Over the past few years, the energy needs of the telecom sector have grown manifold due to the increasing number of telecom towers. However, as most states in the country still face long power cuts, operating telecom towers on a 24x7 basis becomes a difficult task. There are still some regions in the country that have access to less than 12 hours of power, as grid connectivity in India is sporadic, intermittent and deficient. This increases the cost of maintaining network uptime. As a result, energy storage has become a vital component of the telecom industry's energy management efforts.

The industry has been using a host of energy storage solutions such as valve-regulated lead acid (VRLA) batteries, lithium-ion (Li-ion) batteries, lead acid batteries, flow batteries, thermal energy storage and protection circuit module batteries. These solutions can be used for towers that face long power cuts as well as those that have grid power available for most of the day. While in the first case they help in reducing the use of diesel generators (DGs) for long hours, in the latter, advanced energy storage systems can be used as a possible option for completely eliminating DG usage. Energy storage has thus become integral for ensuring energy autonomy in the industry.

Key solutions

Energy storage systems are crucial in unreliable electricity supply scenarios. An efficient storage system with higher backup decreases DG running 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. Earlier, heavy VRLA batteries were used to provide backup to base transceiver stations (BTSs). In VRLA batteries, the cost of energy storage is Rs 18-Rs 20 per kWh. This solution worked well for eliminating the use of DG sets in locations where grid power availability was up to 20 hours per day. However, it had limitations like short discharge time, long charging time, a short life, cell pilferage issues and need for air conditioning at high temperatures.

To overcome these shortcomings, battery manufacturers have come up with new models that charge fast, require less space per kW and have high round-trip efficiency. These models include Li-ion and lead acid batteries, flow batteries, thermal energy storage and protection circuit module batteries. Among these, Li-ion batteries have found wide acceptance at tower sites that are facing low grid power availability as the technology supports quick charge and

extended discharge functions that are suited for cyclic usage patterns. Li-ion has emerged as the most suitable technology for small cells and microcells given the benefits of space, weight, efficiency and charge and discharge time. VRLA hybrids and hydrogen fuel cells are some of the other solutions used by tower companies in the country.

Meanwhile, the need to reduce their opex and the industry's carbon footprint has led tower companies to experiment with alternative power sources such as solar, wind and biofuel for powering their towers. As per industry reports, tower companies can reduce their energy costs by 30-40 per cent by adopting green technologies. However, a key requirement for operating these energy sources is the adoption of appropriate storage solutions as renewable energy is not available at all times. Thus, there is a need to integrate energy storage solutions with telecom towers that run on renewable energy. Such integration can result in significant cost savings on fuel and increase the reliability of energy supply to the tower. Therefore, the increased renewable energy uptake has also become a key driver for the implementation of energy storage solutions in the country. Energy storage technologies such as advanced lead acid and Li-ion can be used for this purpose.

Issues and challenges

While the industry has started resorting to energy storage solutions to ensure continuous supply of electricity to telecom towers, there are several issues that remain unresolved. Each telecom tower site is different in terms of configuration, number of BTSs, load requirement, grid power availability and prevailing weather conditions. Therefore, companies need to try different permutations and combinations before selecting the best storage solution for a particular site. Further, site configuration should be planned well in order to reduce opex on energy. There are also issues related to the suitability and compatibility of new technologies with the existing tower site infrastructure, as well as limited field support.

Moreover, energy storage needs to be used effectively, which involves deploying a combination of Li-ion batteries and VRLA batteries. The energy storage industry also needs to move from products and solutions to an outcome-oriented model. To this end, companies need to offer solutions that can promise a given uptime along with a reduction in opex. These companies will have to make use of suitable technology for achieving these objectives. Further, the available storage technologies that provide high efficiency require a huge capex, thus impacting the return on investment. This is because the storage cost of VRLA batteries or li-ion batteries is not declining as it is difficult to reduce the procurement cost of batteries. Therefore, battery manufacturers are not able to factor in the increasing procurement costs and recover their energy costs from operators.

Li-ion systems have three components – cells and their bundling, sensors for each cell, and the battery management system. Each of these elements needs regular maintenance but none of these is standardised as every supplier has a different design. Another challenge is that Li-ion batteries have a high replacement cost. Unless they are priced in the same range as lead acid batteries, it will be difficult to adopt new solutions as tower operators are yet to establish the performance of new systems in the long run.

The way ahead

Given the significant gap between power generation and demand in the country, energy storage solutions are important to ensure round-the-clock operations of telecom tower sites. According to the India Energy Storage Overview Report by the India Energy Storage Alliance, telecom towers would account for 460 MW of the total estimated market potential of 16,445 MW for energy storage by 2020.

Further, the telecom industry is at the forefront of implementing the government's Digital India and Smart Cities Mission. To achieve the goals envisaged under these programmes would require a robust telecom infrastructure comprising towers, microsites and fiberised backhaul networks for communication. In addition, innovative energy storage solutions would need to be deployed to ensure power backup for towers in Smart Cities for smooth communication.

In addition, the Telecom Regulatory Authority of India (TRAI) has proposed that 75 per cent of towers in rural areas and 33 per cent in urban areas should be powered by hybrid power, comprising both renewable and grid power, by 2020. Earlier, the regulator had asked telecom operators to aim at carbon emission reduction of 12 per cent by 2016-17 and 17 per cent by 2018-19. In order to achieve this target, the industry has been stepping up investments in renewable energy. This also requires investments in suitable energy storage technologies.

Going forward, energy storage solutions will play a key role, with industry players showing a commitment towards green energy technologies. However, storage solutions can be a win-win strategy only if the costs and benefits are shared between telecom operators and their respective tower companies. If storage solutions are designed, operated and managed optimally, they can be the single largest contributor to energy savings in the telecom tower industry.

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