

The Indian telecom tower industry has come a long way in terms of achieving operational efficiency. Central to this achievement has been the industry's move towards adopting and exploring new, smarter strategies and solutions for energy management and cost optimisation at tower sites. The industry is finally moving beyond its dependence on diesel generators (DGs) as the only substitute to poor grid and off-grid sites. Use of energy efficient equipment, hybrid solutions, renewable technologies and energy storage solutions are helping companies bring down their energy consumption and related costs.

Telecom infrastructure major Indus Towers has converted 50,641 sites into green sites (or diesel-free sites), out of its portfolio of about 120,000 sites. By going green, the company has been able to save 25-30 per cent on its energy cost. As per Bharti Infratel's investor presentation for August 2016, the company had over 33,750 (38 per cent of the company's portfolio) towers across the network as green towers.

Also, there has been a shift in the fundamental business model with the tower industry opening up to the idea of outsourcing the energy management function to specialised players. The companies are also warming up to the idea of using technology, IT and analytics support to undertake real-time and preventive maintenance of even remote sites.

### Escalating energy requirements

A surge in the adoption of data services has led to a rise in new tower roll-outs as well as the addition of new base transceiver stations (BTSs) at the existing tower sites for addressing operators' capacity and coverage requirements. This will, in turn, drive the energy requirements. Of the new tower roll-outs every year, about 70 per cent will be in rural and semi-urban areas, which continue to suffer from patchy and/or no grid power availability. Further, most tower deployments are likely to take place in spectrum bands with higher frequency such as the 1800 MHz, 2100 MHz and 2300 MHz bands. Spectrum in these bands is the most sought after. Given the weak in-building propagation characteristics of these spectrum bands, the number of towers required to provide adequate coverage is high. The additional towers will further increase the sector's energy demands going forward.

### Key solutions and strategies

- Indoor-to-outdoor conversion of a site: This has emerged as a widely adopted strategy as it significantly reduces the need for air conditioning or totally eliminates it in certain cases. The

companies are installing free cooling units, which channelise air even as the BTS continues to stay in the shelter. Indus Towers converted 41,484 towers to outdoor sites during 2015-16. Meanwhile, between end-2013 and end-2015, Tata Teleservices Limited (TTSL) achieved BTS conversions for around 16,000 sites. This progress has been made under Project Optimus, which was started in 2010 for optimisation of the operator's network operation cost and reduction in the carbon footprint. Through various initiatives under the project, TTSL has been able to achieve annualised opex savings of over Rs 980 million and annualised carbon savings of up to 80K TCO<sub>2e</sub>.

- Emergence of hybrids:** The state of power availability in the country is unlikely to reverse overnight or in the near future. Further, doing away with DGs from all sites will take many years. Thus, optimising the current DG usage by using these systems in a hybrid form with other technologies is a good option. Hybrids of solar photovoltaic, biogasifiers, DGs and batteries are already in commercial use by many tower infrastructure companies. Among the available green solutions, the solar-DG hybrid solution is emerging as the one most preferred by telecom operators.

- Energy storage:** Given the unreliable grid conditions in India, storage of energy is crucial. A storage system with higher backup and better efficiency means less DG run-hours, which translates into reduced diesel consumption. This is not only a financial gain for an organisation, but also means lower carbon emissions and a reduced carbon footprint. Over the years, significant innovation and revamp have taken place in the batteries being deployed at tower sites. The new-age batteries are more compact and have longer discharge times, shorter charging times, relatively longer life and limited air-conditioning requirements.

Both lithium-ion and valve-regulated lead acid (VRLA) batteries have emerged as the preferred choice of tower companies to store energy from various sources like the grid, DG and solar, which are discharged effectively to reduce the diesel run-hours.

Lithium is catching up much faster in the urban areas, especially for small and micro cells. According to the Indian Energy Storage Alliance (IESA), lithium-ion batteries worth about \$500 million have been bought for use in Indian telecom towers in the past two years. Going forward, backed by increasing 4G roll-outs and the accompanying surge in energy requirement at tower sites, the market for lithium-ion batteries is projected to grow at a compound annual growth rate of over 32 per cent during 2016-21.

Reliance Jio Infocomm Limited has installed lithium-ion batteries across the majority of its towers. Bharti Infratel and Indus Towers have also been testing lithium-ion batteries. Indus Towers has also deployed a large number of advanced VRLA+ batteries, which has resulted in a significant reduction in diesel consumption. Moreover, at many sites, they have been able to remove DGs completely and convert normal sites into green sites.

- Renewable solutions: Renewable energy can help tower companies reduce emissions, energy costs as well as diesel logistics costs. The cost economics pertaining to sources like solar and wind have improved significantly in recent years, resulting in several, though small-scale, deployments. Solar has emerged as by far the most deployable and favourable technology in the green domain. It is best suited for rural areas, which offer vast expanses of land for panel installation. In urban areas, solar panels mounted on rooftops are gaining acceptance. The industry is now also ready to experiment with new technologies like fuel cells and biomass. As per Bharti Infratel's investor presentation for August 2016, the company had close to 3,070 solar-powered towers with an installed capacity of over 11 MW.

- Shift towards O&M and remote site monitoring: The inability of tower companies to manage the massive energy requirements and the accompanying costs in recent times has given rise to a new crop of specialised operations and management (O&M) companies. These cater to specific or, in some cases, end-to-end energy requirements at tower sites. They often use analytical tools to help operators identify anomalies in their systems and resort to remote site monitoring. The key advantage offered by remote site monitoring is the real-time information on tower site performance and its energy consumption pattern. As per industry estimates, energy consumption monitoring could increase asset life by 10 per cent and operational efficiency can be improved by 20 per cent through actionable intelligence.

In September 2015, GTL sold its energy management business unit to Essential Energy for Rs 85 billion. Apart from kicking off energy management outsourcing activity in the industry, the deal has also given a push to the uptake of hydrogen-based fuel cells to power telecom towers in India.

### Challenges

The high capex associated with new and high efficiency storage solutions continues to be a key hurdle in the wide-scale adoption of energy management solutions. Even with renewable energy technologies, high capex requirements have led to a limited scale of adoption.

Stringent government laws also pose a big challenge to the industry. Even though steady progress has been made in adopting clean energy solutions, the speed of adoption continues to be slow, to say the least. This makes the Department of Telecommunications' targets to run 75 per cent of the sites in rural areas on hybrid power and 33 per cent in urban areas by 2020 a Herculean task.

Further, given the length and breadth of the country across which telecom towers are deployed, each one of them is unique in terms of configuration, number of BTSs, load requirement, grid power availability and prevailing weather conditions. Therefore, it becomes difficult to adopt the one-shoe-fits-all approach. In addition, companies have to undergo several trial runs before arriving at the best fit for a particular site.

## **The way forward**

Over the years, energy management has become a key area of concern for the industry as the growth of India's power grid has failed to keep pace with that of the country's wireless network reach. Diesel-run generators, the most convenient substitute for grid power, are now proving to be extremely expensive and are damaging the environment.

The industry's recent steps to move beyond its dependence on grid and DG through the use of hybrid, high efficiency and energy storage solutions are commendable. However, at present, the solutions are mostly being implemented in bits and pieces. The large-scale capex required for energy solutions remains a key issue that can be addressed by adopting opex models. In addition, semi-opex models can be adopted wherein customers can own assets but a specialised service provider takes care of energy management services.

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