Bharti Infratel Limited

Whitepaper

Green Networks: Transforming Telecommunications on Sustainable Energy Alternatives

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ABSTRACT

The telecom industry in India has more than 3,00,000 towers with an average tenancy of 1.5 operators per tower. Traditionally, telecom tower companies use grid power as the primary source and Diesel Generators as the secondary source, or as backup to grid power. The average load at a telecom site usually varies from 0.75 kw to 20 kw. Considering an average of 3 kw consumed by a tower site, total energy requirement across the country is estimated at 9 billion units of energy. This humongous requirement for energy is estimated to emit 6.8 million metric tons of CO_2 into the environment, every year!!

Bharti Infratel's pioneering GreenTowers P7 Initiative is a comprehensive energy-efficiency and alternate-energy program covering seven high impact initiatives, which are aimed at reducing the carbon footprint through lower and optimized diesel usage.

These initiatives include:

1. **Alternate energy sources** like solar, fuel cells etc. are clean energy solutions which are good alternatives to conventional sources of energy. This has already been deployed at around 1200+ sites and has saved more than 35,500 MT of CO_2.
2. **Energy efficiency measures** like Integrated Power Management System (IPMS) and variable speed DC generators (DCDG). These have been implemented across 3500 sites and have also significantly reduced diesel consumption by 3.5 million litres, and thereby a reduction of 9800 MT of CO_2.
3. **Demand side management** through the use of Free Cooling Units (FCU) etc., instead of air conditioners, which substantially reduces the electrical load requirement and the need to run Diesel Generator in absence of grid power. This has already been implemented at 3400+ sites.

Passive Telecom Infrastructure in India is dependent on diesel generators as the primary source of backup power, due to (a) poor grid supply, (b) no grid connectivity in rural areas and (c) low quality grid power

BHARTI INFRATEL'S GREENTOWERS P7 PROJECT

Objectives

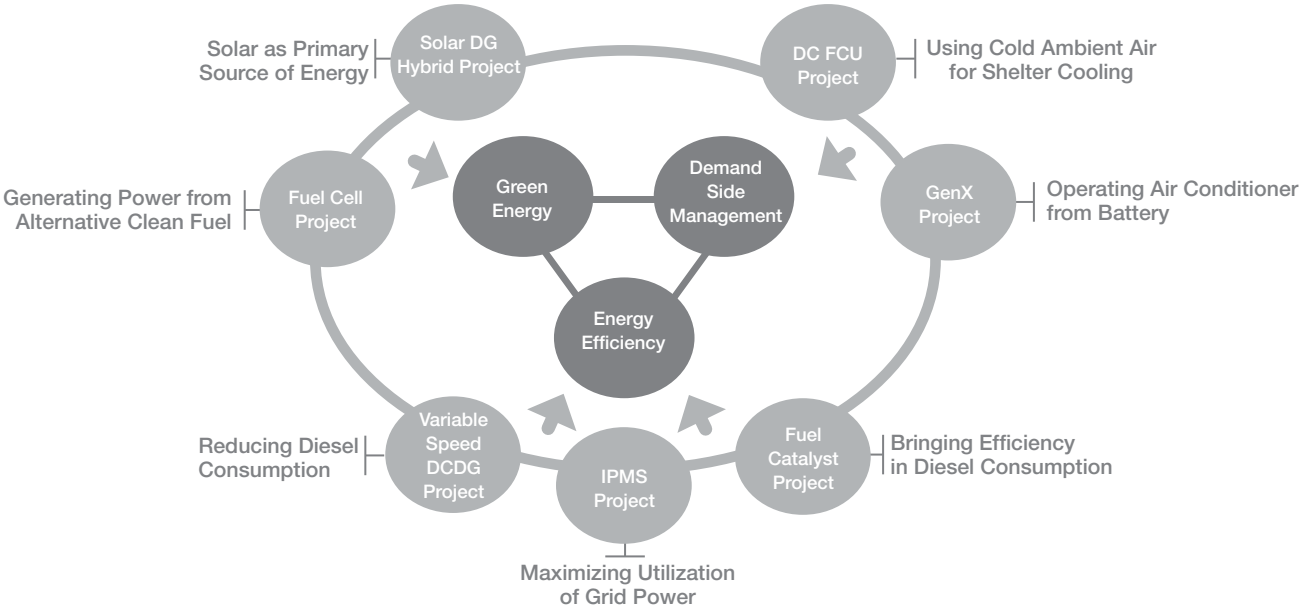
Bharti Infratel's GreenTowers P7 Project is an earnest, conscientious and path-breaking initiative towards the goal of adopting cleaner technologies for power generation and energy efficiency, to mitigate greenhouse gas emissions. It is the association of 7 sub-projects; having the following objectives:

- Reduce dependence on conventional sources of energy
- Sustainable development and reducing carbon footprint of the company
- Reduce Opex for cellular operators, and help reach rural population at lower tariffs
- To increase energy efficiency of the company, thereby reducing energy costs
- Remain competitive in the Telecom Infrastructure business

The GreenTowers P7 initiative covers 7 high-impact initiatives to reduce diesel consumption, and hence the carbon footprint.

Technology Enablers

The P7 Initiative has emerged out of various observations, and operational best practices, followed at Bharti Infratel.



ALTERNATE ENERGY SOURCES

1. **Solar-DG Hybrid Solution:** Non-electrified cell sites rely on Diesel Generator sets extensively for their power requirement, therefore consuming significant volumes of diesel. The volume consumed varies depending on tenancy at the site, which can sometimes take the average DG run-hours to 20-22 hours per day. Solar energy is a fair alternative in India, considering the adequate sunshine received.

   But again, the use of solar power in its pure form, is not the best alternative, as each KW of solar energy requires 7 sq.mtrs of shadow-free, south-facing space. Not all tower sites fit this requirement. Further, a stand-alone solar system is very high on Capex, and has limited utility on cloudy or non-sunny days.

   To overcome these challenges, Infratel created worked out a unique and innovative Solar-Hybrid system along with its partners. The solution uses 3 kw -7 kw capacity solar panels in tandem with & 600 AH-1200 AH battery banks, which helped reduce the DG run hours from 20 to 6 hours a day. The balance 18 hours is entirely powered by this solution.

   SOLUTION ARCHITECTURE

   i. Solar Panels
      - 3-8 KWp
      - Mono & Multi-Crystalline Silicon

   ii. VRLA Batteries (600Ah-1200Ah):
      - Prolonging battery backup upto 11hrs
      - New battery instead existing one

   iii. Hybrid Solar Controller (HSC):
      - Sophisticated controller for optimization
      - Communication with centralized data management center

   iv. Data Management Center (DMC):
      - 2-way communication with sites
      - Data reporting
      - Escalation Alarms

When all 2000 sites are fully functional:

- Reduction in DG run-hours: From 22 hours/day to 4.5 hours/day
- Reduction in diesel consumption: By 21.45 Million litres per year
- Reduction in CO_2 emissions: 57,915 Metric Tons per year

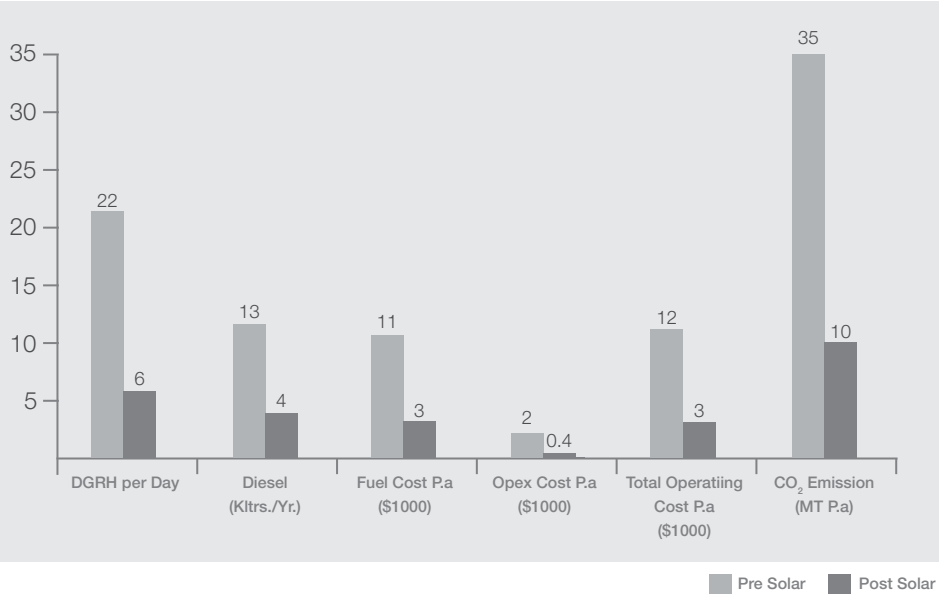
BENEFITS & IMPACT

- Bharti Infratel has installed over 1200 sites in Bihar circle with a cumulative capacity of over 6 MW, using the above solution. At these sites, Bharti Infratel is generating around 8 million units of electricity every year using renewable energy.
- For the 1200 sites installed, reduction in CO_2 emissions is estimated to be 35,000 MT/year.

Infratel plans to increase the number of such sites to 2000. When all these 2000 sites are fully functional:

- Reduction in diesel consumption is estimated to be 63.6%
- Reduction in CO_2 emissions is estimated at 57,915 MT/ year

KEY PARAMETERS FOR 1 BTS SITE



In addition to the reduction in carbon emissions, the solution has helped improve the life of the battery-bank installed at the sites. Further, DGs require ongoing O&M (operations & maintenance) activity. With the reduction in run-hours, the O&M effort has also reduced significantly, while improving the network uptime performance.

2. **Fuel Cells:** Fuel cells convert the chemical energy of hydrogen into electricity through a chemical reaction with oxygen or another oxidizing agent, emitting zero emissions at the source. This technology is aimed at replacing DGs and reducing diesel consumption significantly.

   Infratel's technical research team also concluded that the Fuel Cells technology provided a good business case to replace Diesel Generators in sites having up to 3 outdoor BTS'.

   BENEFITS & IMPACT

   Once all the 500 sites, planned for, are fully functional:

   i. Reduction in diesel consumption is estimated to be 6.58 million litres
   ii. Reduction in CO_2 emissions is estimated at 17,766 MT per year

The GreenTowers P7 program is scoped to cover 70% of Bharti Infratel's tower network. Multiple technology initiatives have been combined and mapped to fit various tower site categories.

ENERGY EFFICIENCY MEASURES

3. **IPMS:** IPMS provides complete AC and DC power management along with communicating all critical alarms to the control center. Designed to seamlessly switch between different sources of power intelligently and maximize power utilization.

   Integrated Power Management System is targeted for all sites having poor grid availability where low voltage and single phasing are pertinent problems. This results in maximizing usage of grid power and reducing DG run-hours at cell sites. The IPMS helps improve the combined efficiency of the equipment by as much as 3-5%.

   BENEFITS & IMPACT

   Once all the 4658 sites planned for, are fully functional, estimated:
   i. Reduction in CO_2 emissions: 11,340 MT per year
   ii. Revenue savings: US$ 3 Million per year

4. **Fuel Catalyst:**

   BENEFITS & IMPACT

   Once all the 4800+ sites planned for are fully functional, estimated
   i. Reduction in diesel consumption: 6-9% per year
   ii. Reduction in CO_2 emissions: 8937 MT per year
   iii. Revenue savings: US$ 2.8 Million per year

5. **Variable Speed DC DG:** Cases of low grid availability, and poorly electrified cell sites, are no different. Both of these use DG sets extensively for their power requirement. Depending on the number of tenants, diesel consumption varies and may go up with the requisite increase in tenancies. Average DG run-hours for such sites hovers around 16 hours/day. Since the load at cell sites is highly variable, constant speed AC DGs become inefficient under low-load conditions. Infratel's team found that variable speed DC DGs have a relatively flat efficiency curve and are a better solution for cell sites. Fuel consumption for similar load applications in case of DC DGs is about 50% lesser than AC DGs thus significantly saving on diesel consumption.

   BENEFITS & IMPACT

   Having implemented across 2000 sites:
   i. Reduction in diesel consumption at cell sites: by 60%, or 10.18 million litres per year
   ii. Reduction in CO_2 emissions: 27,486 metric tons of CO_2 every year

DEMAND SIDE MANAGEMENT

6. **DCFCU:** The power consumed by a DC Free Cooling Unit (DCFCU) is only 208 watts as against 1350 watts consumed by a 0.9 ton air-conditioner. Further, a DCFCU operates on DC power whereas an Air-conditioner requires a 230 V AC supply. So, in case of a grid power failure, a DCFCU can run on power available in the battery, and reduce the usage of DG by maintaining the temperature.

   Accordingly, Infratel has installed DC Free Cooling Units at those indoor cell sites where ambient temperatures remain predominantly around 25° C. The product would avoid running of air-conditioners during favorable ambient temperatures, and reduce consumption of grid power when it's available. When grid power is not available, DG operation will be delayed since DCFCU draws power from the battery source.

   BENEFITS & IMPACT

   Once all the 6318 sites planned for, are fully functional, estimated:

   i. Reduction in diesel consumption: 7.57 million litres per year
   ii. Reduction in CO_2 emissions: 20, 439 MT per year
   iii. Revenue savings: USD $4.1 million per year

7. **GenX:** GenX is a product, which converts DC power to AC power, and has the functionality of a soft starter. These are being installed at all those indoor cell sites where ambient temperature remains predominantly above 25° C. The product would enable running of air-conditioner from battery source during grid unavailability thus avoiding DG usage. The project is developed to reduce DG run-hours by 3 hours/day at indoor sites.

   BENEFITS & IMPACT

   Once all the 3534 sites planned for, are fully functional, estimated:

   i. Reduction in diesel consumption: 4.88 million litres per year
   ii. Reduction in CO_2 emissions: 13,176 MT per year
   iii. Revenue savings: USD $4.1 Million per year

The GreenTowers P7 Initiative would help Infratel reduce:

- Energy costs by 25%;
- Diesel consumed by 58.17 million litres and
- CO_2 emissions by 1,54,000 MT -every year!

Accolades

As an industry leader, Infratel has always led landmark initiatives, which have been instrumental in setting benchmarks for the industry.

The GreenTowers P7 initiative is another such important example where the use of renewable energy sources at Infratel's tower locations is now a proven success – and is now being replicated by many other telecom tower players and mobile operators across the globe.

Bharti Infratel has also been widely recognized for this pioneering and sustainable program, at both national and global forums. Infratel bagged the 'Green Mobile Award' at the GSMA Mobile World Congress in Barcelona, on February 2011, and is the only Indian company to have received this honor at this international forum.

Future Roadmap

Inspite of what's been accomplished, Bharti Infratel recognizes that the journey to a cleaner and greener environment has just started. As a company, Infratel is working relentlessly on expanding their green energy portfolio by embracing various technologies like wind energy, biomass, zero emission batteries etc; as well as developing a sustainable community power program in rural areas.

Infratel is currently the only telecom tower company, which has installed more than 6 MW of solar capacity on their network, generating more than 8 million units of electricity every year. All this has been creditably achieved in spite of a high initial investment cost for solar unit installations and no external financial support.

ABOUT BHARTI INFRATEL

Bharti Infratel Limited is one of the world's leading telecom tower infrastructure service providers. It deploys, owns and manages telecom towers and communication structures, for various mobile operators across 18 states of India. It has a vast footprint of over 33,000+ towers and holds a 42% stake in Indus Towers Limited – a Joint Venture between Bharti Infratel, Vodafone & Idea Cellular.

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