



## Full Length Research Paper

# Green energy for Indian telecom towers

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### ABSTRACT

The study is concerned with the development, encouragement and use of more environment-friendly forms of alternative fuels for Telecom Tower Generator sets. These innovative solutions encompass new more environment-friendly Telecom Tower technologies (and also innovative Green Energy concepts with potential for lowering environmental impacts, such as minimizing exhaust emissions). This study mainly deals with the sustainable development Telecom Towers by the use of Alternative fuel-Bio-diesel. Particularly it focuses on the suggestion to curb the generator pollution by the use of bio-diesel. In this study the pollution loads have been calculated and compared by considering usage of the bio-diesel in place of conventional diesel fuel in Generators. The total money which we can save by the use of bio-diesel is also calculated and shown here. For the purpose of this study, the all the Towers of Department of Telecom (DOT) were considered. In India about 6 lakh telecom towers have been constructed. These towers get power from diesel fuel and are responsible for large amount of lead emissions and various other pollutants. The pollution loads were calculated on the basis of information collected from the Telecom Regulatory Authority India (TRAI) Central Pollution Control Board (CPCB), Environment Protection Agency (EPA) and previous studies carried out in this regard by various important agencies. The use of Bio-diesel shows tremendous reduction in various pollutants. By the use of B20 Bio-diesel we can reduce total unburnt hydrocarbons to 20%, Carbon monoxide to 12%, PM10 and PM25 to 12%, NO<sub>x</sub> +2 or -2%, SO<sub>2</sub> to 20%. By the use of B100 Bio-diesel we can reduce total unburnt hydrocarbons to 67%, Carbon monoxide to 48%, PM10 and PM25 to 47%, NO<sub>x</sub> +10 or -2%, SO<sub>2</sub> to 100.

**Keywords:** DOT, TRAI, Telecom Towers, Green Fuels, Pollution, CPCB.

## INTRODUCTION

In India Six lakh telecom towers are being established all over the country. They are using Diesel generators to provide power to these towers. The telecom companies are estimated to be the second-biggest consumers of Diesel in the country; behind only the Railways. Apart from leading to high carbon emission, diesel usage by telecom towers is also a big drain on the exchequer as the loss to the government on account of the cheaper fuel is pegged at over Rs.4,500 crore.

Average fuel consumption by a single telecom tower is estimated at 8760 liter diesel annually, assuming 8 hours of operation by diesel generator sets. The total diesel usage by the telecom tower apparatus spread all over the country is pegged at 5.12 billion liters a year. The total carbon emission on account of Diesel usage by the telecom towers is estimated to be around 10 million tons

of Carbon-dioxide (CO<sub>2</sub>).

The department of Telecom (DoT) has initiated projects in non-grid areas in around 20 states where they power the towers by using green energy sources like solar panels and wind energy. The tests have been found to have "worked out well" and there are now plans to actively spread them to more regions, sources said.

The Ministry of New and Renewable Energy (MNRE) has been roped in for the exercise and the government has initially started the project with the state run BSNL. "The idea is to see whether it is a sustainable model that can also be replicated. Also, they wanted to understand how reliable it will be and how it functions." The Government now plans to involve private operators in the exercise as the DOT has already said that the usage of

diesel by telecom towers has to be curbed in line with TRAI's recommendations on installing "Green telecom" which envisages that at least 50% of all rural towers and 33% of Urban towers be powered by Renewable Energy Technologies (RET) by 2015.

As per Rajan Mathew, Director General of Industry Lobby Group Cellular Operators Association of India (COAI), the Industry is also doing its bit to shift to cleaner sources of energy". He also stated that they are also committed to these initiatives to convert 5000 towers to greener fuel. They are having a target of converting around 40000-50000 towers on greener fuel in the coming time. (Source: The Times of India, New Delhi, Page20, Saturday, August 31, 2013).

Controlling the Air Pollution from Telecom towers is very difficult because the total carbon emission on account of Diesel usage by the telecom towers is estimated to be around 10 million tons of Carbon-dioxide (CO<sub>2</sub>). We need cleaner alternatives fuels to Telecom Towers. Serious efforts are needed to create awareness among the Telecom operators to make their towers to use eco-friendly Green fuels such as Bio-Diesel to reduce emissions.

Increasing energy demand, climate change and carbon dioxide (CO<sub>2</sub>) emission from fossil fuels make it a high priority to search for low-carbon energy resources. Biofuels represent a key target for the future energy market that can play an important role in maintaining energy security. It is primarily considered as potentially cheap, low-carbon energy source. Most life-cycle studies of Biofuels have found that bio-ethanol made from corn or sugarcane generally reduces greenhouse gases, replacing gasoline (petrol) (Hall et al., 1991). Biofuels have been increasingly explored as a possible alternative source to gasoline with respect mainly to transport. Global Biofuels (bioethanol and biodiesel) production tripled from 4.8 billion gallons in 2002 to 16.0 billion in 2007, but still accounts for less than 3% of the global transportation fuel supply (Coyle, 2007). To summarize, interest in Biofuels is increasing for a number of reasons:

- (1) Reduced reliance on fossil fuels;
- (2) Reduction in greenhouse gas emission;
- (3) National independent security of fuel supply;
- (4) Employment and economic benefits through the development of a new fuel production.

In this study we are urging Telecom operators to consider Bio-diesel as an alternative fuel because of its many Benefits and are as given below

## **Benefits of Bio-Diesel**

### ***Environmental Benefits***

In 2000, bio-diesel became the only alternative fuel in the U.S. to have successfully completed the EPA-required Biodiesel significant reduction of virtually all regulated emissions, and showed bio-diesel does not pose a threat

to human health. Bio-diesel contains no sulphur or aromatics, and use of bio-diesel in a conventional diesel engine results in substantial reduction of unburned hydrocarbons, carbon monoxide and particulate matter. A U.S. Department of Energy study showed that the production one use of bio-diesel, compared to petroleum diesel, resulted in a 78.5% reduction in carbon dioxide emissions. Moreover, bio-diesel has a positive energy balance.

### ***Energy Security Benefits***

With agricultural commodity prices approaching records lows and petroleum prices approaching records highs, it is clear that more can be done to utilize domestic surpluses or vegetable oils while enhancing our energy security. Because bio-diesel can be manufactured using existing industrial production capacity, and used with conventional equipment, it provides substantial opportunity for immediately addressing our energy security issues. If the cost of using foreign oil were imposed on the price of imported fuel, renewable fuels, such as bio-diesel, probably would be the most viable option.

### ***Economic Benefits***

Increased utilization of renewable bio fuels results in significance micro economic benefits to both the urban and rural sectors, and the balance of trade. A study completed in 2001 by the U.S. Department of Agriculture found that an average annual increase of the equivalent of 200 million gallons of Soya-based bio-diesel demand would boost total crop cash receipt by \$5.2 billion cumulatively by 2010, resulting in an average net farm income increase of \$300 million per year.

In addition to being to domestically produced, renewable alternative fuel for diesel engines, bio-diesel has positive performance attributes such increased Cetane, high fuel lubricant, and high oxygen content, which may make it a preferred blending stock with future ultra-Clean diesel

### ***Quality Benefits***

B100 (100 percent bio-diesel) has been designated as an alternative fuel by the U.S. Department of Energy and the U.S. Department of Transportation. Moreover, in December 2001, the American Society of Testing and Material (ASTM) approved a specification (D6751) for bio-diesel fuel. This development was crucial in standardizing fuel quality for bio-diesel in the U.S. market. The National Biodiesel Board, the trade association for the bio-diesel industry, has formed the National Biodiesel Accreditation Commission (NBAC) to audit producers and marketers in order to enforce fuel quality standards in the US. NBAC issue a 'Certified

Biodiesel Marketer' seal of approval for bio-diesel marketers that have met all requirements of fuel accreditation audits. This seal of approval will provide added assurance to customers, as well as engine manufacturers, that the bio-diesel marketed by these companies meets the ASTM standards for bio-diesel and that the fuel supplier will stand behind its products.

### ***Environmental Protection Act Benefits***

Effective November 1998, Congress approved the use of bio-diesel as an Energy policy Act (EP Act) compliance strategy. The legislation allows EP Act-covered fleets (federal, state and public utility fleets) to meet their alternative fuel vehicle purchase requirements simply by buying 450 gallons of pure bio-diesel and burning it in new or existing diesel vehicles in at least a 20% blend with diesel fuel. The Congressional Budget Office and the U.S. Department of Agriculture have confirmed that the bio-diesel option is the least cost alternative fuel option for meeting for Federal government's EP Act compliance requirements. Because it works with existing diesel engines bio-diesel offers an immediate and seamless way to transition existing diesel vehicles into a cleaner burning fleet.

- There is no spilling when filling the tank and no possibility of theft or pilfering.
- Generator engine noise is low and one will be using in a more environment-friendly way.

### **EMISSIONS FROM DIESEL VEHICLES**

Due to low volatility, evaporative emissions are non-significant. Though the concentration of CO and unburnt HC in the diesel exhaust are rather low, they are compensated by high concentration of NO<sub>x</sub>. There are smoke particles and oxygenated HC, including aldehydes and odour-producing compounds. Pollutants from diesel-fuelled generators are particulate matter (including smoke), NO<sub>x</sub>, SO<sub>2</sub>, PAH. Residence time and turbulence in the combustion chamber, flame temperature and excess O<sub>2</sub> affect CO formation. NO<sub>x</sub> includes nitric oxide (NO), nitrous oxide (N<sub>2</sub>O), nitrogen dioxide (NO<sub>2</sub>), dinitrogen trioxide (N<sub>2</sub>O<sub>3</sub>) and nitrogen pent oxide (N<sub>2</sub>O<sub>5</sub>). NO and NO<sub>2</sub> collectively represented as NO<sub>x</sub>, are the main nitrogen oxides emitted by generators. About 90% of these emissions are in the form of NO which is produced in the generator engine by combustion of nitrogen at high temperatures. NO<sub>2</sub> is formed by oxidation of NO, and has a reddish brown colour and pungent odour. The total carbon emission on account of Diesel usage by the telecom towers is estimated to be around 10 million tons of Carbon-dioxide (CO<sub>2</sub>). (Source: The

Times of India, New Delhi, Page 20, Saturday, August 31, 2013).

### **MOTIVATION FOR PRESENT STUDY**

In India Six lakh telecom towers are being established all over the country. They are using Diesel generators to provide power to these towers. The telecom companies are estimated to be the second-biggest consumers of Diesel in the country; behind only the Railways. Apart from leading to high carbon emission, diesel usage by telecom towers is also a big drain on the exchequer as the loss to the government on account of the cheaper fuel is pegged at over Rs.4,500 crore.

Average fuel consumption by a single telecom tower is estimated by a single telecom tower is estimated at 8760 liter diesel annually, assuming 8 hours of operation by diesel generator sets. The total diesel usage by the telecom tower apparatus spread all over the country is pegged at 5.12 billion liters a year. The total carbon emission on account of Diesel usage by the telecom towers is estimated to be around 10 million tons of Carbon-dioxide (CO<sub>2</sub>).

It is clear from the study that the Telecom Towers are using Heavy Amount of Diesel and giving rise to Import Oil, Diesel and other petroleum products in turn producing 10 million tons of (CO<sub>2</sub>). By the use of Green Energy i.e., or Bio-Fuel, we can minimize the Imports of Oil and also we can protect our environment.

### **OBJECTIVES OF STUDY**

The principal objective of the present research is to carry out a comparison of pollution for diesel and Bio- fuels. The intent is to suggest strategies for minimizing Telecom Tower pollution in India. The objectives of the present research are achieved through

1. Collection of data related to various alternative fuels, particularly diesel and Biodiesel.
2. Collection of data pertaining to emission factors
3. Collection of data pertaining to Telecom Towers in India.
4. The average Diesel fuel used by each Telecom Tower per day by various towers.
5. Comparison of emission level for Diesel fuelled and Bio-fuelled Telecom Towers.

### **METHODOLOGY**

The following methodology has been adopted for conducting the present study.

**Table 1.** KEY STATISTICS OF TELECOM TOWERS

Diesel Consumption per tower/for 8 hours per day/Year	8760 liter
Diesel Consumption per tower/for 24 hours per day/Year	26280 liter

**Table 2.** diesel consumption for telecom towers

Diesel Consumption for 6 lakh towers /for 8 hours per day/Year	8760 liter	5256000000 liter (5.25 Billion liter)
Diesel Consumption 6 lakh towers /for 24 hours per day/Year	26280 liter	15768000000 liter (15.76 Billion liter)

**Table 3.** cost of diesel for telecom towers in ₹  
(considering diesel price is ₹ 52/liter as on 1<sup>st</sup> sept, 2013 in delhi)

Diesel Consumption for 6 lakh towers /for 8 hours per day/Year	5256000000 liter	273312000000 (273.31Billion)
Diesel Consumption 6 lakh towers /for 24 hours per day/Year	15768000000 liter	819936000000 (819.93 Billion)

- The details of number Telecom Towers in various parts of India have been collected.
- The average daily Diesel consumption of various Telecom Towers was collected from TRAI and reliable Sources.
- The emission levels of various class fuels have been collected from Central Pollution Control Board, New Delhi and from other reliable sources.

Available data has been analyzed with the objective of minimizing the diesel fuel pollution with Bio-diesel fuels.

#### COLLECTION OF DATA

In India Six lakh telecom towers are being established all over the country. They are using Diesel generators to provide power to these towers. The telecom companies are estimated to be the second-biggest consumers of Diesel in the country; behind only the Railways. Average fuel consumption by a single telecom tower is estimated by a single telecom tower is estimated at 8760 liter diesel annually, assuming 8 hours of operation by diesel generator sets. The total diesel usage by the telecom tower apparatus spread all over the country is pegged at 5.12 billion liters a year. The total carbon emission on account of Diesel usage by the telecom towers is estimated to be around 10 million tons of Carbon-dioxide (CO<sub>2</sub>).

(Source: The Times of India, New Delhi, Page20, Saturday, August 31, 2013).

By using above data we can calculate the Diesel statistics of 600000 Telecom Towers of India as shown in table 1, 2 and 3.

The United States advocates that the use of soya bio-diesel can reduce life-cycle emissions of CO<sub>2</sub> and SO<sub>2</sub> by 80 and 100% respectively as compared to petro-diesel (USDA/USDOE, 1998). The same study has shown that in soybean biodiesel production in the US, every unit of petroleum energy consumed produces 3.37 units of bio-diesel. The 80% reduction in CO<sub>2</sub>-emissions has been calculated for biodiesel produced from soybean oil from intensive agriculture (consuming about 75 litres of oil and 125 kg of chemical fertilizers per ha as well as herbicides and insecticides). The life-cycle carbon dioxide emissions resulting from the production of bio-diesel from low-input, no-tillage, perennial *Jatropha* plantations (no application of chemicals foreseen) would be much lower and is likely to be less than 15% compared to petro-diesel. (Source: *George Francis, Raphael Edinger and Klaus Becker / Natural Resources Forum 29 (2005) 12–24*)

The total carbon emission on account of Diesel usage by the telecom towers is estimated to be around 10 million tons of Carbon-dioxide (CO<sub>2</sub>). The United States advocates that the use of soya bio-diesel can reduce life-cycle emissions of CO<sub>2</sub> and SO<sub>2</sub> by 80 and 100%

**Table 4. Emission characteristics of soy bio-diesel compared to petro-diesel**

Type of emission	Soy-bio-diesel emissions as % of petro-diesel emissions
Total unburned hydrocarbons	7%
Carbon monoxide	50%
Particulate matter	70%
NOx	113%
Sulphates	0%
Polycyclic aromatic hydrocarbons (PAH)	20%
NPAH (nitrated PAHs)	10%
Ozone forming potential of exhaust	50%

Source: USEPA (2002).

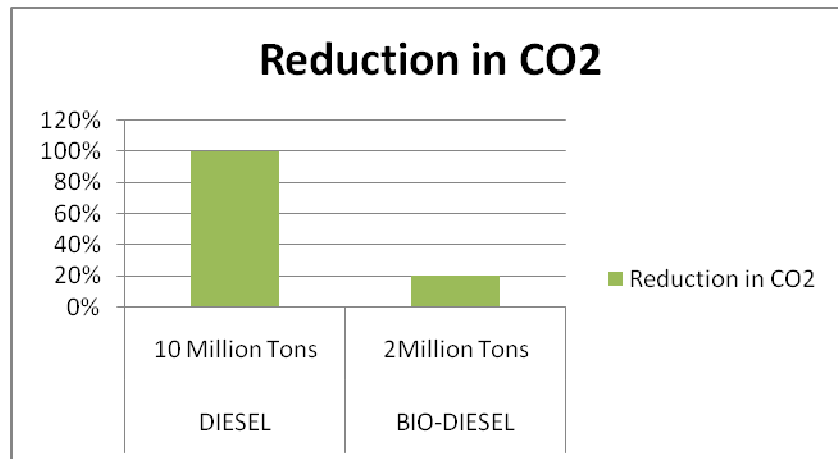
**table-5.** cost of bio-diesel for telecom towers in ₹ (considering bio-diesel price is ₹ 23/liter, as per pcra)

Diesel Consumption for 6 lakh towers /for 8 hours per day/Year	5256000000 liter	120888000000 (120.88Billion)
Diesel Consumption 6 lakh towers /for 24 hours per day/Year	15768000000 liter	362664000000 (362.66Billion)

**Table 6.** comparative CO<sub>2</sub> reduction by the use of bio-diesel with diesel in tons

Fuel Used	CO <sub>2</sub> in Million Tons	Reduction in CO <sub>2</sub>
DIESEL	10 Million Tons	100%
BIO-DIESEL	2Million Tons	20%

**Figure 1.** comparative CO<sub>2</sub> reduction by the use of bio-diesel with diesel in tons



respectively as compared to petro-diesel (USDA/USDOE, 1998).

By referring to above paragraph we can show the reduction in CO<sub>2</sub> by the use of Bio-Diesel for Telecom towers in the Table Number 6.

## RESULTS AND CONCLUSION

By the use of Bio-Diesel Green Energy for Indian Telecom Towers and from above Tables, Graphs and Calculations we conclude that;

(1) We can reduce CO<sub>2</sub> from 10 Million Tons/Year to 2 Million Tons/Year

(2) We can reduce Diesel and Foreign Exchange from ₹ 273.31 Billion to 120.88 Billion Diesel Consumption for 6 lakh towers /for 8 hours per day/Year

(3) We can reduce Diesel and Foreign Exchange from ₹ 819.93 Billion to 362.66 Billion Diesel Consumption for 6 lakh towers /for 24 hours per day/Year for uninterrupted power supply to telecom towers.

(4) We can also reduce also a big drain on the exchequer as the loss to the government on account of the cheaper fuel is pegged at over Rs.4, 500 crore.

(5) In spite of 80% reduction in CO<sub>2</sub>, Carbon Monoxide (CO) can be reduced to 50%, Total Unburnt Hydrocarbon can be reduced by 7%, Particulate Matters (PM) can also be reduced by 70%, .

We can conclude that Green Energy Fuel Bio-Diesel is most important fuel which we can use for Indian Telecom Towers for sustainable development and to curb the Foreign rate particularly spent for importing Petroleum Products as the Rupee is devaluing against dollar. Bio-Diesel is also minimizing Green House gas drastically.

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