machine for charcoal		Rs. 200,000

2. CIVIL CONSTRUCTION COST;

Boundary wall Bricks /concrete platform size 1 5 ft. x 35 ft height gen-set covering shed		Rs. 5,00,000
Parali storage shed size15ft. X15ft. x15 ft. height for 3 months storage		Rs. 3,50,000
Power distribution panel house 10 x10 ft height		Rs. 2,50,000
Transmission line 3 km radius 2 phase in 3 ways including 9000 meter wire and 150 poles.		Rs. 6,00,000
700 households etc board with connection wiring (700 x Rs. 500)		Rs. 3,50,000
	Sub Total	**Rs. 51,50,000**
Miscellaneous expenses @ 10% of the sub total		Rs. 5,15,000
	TOTAL	**Rs. 56,65,000**

***** The land for the unit to be provided by the Village Panchayat.

Cost of Machinery for value addition of village produce of wheat and mustard

- Atta Chakki with accessories, separator		Rs. 1,25,000
- Oil expeller		Rs. 1,25,000
- Construction 20' x 20' shed for above machinery @Rs. 300 Sq ft		Rs. 1,20,000
	Sub Total	**Rs. 3,70,000**
Miscellaneous expenses @ 10% of the sub total		Rs. 37,000
		Rs. 4,07,000

- **Total Cost of the Project – Rs.56,65,000 + 4,07,000 = Rs. 60,72,000/-**

Table - III

Estimates of Operating Cost for a month

Cost of Labour:	**Quantity**	**Amount Rs.**
Operator cum Supervisor @Rs 15000/ month	1	15000.00
Skilled Labour @Rs. 10000.00/ month	1	10000.00
Unskilled Labour @ Rs. 9000/month	1	9000.00
	Total Labour Cost month	**34000.00**
Cost of Parali:		
For a month @ 15 quintals a day @ Rs. 1600/ Trolley of 8 quintal @Rs. 200/quintal	450 quintal	90000.00
Maintenance Cost		25000.00
	Total Cost	**149000.00**

Benefit:

Electricity Generation

Electricity generated by the Plant of 32 kwt @ 90 percent efficiency for 24 hr a day 691.2 kwh = 20736 kwh electricity in 30 days

Production of Charcoal @ 30 percent of the parali feed of 1500 Kg/day = 450 kg

in a month = 450X30 = 13500 kg

Sale of charcoal briquettes 135 quintals @ Rs. 6/kg

Would fetch Rs. (135 quintal x 6/kg) = Rs. 81000/-

Cost per Kwh	Rs. 149000
Less amount released from sale of charcoal –	Rs. 81000
Cost of generated electricity –	**Rs. 68000**
Number of units generated -	20736
Per Unit Cost - Rs. (68000/20736) =	**Rs. 3.28 kwh**

The electricity generated by the Gassifier can be used for value addition of the agri- produce in the village. Farmers may grind flour by using wheat. May produce oil from mustered.
The farmers can install Atta chakki, Oil expeller & Rice huller for value addition.

Execution of the Gassifier Plant under BOT Scheme:

The execution of the pilot Gassifier plant should preferably be carried out by the agency which has experience in either manufacturing of the Gassifier or erection of the plant. Ganesh Engineering Works (GEW) is accredited by the Ministry of New & Renewable Energy (MNRE) Government of India as manufacturer of Gassifiers. They have already supplied over 500 Gassifier to generate power in Bihar & other places. They are also exporting these Gassifiers abroad. Considering their background GEW would be appropriate agency to setup the pilot Gassifier plant at village level in one district each of Punjab & Haryana, which is in the news for parali burning.

Ganesh Engineering Works (GEW) manufacture the equipment at district Buxar (Bihar). GEW will set up the plant under BOT Scheme and will operate the plant for three months. For operating the plant they will form a Self Help Group by involving the beneficiaries & other interested youth of the village and they will also train the members of Self Help Group during the period of operation of the plant. GEW along with operation of plant and will extend their expertise in maintenance of the plant during the period of operation. However they will also extend assistance for maintenance to the beneficiaries after handing over the plant to the villagers for operation.

Requirement of Land

For setting up of the Gassifier plant and machinery for value addition i.e, Atta Chakki, Oil expeller etc, total requirement of land would be about 2500 sq. yards or 0.5 acre. This land could be allotted by the Gram Panchayat from the common land pool. In case there is no common land in the village the land could be purchased directly from the farmers. In such a case there is a need to make provision for purchase of land in the budget for setting up of the Pilot project.

Fund Mobilization for Installation & Operation of Pilot Gassifier Power Plant:

How far the proposed alternate is technically sound & economically effective needs to be demonstrated on the ground. For showcasing its usefulness in controlling the burning of parali which aggravates air pollution, a pilot Gassifier plant is to be setup at village level in one district each of Punjab or Haryana.

The cost of one Gassifier plant is estimated at Rs. 60.72 Lakh including the cost of machinery needed for exhibiting the concept of the value addition of village produce. Apart from this the cost for operating the plant for one month works out to Rs. 1.49 Lakh/month.

Total fund requirement including three months operating cost for setting up of the pilot plant would work out to Rs.65.19 Lakh (Rs. 60.72 Lakh Capital cost + Rs. 4.47 Lakh 3 months operating cost @ Rs. 1.49 Lakh/month).

In order to meet the above fund requirement a proposal need to be prepared for availing financial assistance. The Ministry of Environment Forest and Climate Change which is a Nodal Ministry may be approached for extending financial support to set up the pilot Gassifier Power plant. In union budget for the year 2017 – 18 an allocation of Rs. 1140.29 crore has been made to fund the machinery scheme. Under this scheme financial assistance is provided to farm machinery testing institutions which also impart training to farmers. The setting up of the Pilot Gassifier Power Plant may be submitted for consideration and financing under this scheme as it would curb burning of paddy stubbles which destroys not only the productivity of land and leads to air pollution and result into waste of national wealth.