

# Going Green-Methods and Initiatives in Telecom Sector for Energy Management

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## Abstract

Telecom sector's performance is growing day by day in terms of energy intensity and potential existence all over the world. Telecommunications and Data centres are the main sources of whole energy consumption of Information and Communication Technology (ICT). Around 70% of energy is consumed by them. So it is necessary to think about energy efficiency which is used for decrement of operation expenditure for consumption of energy. Curtailment in use of energy and replacement of lesser efficient fuel from Renewable Energy Target (RET) are used to amplify the energy efficiency. In this paper, various techniques and inventiveness have been introduced by ICT industry while holding different aspects regarding energy efficiency in terms of 'going green' and accompanying with the league of environment friendly organizations.

**Keywords:** ICT industry; Going green; Energy efficiency; Renewable energy target (RET)

## Introduction

The main reason of Global warming is the increase in the average temperature of the earth's atmosphere which causes the emission of greenhouse gases (GHG) (carbon dioxide, methane and nitrous oxide) covering the whole earth. This GHG is the result of excess utilization of energy of ICT industry which leads to environmental, economic and health consequences.

As fossil fuel is one of the source of GHG emission, but it is still used by Telecom industry. Excess use of energy through fossil fuel and its price hike have put the Telecom industry in difficult situations. Now there is a need to move towards the new energy efficient technologies and alternate sources of energy. This would help telecom network in 'going green' or to become environmental friendly. Telecom service manufacturers and providers have taken important steps towards greening of telecom sector industry. For efficient power management, infrastructure sharing, use of renewable energy sources and cutting down carbon emission over the complete duration of the product lifecycle have been under intense consideration by telecom industry all over the world.

## Literature Survey

Green Energy Technology (GET) For Telecom Applications [1] present types of Green Energy technology, its features, drawbacks, applications, challenges and its need in future, etc. Its aim to curtail the emission of GHG to convert Telecom industry into Green Telecom industry. There is need of large of amount of electricity to power the enhancement of infrastructure of Telecom industry. One of the parts of the electricity comes from the power grid and remaining through burning of fossil fuel like diesel. Both of these sources contribute to emission of greenhouse gases (GHG) with the negative environmental effects. Telecom sector can be called as Green Telecom sector when the emission of GHG would be lesser. It could be categorized as Green Telecom networks, Green Telecom equipment's, ecofriendly design of Telecom buildings and safe Telecom waste disposal. So the main objective is the amplification of energy efficiency in terms of conservation, lesser demand of energy and upgraded codes, standards and related technology.

Methods and Initiatives by Telecom Companies in the Indian Telecommunication Sector [2] is an attempt to highlight the methods and some initiatives taken by the telecom companies for going green and go together with eco-friendly organizations. Renewable energy plays a vital role in terms of enhancement of energy efficiency. So Telecom service providers and manufacturers have been forced to switch towards solar energy. Integration of renewable energy sources and green innovative technologies are the only techniques to reduce emission of GHG and intensification of energy efficiency for the Telecom industry. This would shift Telecom sector to green Telecom sector.

Energy Efficiency in Green Telecom [3] shows the importance of energy efficiency in modern and future telecommunication networks. While comparing with global standards, Telecom industry is emerged as one of the fast growing industries in terms of energy intensity and some other potential. More than 70% of energy utilized by these industries, so it is necessary to think about energy efficiency which is used for decrement of operation expenditure for consumption of energy. Curtailment in use of energy and replacement of lesser efficient fuel sources like Diesel would lead to amplify the energy efficiency for Telecom industry. Now a day, demands for telecommunication services have been raised, which has led to increment of energy consumption significantly and poses an environmental challenge in terms of larger emission GHG.

Green Telecom Layered Framework or Calculating Carbon Footprint of Telecom [4] introduces the basics of green telecommunication network, and wireless communication network. It provides information about the carbon footprint within the

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fixed limited range. As IT is a worldwide goal to decrease energy consumption and CO<sub>2</sub> emissions. The carbon footprint of the network equipment, that is, the telecom infrastructure is calculated based on the energy consumption at both, the network component layer and the transmission technology layer. The carbon footprint calculation can be divided into two parts depending upon the operation of the telecom network equipment using Grid Power and using Diesel Generator Set.

### Problem Statement

1. Energy consumption from Telecom network is an increasing contributor to Global Greenhouse Gas (GHG) emission.

2. Limitations on carbon dioxide emissions will be more difficult for most of the countries where electric generation comes primarily from coal.

3. The carbon emission footprint of telecom sector has risen significantly and will rise despite the development of energy-efficient technologies.

### Objectives of the Study

To introduce the reader to current green technologies and outline the necessity for energy efficiency in information and communication technology

To study different measures taken by telecom industry in India to Go Green.

To get information about the carbon footprint within the wireless and fixed line communication network.

### Methodology

#### Going green in telecom sector

The need for growing Green in the telecommunication Sector was felt because the cost of operation associated with the energy resources for telecom sector is very high as well as the conventional energy resources that we are using exert harmful gases in the atmosphere. Due to which various environmental issues like global warming and other arises. Also the usage of green technology will help in fulfilling the energy requirement of rural areas where in current scenario power availability is very poor. The usage of renewable energy resources will help in meeting the energy requirement of those areas as well as the cost associated with renewable energy resources is very less as compared to conventional resources. Because of the influence of the social and political trends towards environmental responsibility against global warming and other issues that are occurring due to the emission of those harmful gases and creating sustainability in business, going towards green technology seems to be an efficient alternative.

#### Steps towards green telecom

1. The use of renewable energy resources for compensating carbon emission due to telecom Industry.
2. Adoption of innovative technology and energy efficient equipment to reduce the energy requirement for telecom sector.
3. Passive Infrastructure Sharing.
4. World Bank has rolled clean Development Mechanism (CDM) carbon trading.
5. Main emphasis on reuse and recycling of network equipment.
6. Improvement of grid supply.

7. Better network planning like less air conditioning requirement to cool sites, more outdoor BTS and less BTS.

8. Improvement of grid supply.

9. Government support-subsidies, taxes and levies.

10. Improving efficiency of Backup power sources.

11. Optimized cooling by free cooling unit and green shelters.

12. Battery improvement.

### Initiatives by Indian Telecom Industry

To reduce the cost of operation and due to responsibility towards environment and society, Many initiatives has been taken by Indian telecom players which includes "Green Power program" which explore the use of a wide range of technologies like bio diesel, fuel cells, Pico-hydro, wind and photo voltaic panels to fulfil the energy requirement for the telecom sector with less emission of carbon.

#### Aircel

NDTV Toyota Greenies Eco Award 2010 is awarded to it under the category Best Green Company. It has adopted green initiatives which are designed and implemented by Wipro Eco energy, which was the clean energy division of Wipro.

#### Vodafone

It adopted energy efficient approach for cooling base stations and to reduce the fuel consumption, alternating diesel battery hybrid mode. To create different sustainable models for recycle waste and conserving resources in offices, it has started a campaign named "Resolve". Along with this, there are some other effort taken by Vodafone towards Green telecom Include Passive Infrastructure solutions and Active Equipment solution.

##### i) Passive infrastructure solutions

1) Free cooling boxes: Smart air conditioning method to shut down air conditioning when outside air temperature is lower than 26°C. Vodafone has successfully implemented it at 1500 sites which equals to reduction of CO<sub>2</sub> footprint by 5.8 Mn kgCO<sub>2</sub> per annum.

2. Solar Powered sites: Vodafone has piloted this concept at 4 sites in 2010, where the availability of grid power was less or inefficient. Due to this concept, Vodafone foresees a decrease diesel dependency to the tune of 2.8 Mn kgCO<sub>2</sub> per annum.

3) Hybrid solutions: Vodafone has adopted various hybrid solutions at 2200 sites to effectively reduce the energy consumption by 26, 28, 548 litres or 7 Mn kgCO<sub>2</sub> in 2011.

##### ii) Active equipment solutions

It includes shutting down associated cabinets and extra transmitters during low traffic so as to reduce the energy consumption. This has resulted in saving nearly 4 Mn kW of electricity and reduction in CO<sub>2</sub> emission by 3,240,000 kg per annum.

#### Airtel

It has employed the concept of "Green shelters" leading to major savings in energy consumption by its network in India.

#### Idea cellular

On the trial basis, it has deployed solar and bio fuels for their base stations.

## Uninor

For the best contribution by a Corporate/Business Enterprise, Prestigious Green Globe Foundation Award 2011 awarded to Uninor. Every sector including tower companies, Equipment vendors, and network service providers are investing heavily for bringing out these green products.

## Ericsson

Ericsson tower tube was developed to reduce power consumption, which uses natural convection cooling, to reduce feeder loss, which resulting in a reduction up to 40 percent in power consumption.

## Huawei

Huawei has developed single RAN solution based on software-defined radio (SDR) system to truly combine multiple networks. They have employed the usage of energy-efficient equipment which was powered by green energy for their network system and able to reduce power consumption and carbon footprint to some good extent.

## BSNL

BSNL has taken up various pilot projects for 10 kw solar plants at 14 sites and wind power project at 6 USO funded sites in Rajasthan, Gujarat, Tamil Nadu, and Maharashtra.

## Bharti infratel

Bharti infratel doing alternate energy programme which is covering seven high impact initiatives of Green Towers, which are aimed at reducing diesel usage and therefore the carbon footprint.

## This Initiative Includes

- 1) Alternate energy sources like solar: It has been deployed at around 1050 sites (including 500 nos. of indoor towers), which has saved 6.9 mn litres of diesel and around Rs.280 mn.
- 2) Energy efficient approaches: Integrated power management system (IMPS) and variable speed DC generators (DCDG) which has reduced diesel consumption by 1.2 mn litres and already saved Rs.47 mn across 900 sites where it was implemented.
- 3) Free cooling unit instead of air conditioner for reducing electric load requirement. Almost 60% of the energy requirement for a telecom industry is required for cooling unit. It has been implemented across

3400+ sites which results in saving of 4.1 mn litres of diesel.

There are various projects has been taken up by many telecom companies in India. The description of some projects is given as:

### Pilot project-1

This is a solar photovoltaic project in which service providers like reliance/BSNL/Vodafone has tried to employ solar energy instead of conventional energy sources for powering up towers. This was implemented on off grid sites where the average energy requirement was 1530 units/month or 51 units/day. For this, 20 kVA D.G set ran for 16 hours/day with solar array capacity of 10 kWp resulted in generation of 40.69 units/day. The saving out of all this has been described below Tables 1 and 2.

### Pilot project-2

Service Providers: Airtel/BSNL/Vodafone.

Average energy requirement: 2200 units/month.

Grid Supply: 6 hours/day.

20 KVA D.G set running: 10 hours/day.

Solar array capacity: 10 KWP.

WTG capacity: 5 KW.

Units generated: 1470/month.

## Adoption of renewable energy technology and reduction in carbon footprint

A carbon footprint is a measure of the impact of our activities on environment, in particular climate change. It amounts to the amount of green house gases produced in a day due to our activities.

In Telecom industry, we use diesel or other non-renewable energy sources like fossil fuel for powering up towers instead of employing solar energy or wind energy. Due to the burning of fossil fuels, emission of green house and some other harmful gases takes place which results in various environmental issues. Hence there is a need of some checks on emission of GHG gases to avoid harmful impact on environment.

The efficient way to reduce the carbon footprint is to either decrease the energy needed by organization or decrease the dependence on carbon emitting fuels.

S.No.	Items	DG Set	SPV with DG Set	Savings
1.	20 KVA DG Set running	16 hours/day	2 Hours/day	14 Hours/day
2.	Fuel Consumption (2.75 litres/hour)	1320 litres/month Rs. 52800/month	165 litres/month Rs. 6600/month	1065 litres/month (Rs.46,200/ month) Rs.5,54,400/annum
3.	Carbon Emission	3537 kg/month	442 kg/month	3095 kg/month 37140 kg/annum

Table 1: This is a solar photovoltaic pilot project 1.

S. no.	Items	Before	Solar wind hybrid with DG SET	Savings
1.	20 KVA DG set Running	1022 units/month	448 units/month	574 units/month
2.	Fuel Consumption (2.75 litres/hour)	865 litres/month Rs. 34626/month	231 litres Rs.9260/month	634 litres/month Rs. 25366/month
3.	Carbon Emission	2318 kg/month	619 kg/month	20387 kg/annum
4.	Grid Supply	1209 units/month Rs.8003/month	547 units/month Rs. 3607/month	662 units/month Rs. 4396/month
5.	Total Savings			Rs. 29762/- per month Rs. 3,57,144/annum

Table 2: This is a solar photovoltaic pilot project 2.

Replacing diesel with efficient power sources:

1. Replacement with grid power instead of non-renewable resources.

a) A battery is device that stores energy to serve as back up in 24x7 points of consumption like Dcs/sites.

b) Typical VRLA battery with battery life of 3 years provides backup for 3-4 hours to the telecom site at 50% DOD. Newer batteries like Li-ion batteries provide for more than 8-10 hours of backup. These batteries provide a viable option to increase efficiency of telecom.

2. Replacement with renewable power.

a) A way to increase the energy efficiency is by replacing diesel with renewable sources.

b) Replacement with renewable energy sources require huge capital investment but we will be able to reduce carbon footprint to some good extent.

### TRAI Recommendations and DoT's Directions

The Telecom Regulatory Authority of India (TRAI) has released a consultation paper [5] on "green telecom" in 2011 which offers guidance for the use of eco-friendly equipment in the ICT sector. ICT sector alone accounts for 860 million tonnes of the world's greenhouse gas emission. On the basis of TRAI's recommendations, DOT issued different directions to the licensees for implementation with immediate effect:

1) For rural area at least 50% of towers and for urban area 20% of towers should get powered by hybrid power by 2015 while 75% of rural towers and 33% of the urban towers should be able to get powered by hybrid energy by 2020.

2) All the service providers should share the data for estimation of carbon footprint of their operation in format prescribed by TRAI. This declaration should follow the formulas and procedures prescribed by TRAI. This declaration of carbon footprint should be done twice a year.

3) Service providers should adopt energy efficient technologies, passive infrastructure sharing, and adoption of renewable energy resources and Voluntary code of practice encompassing network planning by energy efficient ways.

### Technology (RET) includes the following elements

1) To reduce overall energy and power consumption, the network operator should carefully design and optimized energy efficient radio networks.

2) For reduction of carbon footprint, many service providers should ensure that the total power consumption of each BTS should not exceed 500 W by the year 2020 for 2+2+2 configuration of BTS.

3) In the rural areas, a phased program should be placed by the telecom service providers to have their cell sites, powered by hybrid renewable energy sources including solar energy, wind energy, fuel cells etc.

4) By the year 2020, service providers should provide a 'carbon credit policy' in line with carbon credit norms with the objective of achieving a maximum 50% over the carbon footprint levels of the base Year in rural areas and achieving a maximum of 66% over the carbon footprint levels of the base year in urban areas.

5) From the details provided by all service providers regarding Carbon footprint, service providers should aim at reducing the carbon

emission at 5% by the year 2012-13, 8% by the year 2014-2015, 12% by the year 2016-2017 and 17% by the year 2018-2019.

DOT decided to adopt the measures recommended by TRAI on green telecommunication. Accordingly all the mobile phones/ Telephone instruments manufacturers were directed to follow the E-wastage (Management and Handling) rule 2011 dated 12th May 2011 notified by the Ministry of Environment and Forests, while manufacturing/distributing phones.

The following direction has been issued to the mobile phone/ telephone instruments manufacturer for implementation which is described as:

1) All the Mobile phones and telephone instruments should be free from brominates and chlorinated compounds and antimony trioxide in accordance with the E-wastage rule 2011 dated 12th May 2011 which was notified by the Ministry of Environment and Forests.

2) All the Mobile manufacturers/distributors are required to place collection pins at appropriate places for collection of e-wastage like battery, chargers, mobile phones etc. This collected e-wastage should be recycled or safely disposed as per the prevailing standards. All these processes like transportation, storage, collection, segregation, dismantling, refurbishment, recycling and disposal of e-wastage should be accordance with the E-wastage (Management and Handling) rule 2011 dated 12th May 2011 notified by the Ministry of Environment and Forests and the procedures prescribed in the guidelines by the pollution control board from time to time [6].

### Global Initiatives on Green Telecommunications

1. In 2008, China Mobile had total 2135 base station powered by alternative energy resources like wind, solar, or other renewable energy sources. Of these 1615 were powered by solar energy, 515 by solar and wind and 5 by other alternative sources. Due to the usage of low carbon resources for power generation has saved 48.5 million metric tons of direct carbon dioxide emission in 2008 and 58.2 million metric tons in 2009 and projected to deliver as much as 615 tons in carbon savings by the year 2020.

2. For reduction of the energy requirement for telecom services, active sharing agreement has been entered into by T-mobile and 3 Group in UK, Telstra and 3 Group, as well as Vodafone and Optus, in Australia, Tele 2 and Telia in Sweden.

3. Since almost 60% of the total energy needed by telecom industry has been used by cooling system. To reduce the energy requirement, Swisscom has successfully implemented.

It's "Mistral Mobile" cooling system at 30 of its BTS which leads to a reduction of 80% in the energy needed for cooling mobile network equipment.

4. Nokia has launched a good initiative towards recycling of old Nokia phones by placing kiosks at public places. This initiative has been launched in many countries including India. These kiosks are used for collecting old phones for recycling and use. For every phone dropped in these kiosks, Nokia plants a tree and provides the customer with a unique URL and instructions with which to view their tree through Google Earth.

5. A new approach called Green Touch have been formed by Alcatel-Lucent's Bell Labs and partners such as China Mobile, Telefonica and AT&T that vows to develop networking equipment's that reduce energy consumption by a factor of 1000, reducing emission in the process.

6. Ericsson has installed almost 200, solar powered base stations (photovoltaic 'Sun sites') in Morocco, Mexico and Ethiopia, among many other countries.

7. For providing macro coverage in Sumantra and rural areas of Indonesia, Indonesian operator PT Telekomunikasi Secular (Telkomsel) is using latest generation low power consumption RBSs which are powered by solar technology from Ericsson.

8. In all Millennium Villages in the ten countries in sub-Saharan Africa, Solar Chargers have been deployed by Ericsson.

9. Sprint indicated that 75% of the energy used at Sprint's 200-acre headquarters facility in Overland Park, Kan., is generated with wind energy. That makes Sprint the 15th-largest Purchaser of renewable energy in the U.S.

10. Globally, BT gets the credit of one of the most aggressive companies in reducing its carbon footprint. The company has made a reduction of 60% in carbon-footprint from 1.6 million metric tons of carbon emission in 1996 to 64 million metric tons of carbon emission in 2006 in UK. BT has pledged an 80% reduction of its 1996 total by 2016. In the UK, nearly all of the BT's energy comes from renewable energy resources and combined heat and power plants [7,8].

## Results

### Low carbon solutions

1) To reduce Energy consumption, some smart energy saving strategies should be employed.

2) Transition from conventional resources to Renewable/Clean energy Technology.

3) Optimization of Network for Energy Usage with minimum consumption.

4) Optimally, RF planning with careful attention to energy efficiency for BTS. (Macro, Micro (with maximum EIRP up to 4 watt)) – No overdesign

5) Active and Passive Infrastructure Sharing

6) BTS carry the highest potential of energy saving in Telecom Sector.

7) To enhance indoor coverage, Indoor Pico base station has been deployed.

8) Simple and clean installation of mobile/telephone infrastructure.

9) By setting the Energy consumption benchmark for different telecom network elements.

10) Reduction of diesel oil and energy consumption by Introduction of Renewable Energy Technologies (RET) which includes lithium-ion batteries and Energy Management System (EMS), introduction of India's telecommunication tower based on green technology.

## Conclusion

Since Environmental balance is very important and it should remain like that so taking initiatives for Green Economy by telecom sector will decrease GHS emission and reduce its negative effect. It will also be beneficial for Telecom companies and vendor as their operating cost will be reduced and Customer will get the benefits as they will get the services at reduced cost when operating cost will be reduced. Now the Telecommunication and Regulatory Authority as well as Government in India is closely regulating the telecom sector to make it totally green - all together the global players, industry players, and even the government is working towards the aim to become green telecom. By adopting the suggested measures telecom sector can become green in all fields and will also make planet liveable for the generations to come.

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