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OVERVIEW OF ENERGY STORAGE SYSTEM IN INDIA & THEIR FUTURE

Ever since first steam powered electrical distribution system was built in 1882, electricity has today reached and accessible to almost everybody living in the world.



AUTHOR



MR. MANOJ KUMAR UPADHYAY
FOUNDER & CHAIRMAN
ACME GROUP

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Technology has evolved and electric light has become competitive with gas light more than a century ago. Majority of the energy even today is being generated by using fossil fuels. However over the centuries electricity is being generated, transmitted distributed and then either used or wasted. There is no significant storage of electricity so far. This is also because of the fact that demand is always surpassing the generation and all of that which is generate has been used. This landscape has changed off-late when Renewable energy became competitive with technologies based on fossil fuels. At the same, the facet of transportation is changing very fast from IC engines to Electric Vehicles. World is now moving from power deficit to power surplus and also new forms of energy generated by intermittent sources. Regulating intermittent sources of energy and integrating it with main grid would be difficult without the presence of large storage system. Electric mobility demands energy storage elements with large energy density to meet expectations on range, speed, acceleration and driving experience.

However, to make these new technologies truly disruptive, there is a need to develop high life cycles and higher energy density storage system. Lead Acid batteries stood undisputedly the most popular batteries until Lithium-ion based batteries were commercialized. Lithium ion based batteries exhibit far better and higher energy density than any other battery in the category. Usage of Lithium ion batteries has become imperative by early 90s, by the advent of commercially viable portable devices. Taking the advantage of increase in volume, higher energy density and falling prices major car manufacturers are leaning towards extensive usage of Lithium ion batteries while designing their EV versions of cars. Though EV has not reached parity against its IC engines, future looks pretty much attractive with the prices are expected to fall significantly over next couple of years.

Taking this imminent advantage, grid scale storage segment is definitely going to get benefitted. Growing level of integration of Renewable energy sources on to the main Grid and given their intermittent nature makes it imperative to bring in Energy Storage solutions (ESS) in Indian context. Grid stability becomes a major issue when there is substantial addition of energy through renewable sources, which are intermittent in nature. Energy Storage can play a key role grid stabilization through operations such as Frequency response, peak shaving and time shifting. Energy forecasting which could become major requirements with increased level of Renewables can be made possible by having ESS in place.

Apart from the large scale grid level storage systems, equal importance has to be given towards distributed storage systems at residential & micro grid level that can also bring energy independence to individual user. Another importance segment where energy storage brings value is EV to building or EV to Grid. With an aggressive plans across the world to introduce Electric Vehicles, this segment is going to clearly influence the Energy storage markets.

Energy storage in this context is not just a back-up power source that is used only when grid is not available. Storage element is not going to be operated in floating applications as it is being used presently with the conventional storage technologies. However, Energy storage is subjected to a daily cycling when it is used in conjunction with renewable sources or Electric Vehicles. This brings a challenge of cyclic life for an energy storage unit. ESS shall have the capability to be used either as an Energy source for applications such as grid and also as power source for applications as in Electric Vehicle. In this context, we see Lithium ion battery clearly

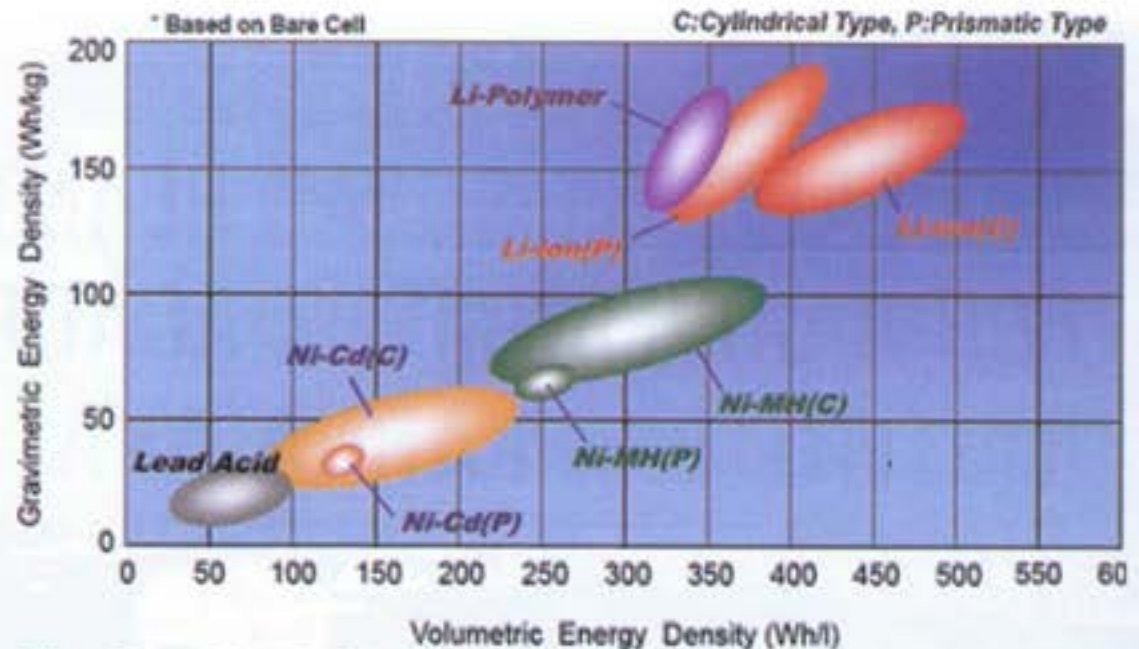


Fig 1. Energy Density Comparison (Image credit: NASA)

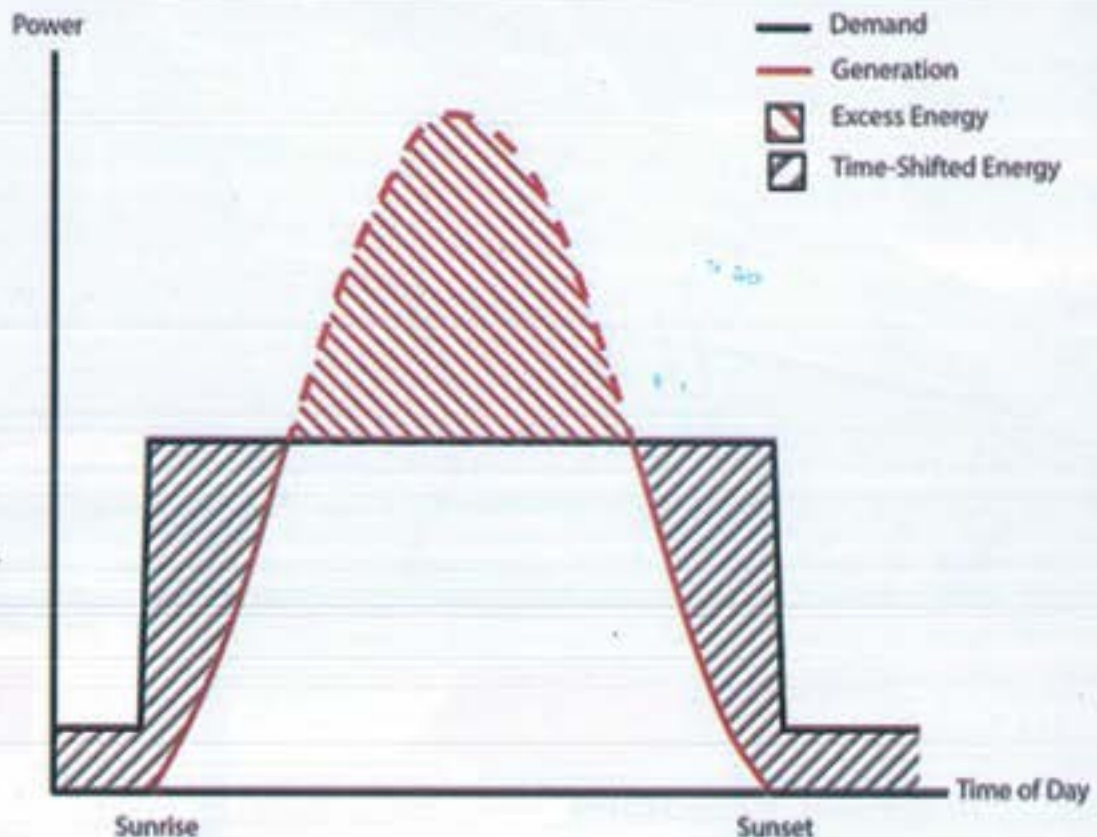


Fig 2. Grid scale Energy Storage

emerging as a favorable choice. With several segments such as Utility scale storage, Distributed Energy and EV emerging as potential growth engines for Energy Storage, it is very important for the country to initiate few pilot projects, gain experience to deal with all these applications. Though large scale storage systems are already installed and operational in countries like Germany, Japan we do not have any thing operational in India. While it is helpful to learn from what has been installed already elsewhere in the world, it is important to establish proof of concepts in India. This helps the industry to learn what challenges are there in Indian context and also frame regulations and policies around this segment. It is equally important to initiate process of standardization and setting up of testing facilities. Realizing this impending need of Energy Storage, ACME being the leader in Solar Energy, has been

giving a serious thought towards providing sustainable solutions in this area. ACME has already installed Lithium Ion battery based Energy storage systems, and established working examples in various segments like Rural micro grids, Renewable integration at high altitude areas and building solutions. ACME recently has successfully tested its Lithium ion based battery for two and three wheeler passenger vehicles in India. It is also giving that extra push towards localizing battery assembly in India under "Make in India" initiative. ACME is marching towards major energy supplier for EV industry and is also planning to setup charging stations at identified locations. Hybrid Power Conversion technologies, Battery management system and battery packaging technologies are the key areas ACME is focusing on, towards achieving reliable and sustainable in-house solutions for local and global markets.