

In recent years, ensuring continuous network availability has emerged as a key requirement for guaranteeing quality of service. To this end, the Telecom Regulatory Authority of India has issued stringent quality of service regulations for mobile service providers as part of which a telecom tower site needs to have an uptime of 99.95 per cent. This implies that a service provider can afford only about 20 minutes of downtime per month.

Ensuring a high uptime on telecom tower sites requires uninterrupted power supply. Although grid supply has witnessed significant improvement across the country, the situation is far from acceptable. For instance, the average grid power availability at non-metro locations is around 12 hours a day. To plug this gap, towercos are adopting innovative technologies and deploying energy efficient equipment to reduce energy requirements at telecom sites.

Changing energy requirements

The adoption of energy management techniques is becoming imperative due to the evolving technology landscape. Energy consumption is estimated to form 25-30 per cent of the total operational expenditure (opex) of a tower company. However, with the advent of emerging technologies such as 5G, internet of things (IoT) and artificial intelligence (AI), energy consumption is likely to go up to 40-45 per cent of the opex.

As per industry reports, the move towards 5G is expected to increase the total network energy consumption across the globe by 150-170 per cent by 2026. This would primarily be on the back of a growth in the number of small cells and a rise in massive multiple input multiple output (MIMO) antennas. While energy consumption by a small cell is lesser than that at a conventional site, the number of small cells required to cover the same area with 5G would be much higher. Further, massive MIMO would require more antennas at each base station and therefore more hardware equipment per base station.

Energy management strategies

Amidst changing energy requirements, towercos have been adopting a number of energy management strategies to enhance efficiency. These include:

- *Conversion of indoor sites:* As per EY estimates, nearly 10 million tonnes of annual carbon dioxide emissions are caused due to diesel usage at tower sites. To offset this, the Indian tower industry has converted a number of indoor sites into outdoor sites, which has led to savings of over 4 tonnes of carbon dioxide emissions per site. Indoor sites require air conditioning, which accounts for around a third of the site's opex and about 50 per cent power consumption at the tower. Air conditioners are therefore being increasingly replaced with free cooling units (FCUs) and natural cooling units (NCUs).
- *Energy storage solutions:* The industry is deploying energy storage solutions such as batteries, which are crucial for ensuring uninterrupted connectivity in places where grid power is unreliable. Apart from being an alternative backup source to diesel, battery-based power is almost half the cost of diesel genset-based power. Earlier, valve regulated lead acid (VRLA) batteries were used to provide backup power to base transceiver stations (BTSs). However, VRLA batteries suffer from limitations such as quick discharge, slow charging, shorter lifespan and the need for air conditioning. Over the past few years, new energy efficient technologies such as lithium-ion (Li-ion) batteries, with higher performance parameters such as depth of discharge and efficiency, have emerged.
- *Going green:* Green energy solutions such as solar, wind and biomass are also finding many takers among towercos. This has helped towercos to significantly reduce their greenhouse gas emissions and make their operations more energy efficient. Out of all renewable energy technologies, solar power is the most commercialised. However, solar-powered sites account for less than 10 per cent of towercos' portfolios. This is because solar is an intermittent and inconstant source (it is typically available for only five to six hours a day). As such, solar power cannot be used as a stand-alone solution to power telecom towers and, therefore, wind energy is being increasingly deployed at rural sites, particularly in states such as Tamil Nadu, Karnataka and Gujarat.
- *Hybrid solutions:* Some companies have started exploring hybrid energy solutions, which are a combination of solar photovoltaic (PV) batteries, diesel generators (DGs) and grid power. TRAI has also announced plans to support around 75 per cent and 33 per cent of towers through hybrid solutions in urban and rural areas respectively. In addition, fuel cell systems are being explored. Fuel cells have higher capacity than renewable energy solutions and have better efficiency and load characteristics as compared with DG sets. Therefore, fuel cell systems can be used for reducing the energy requirement of a telecom site.

Industry-wide adoption trends

Among towercos, Indus Towers has achieved a milestone of operating over 100,000 air-conditioner-free sites. The company plans to go diesel-free by 2021. According to its sustainability report for 2017-18, Indus had a total of 123,639 towers, of which 67,544 were green towers, which implies that over 50 per cent of the company's sites are diesel-free. The company intends to scale up its renewable energy deployment and targets to cover the remaining 50 per cent of telecom sites by 2021. As part of its zero-diesel initiative, Indus has launched a green innovation programme called Harit Sanchar. The implementation of the programme has resulted in multiple benefits to stakeholders such as lower greenhouse gas emissions, 24x7 network availability, lower cost of operations on account of a huge reduction in opex, and lower diesel consumption. In the energy storage space, Indus has moved from normal lead acid batteries to advanced VRLA batteries and now it is using energy efficient Li-ion batteries. Indus has installed a 5 kW methanol-based fuel cell system called Proton Exchange Membrane Fuel Cell at a site in Delhi. Additionally, the company has successfully tested piped natural gas (PNG) generators in one business unit and is planning to deploy these across other units, as the availability of the PNG pipeline network is increasing in various areas.

GTL Infrastructure has a total of 7,875 diesel-free sites. The company has undertaken several measures such as the conversion of indoor sites to outdoor ones, installation of emergency-free cooling systems to improve the efficiency of grid-connected sites, and deployment of new technology equipment to increase power efficiency. The company is assisting its telecom operator tenants in swapping their indoor BTSs with outdoor BTSs.

Meanwhile, Bharti Infratel has around 45,000 green sites across its network on a consolidated basis. This milestone was achieved on the back of initiatives such as the Green Towers P7 programme and the zero-emission network (ZEN) model. The company operates about 3,100 solar-powered sites and is working towards scaling up solar installations across its network. Another towerco, ATC India has been setting up captive hybrid solar systems at sites where DGs run for longer durations. So far, solar panels averaging 4.4 kWp have been installed at more than 450 sites in Bihar, Uttar Pradesh, Odisha and West Bengal. The current total installed capacity of solar systems has surpassed 2 MWp and this has significantly reduced the company's carbon footprint.

The way ahead

The industry has taken commendable steps to reduce its reliance on diesel and manage its energy needs. These steps have helped the industry in reducing its energy opex and carbon footprint. However, a lot needs to be done. The telecom industry accounts for around 1 per cent of the country's total carbon dioxide emissions, which is higher than the global standard of 0.7 per cent. Further, only 25 per cent of the mobile towers in India utilise renewable energy.

In this scenario, government policies aimed at offering tax incentives for adopting renewable energy can help scale up the deployment of these solutions. Incentives that encourage the use of battery technologies such as Li-ion will be a welcome step. The telecom industry can also look at a sharing model, which allows telecom tower sites to host active network components of multiple service providers. This, in turn, will help the industry reduce capex and opex as well as its energy requirements.

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