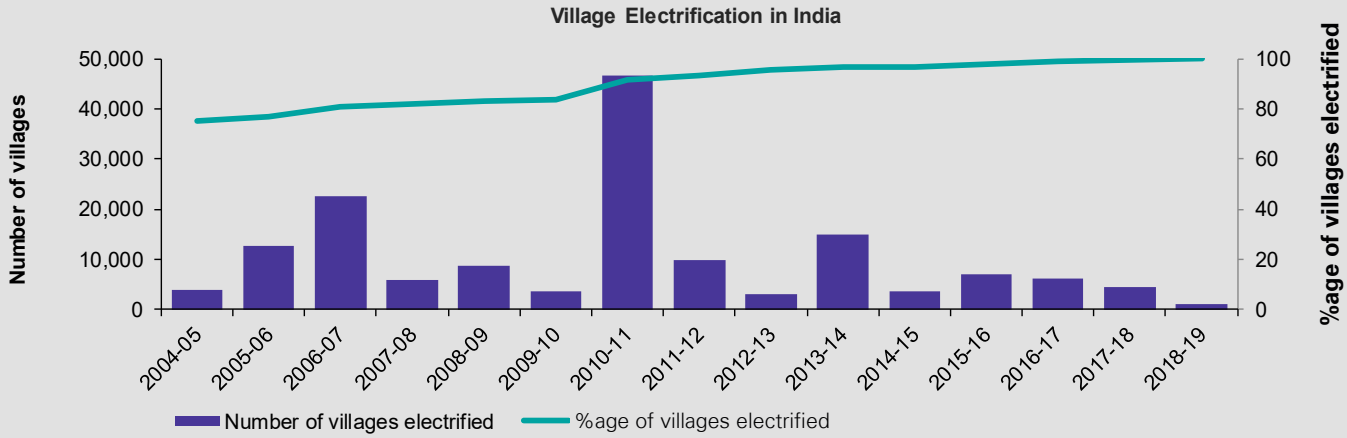
This paper started with the electrification imperatives in a carbon constrained world. The imperatives for India as a country go well beyond carbon. In the end, it comes down to the basics: do we have the right products and services for the market; is the pricing right; are the delivery channels appropriate for the age that we live in. As the country moves towards renewable energy and energy storage from conventional resources, there are massive economic implications of the pathways that we choose for technology development, manufacturing, production, supply and pricing. In many ways, our approach in ushering in the new world of energy will determine the health of the economy and well-being of citizens and the youthful workforce.

India just cannot miss the fact that we need to build a producing economy rather than just being a consumption centre. Large swathes of population still live below acceptable standards of economic well-being. Governmental initiatives in the past few years have transformed energy access. The next wave must focus on economic development using energy, and in particular electricity, as a principal resource lever.




Source: Central Electricity Authority

India needs to garner competitive advantages in production that will help leverage its large consumption base. We identify four imperatives from an energy standpoint for that economic transformation:

**1. Energy goods** must be substantially produced in India to take advantage of the large consumption base

**2. Energy prices** for the producing sectors must be lowered and artificial cost build-ups removed

**3. Energy services** must be modernised to allow for efficiency and innovation in consumption

**4. Energy markets** must be furthered to allow for flexibility and lowering of transaction costs

In the coming years the investments required in energy projects will be to the tune of INR 200,000 crores per annum or more[38], through the electricity value chain. Basis current estimates solar energy will have a preponderance among the generation resources in the coming decade. The cost of capital equipment constitutes most of the overall project costs. India imports more than 90 percent of the modules[39] of the required capital equipment, mostly from China. As demonstrated in the previous section, China has taken a huge technological leap in renewable energy, exemplified by the number of patent awards. As new energy products like battery storage and hydrogen come into play, India must **aim for technological leadership ab-initio**. Government's priorities must be clear in this regard, as they are in China.

[38] KPMG in India Analysis based on the data provided in National Electricity Plan, January 2018

[39] Ministry of Commerce and Industry data

Technological leadership, even if achieved, must be nurtured and expanded through **large scale manufacturing**. Here, India is at a disadvantage because infrastructure, including power, is unreliable and expensive, and taxation levels are high. As per the recent developments, the government has brought down the tax rate for new manufacturing units to 15 per cent to enable a better market for domestic manufacturers . Unlike China, through electricity tariffs, India has looked towards the industry to subsidise other sectors. That is not tenable if India wants to look at manufacturing leadership. Industrial electricity tariffs for all producing activity – but especially for identified priority sectors – must be brought down to make manufacturing competitive in areas where the end-use market is large and employment generation and economic multiplier effects are high. To reiterate, *only large-scale manufacturing can sustain technological advantages over time*.

For pricing to be competitive the country needs to throw open retail electricity supply to usher in competition and innovation. That is not possible in an ossified electricity distribution sector. Experience has by now demonstrated that state ownership is a monopoly structure and does not provide incentives for efficient supply and commercial innovation. With increasing options on the supply side in future, electricity will be delivered increasingly as a complete service by the service providers rather than as a rigid product. The supply side of electricity requires competition and innovation for that to happen. Alternative means for that could be franchising, licensing or any other alternate form. Also, even as politically challenging as it is, governments of today and tomorrow must consider privatizing the sector entirely. In a fast-changing world, the legacy

arrangements just don't have the strength to deliver for the country.

**Energy markets must be opened up** and deepened to allow for greater flexibility and lower the transaction costs. For this there are several asks. The building blocks in terms of Universal Service Obligations (USO), planning regimes, data disclosure, capacity adequacy statements and appropriate penalties for load serving entities for defaults must be in place. These are standard requirements in any modern power system. For a country that features the largest synchronous power system in the world, India is woefully behind the curve on these aspects. The existing Day Ahead Markets (DAM) must be deepened and new product-markets introduced for vibrancy in intra-day trading and ancillary services. Contractual rigidities that have not only affected the power sector but have, in turn, lacerated the financial sector must be dealt with and not allowed to persist. Fuel markets must be liberalised. Vibrant power and fuel markets will go a long way in supporting clean energy and its integration.

The final recommendation of this paper is on **overhauling sector governance.** Authorities in governance and regulatory roles in the sector must define their charters aligning to the overall economic and sector agenda and act accordingly. Energy is and will always remain, a sensitive commodity since it touches ordinary lives very deeply. At the same time energy is also the fuel of economic growth. Just as India has been working to bring its energy products to global standards (especially in hydrocarbons), its energy governance must also measure up to world standards. Presently the gap, especially in electricity, is far too large and unsustainable. To measure up to the asks of a young, growing, vibrant and ecologically responsible economy, India must also radically change the sector ownership arrangements and governance to usher in the electric future.

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