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Role of Bio-CNG in Development of Rural India: A Prospective Study

Since, India is rich in bio-waste in rural area as well as urban areas; a huge amount of energy can be harnessed from organic wastes that are biodegradable like cattle dung, food waste, agricultural waste, bagasse, sugar mill waste, waste from trees, dry leaves and green leaves etc.

Concept note describes the role of Bio-CNG in development of Rural India as an alternate fuel, its importance to Indian Government, Indian economy, carbon footprint reduction and climatic conditions. The overall cost saving by replacing conventional fuel with indigenous fuel has been evaluated to highlight the importance of bio-degradable waste utilization and management of domestic waste with carbon footprint reduction. Like other sources of renewable energy, solar energy, wind energy, tidal energy, vibration energy, biogas etc., Present focus in global energy scenario is to bring upon the awareness and importance of compressed biogas (Bio-CNG), which is more refined form of biogas and contributes cleaner and greener environment.

Energy Scenario in India

Imbalance in the demand and supply of energy is permeate requiring serious efforts to elevate energy supplies as India faces possible severe energy supply constraints. Achieving energy security in this strategic segment of the economy is of fundamental importance not only for India's economic growth but also for the human development objectives that aim at alleviation of poverty, unemployment and climatic change.

An economy's development would be reflected in its consumption of energy. India is one of the developing country. The main reason behind the fact is undeveloped Rural India, where, still so many villages are without energy supply. Presently, country is mostly dependent on imports for energy sources. Imports are mostly dependent on natural gas, coal etc. which are expected



Role of Bio-CNG in Development of Rural India

- Improving Rural Economy of India
- Enhancement of Rural Economy
- Rural Development
- Rural Employment
- Women Empowerment
- Prevention of Rural Migration
- Helps to meet demand of army, police, military etc.
- Supports Make in India
- Improving Climatic Conditions of India
- Eco-friendly
- Petrol and CNG imports reduction
- Carbon footprint reduction
- Waste management
- Produces Organic fertilizers
- Supports Clean India Mission

to increase by 5-10% in 2016-2017¹. This trend will continue to increase as the population is increasing at very high rate.

To fulfill energy supply and demand, freely available energy sources such as solar, wind, vibrations, biogas etc. must be harnessed efficiently to meet human needs without disturbing integrity, stability and beauty of the environment.

¹ www.mospi.nic.in/Mospi_New/upload/Energy_stats_2015_26mar15.pdf

Bio-CNG: An Alternative Fuel

To make India developed country, present state of Rural India should be changed. This can be done by increasing energy supply consumption (per capita). The main focus of this concept paper is to bring Bio-CNG fuel (Compresses Natural Gas from biogas) as the main source of energy for Rural India as it would be cost effective and easily available at far-flung villages.

Biogas is one of the best alternative renewable energy sources for rural areas in India. The country ranks second in biogas utilization after China². To enhance the quality of biogas in respect to calorific value, it is being compressed, after removing carbon dioxide (CO₂), hydrogen sulphide(H₂S) and moisture with reduced carbon footprint.

Bio-CNG is a clean, low carbon technology for efficient management and conversion of fermentable organic wastes into clean cheap & versatile fuel and bio/organic manure. Potential of Bio-CNG is not being utilized and commercialized so far, which could provide three in one solution of gaseous fuel generation like cooling gas, fuel gas & electricity, proper bio-degradable waste management and organic manure production as shown in figure-1 for the development of India, easily achievable at far-flung villages.



Figure 1: 3 in 1 Solution by Bio-CNG.

By replacing conventional fuel with Bio-CNG, there would be reduction about 75% in carbon monoxide, 60% in organic gas, 85% in nitrogen oxides and 20% in carbon oxide.

Potential OF Bio-CNG AS A National Fuel

India has vast scope of energy generation from organic wastes. The energy produced from biogas will be more efficient if it get compressed. Calculating on yearly basis, including all waste disposals with different methane content, biogas generated is about 7000 million tons liters³ (approx.).

2 <http://pib.nic.in/feature/fe98/fe0798/PIBF2907987.html>
3 <http://www.moef.nic.in/divisions/ic/wssd/doc2/ch4.html>

Import Data for the year 2014-2015 (April-December)		
Amount of fuel Imported	Petrol :9,52,000 Metric Tons per year	CNG: 12000000 Metric Tons per year
Cost of fuel	Rs(43 ¹ X 9,52,000 Metric Tons per year) Rs 4093 crores per year	Rs(35 ² X 12000000Metric Tons per year) Rs 42000 crores per year
If same amount of Bio-CNG is replaced with imported fuel then its equivalent has been calculated		
Equivalent	1 kg of petrol =1.3 kg of Bio-CNG ³	1 kg of CNG =1.56 kg of Bio-CNG ⁴
Amount of Bio-CNG	1.3 X9,52,000 tons per year 12,37,600 tons per year	1.56 X12,000,000 tons per year 18,72,000,000 tons per year
Cost of Bio-CNG	Rs (30 ⁵ X 12,37,600,000 per year) Rs 3,712 crores per year	Rs(30 X 18,72,000,000,000 per year) Rs 56,160 crores per year
Cost Saving to Indian Govt.	Rs 4,025 crores per year	Rs 42,000 crores per year

Table 2 Cost Saving Calculation when imports replaced by Bio-CNG (Indigenous Source).

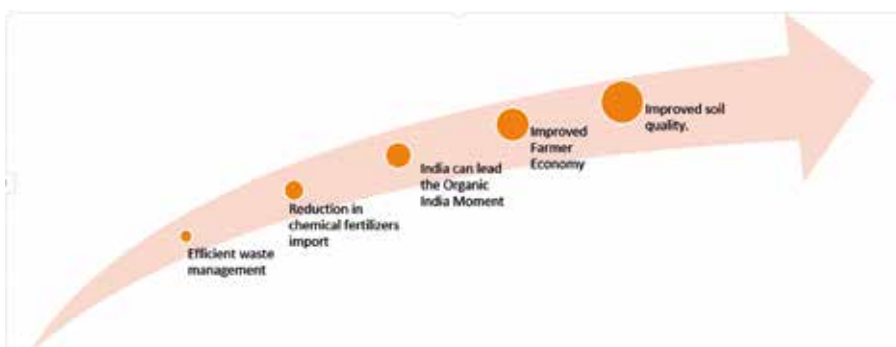


Figure 3 Benefits of Organic Fertilizers



Figure 2 Output from Cattle dung⁴

Commercialization of Bio-CNG can be done by awareness and promotion. CSR spend – trigger points under the Companies Act, 2013 is an act which can be utilized in promoting Bio-CNG. Under this, if any company with turnover more than 1000 crores, net worth more than 500 crores and net profit more than 5 crores and if financial strength criteria is met, every company is mandatorily required to

4 web.iitd.ac.in/.../Biogas%20Enrichment%20Using%20Water%20Scrubbing_IIT%20D

spend 2% of average net profits of last 3 years on specified CSR activities by donating to Govt. or independent NGOs.

Carbon Footprint Reduction

Most potent tools for mitigating climatic change by preventing carbon emission from vehicles by replacing fossil fuel with Bio-CNG. About 90% of the Green House Gasses (GHG) would get reduced. Graph 1 shows the different quantity of pollutants emitted from vehicle gram per kilometers(g/km) with respect to different type fuels⁵. It has been estimated that emission from Bio-CNG would be least.

5 <http://www.jgsee.kmutt.ac.th/see1/cd/file/C-003.pdf>

If Bio-CNG will be replaced by conventional fuels, there will be huge carbon foot print reduction shown in graph 2.

Powering Fuel Cost

Present day problem in India is the continuous increased energy intensity (Rs/kg) i.e. increases in cost of energy per kilogram⁶. The main reason behind the increased energy intensity is increase in rate of energy consumption and depletion of conventional energy sources at an alarming rate. Hence, needs to be replaced. Cost of production of Bio-CNG would be half the cost of diesel and petrol and with high calorific value. Cost savings will be increased to about 25-50%. Graph 3 depicts the energy intensity of different fuels.

Replacing Petrol and CNG

Our aim is the progressive reduction of the import bill. India imports more than 47 percent of the oil it uses. But, due to increase in domestic resources import has been decreased and export of petroleum increased up to 7%⁷.

If Bio-CNG is replaced by petroleum, there will be huge profit to Government.

From the table 2, huge cost savings can be done to Indian Govt. by replacing imported fuels with domestic/indigenous fuel i.e. Bio-CNG. This will not only make country greener but also improves the economy of country.

Organic Fertilizers

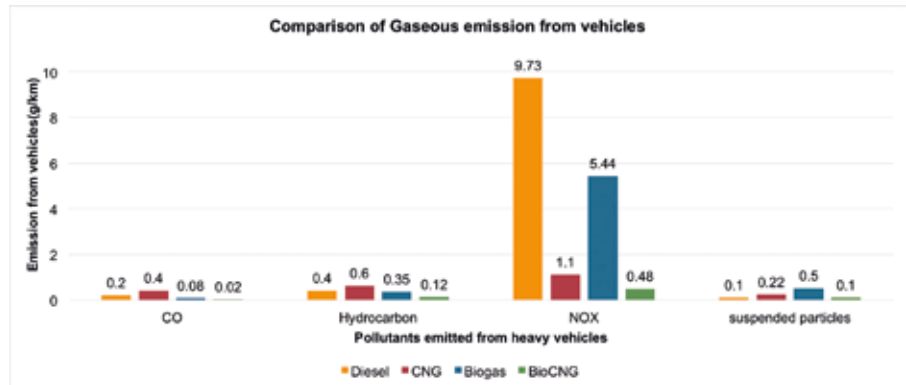
Apart from this, Bio-CNG also produces pure organic manure as by-product that can self-utilized or sold to farmers or industries good price and ultimately benefiting to plant. It has following benefits leading to growth of India:

Conclusion

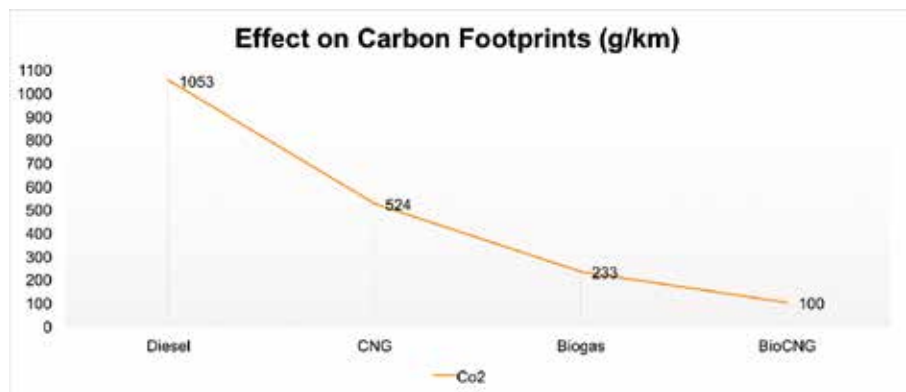
From this note, we can conclude that India has a wide scope in Bio-energy. Since, India is rich in bio-waste in rural area as well as urban areas, a huge amount of energy can be harnessed from organic wastes that are biodegradable like cattle dung, food waste, agricultural waste, bagasse, sugar mill waste, waste from trees,

6 www.mospi.nic.in/Mospi_New/upload/Energy_stats_2015_26mar15.pdf

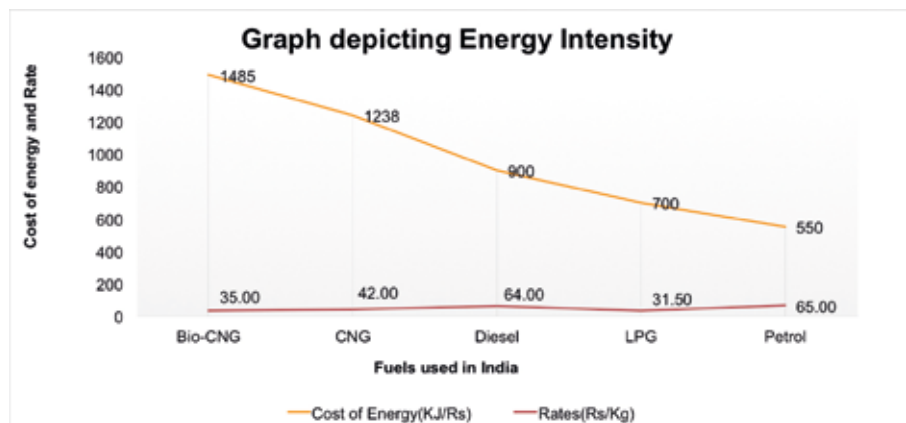
7 ppac.org.in/View_All_Reports.aspx



Graph 1 Gaseous emissions from vehicles.



Graph 2 Reduced CO₂ Emissions from Bio-CNG.



Graph 3 Energy Intensity of Fuels.

dry leaves and green leaves etc. Firstly, all these waste will be managed properly as India is facing a big problem of solid waste management. Secondly, green fuel will be produced which ultimately reduces carbon footprints. Thirdly, by producing sufficient fuels like cooking fuel, vehicle fuel and electricity, it will upgrade the quality of living of rural India. And fourthly, it will make India independent, self-sufficient and promoting Indian flagship programs which

will envision the dream of prosperous rural India of Mahatma Gandhi ◀

1 Petrol price fluctuate day to day. Average value has been taken for last one year.

2 Average CNG price FY 2014-2015

3 www.gbcs.in

4 www.gbcs.in

5 Average price has been taken for calculation of Bio-CNG rates, which may fluctuate in future as per the demand and supply.