

Blockchain: A hype or a game changer in India's energy sector

Governments, industries, businesses, and experts across sectors have shared contrasting opinions about blockchain technology since its introduction. On the one hand, industry forecasters predict that businesses will experience “[blockchain fatigue](#)” in near future due to the absence of proven use cases. On the other hand, energy experts foresee that blockchain technology holds a key to transform a traditional energy system based on centralised power to efficient decentralised systems.

Blockchain technology offers tremendous possibilities for an economy like India with a large power generation and consumption network. It not only shows the potential to offer solutions to major challenges faced by the power sector, such as power intermittency, but can also help in streamlining the market by reducing inefficiencies in the system.

Even though the energy landscape in India is rapidly evolving, a large part of power distribution is expected to remain centralised in India over the next few years. For the present, potential for blockchain technology is primarily considered to be applicable in the fast growing microgrid segment and off-grid rural areas. ¹

Government and public sector at the forefront

India's blockchain technology market size is projected to grow at a CAGR of 58% during 2018-24. The public sector in India is fast emerging as a large consumer of Blockchain Technology. Currently, 40+ Blockchain initiatives are being executed by the public sector in India across domains, with ~92% projects in pilot/POC phase and ~8% projects in the production phase.²

Various initiatives have been taken at central and state levels to establish a case for blockchain technology to bridge system inefficiencies. Considering its potential and the need for shared infrastructure for varied use cases, Niti Ayog (a policy think tank) released a [Strategy paper](#) in Jan 2020 on National Level Blockchain Framework for scaling up and wider deployment of Blockchain applications. From the energy sector standpoint, policy makers have endorsed two use cases in the near term. First for enabling transaction in the battery swapping infrastructure for the e-mobility segment, and second for energy trading by implementing smart PPAs (Purchase Power Agreements), smart microgrids, REC Certificates Issuance, etc.³

In addition, state governments are also taking initiatives by launching pilots and introducing favourable policies. In 2019, the state of **Uttar Pradesh** (UP) took a major leap by amending its regulatory framework to enable controlled peer-to-peer (P2P) energy trading in India. They also launched a pilot project in collaboration with Power Ledger, Australia to demonstrate the feasibility of energy trading through blockchain from rooftops with solar power to neighbouring households and buildings. ⁴

¹ <https://powerline.net.in/2019/08/05/power-to-disrupt/>

² [file:/executive-summary-avasant-nasscom-blockchain-report-final%20\(2\).pdf](file:/executive-summary-avasant-nasscom-blockchain-report-final%20(2).pdf)

³ https://niti.gov.in/sites/default/files/2020-01/Blockchain_The_India_Strategy_Part_1.pdf

⁴ <https://energy.economictimes.indiatimes.com/news/renewable/uttar-pradesh-to-become-first-state-to-launch-blockchain-enabled-solar-power-trading/72291409>

Trends

Globally energy markets have seen a pragmatic shift to meet its energy demands in a sustainable manner. The Indian ecosystem is also witnessing some major shifts due to rising focus on climate change issues and the sustainability agenda. Some of the key industry trends observed by industry experts are highlighted below.

- Rapidly emerging e-mobility and open energy markets being encouraged in India due to favourable government policies and positive sentiment of industry towards paradigm shift in renewable energy sector will provide thrust to adoption of blockchain technologies for increased system efficiencies and management.
- Customer segment is evolving from “consumers” to “prosumers” and growing market for decentralised systems with increased private investment in microgrid segment for better energy access will further pave way to adoption of blockchain technology esp. for P2P trading.
- In 2015, India has pledged a 33-35% reduction in the “emissions intensity” of its economy by 2030, compared to 2005 levels.⁵ While the carbon credit system is a step in the right direction, the lack of standardization limits its effectiveness. Blockchain technology leverages distributed ledger systems, auditable trades and smart contracts, making it a fitting solution to address these issues across industries and regions.⁶
- With smart grids and digitalisation taking centre stage in Indian government’s electricity access strategy technologies like blockchain enabled smart meters will find their way for market rollout ensuring secure and resilient future energy infrastructure.
- Blockchain will pave way to new innovation models in green energy financing by bringing greater transparency for investors such as providing direct connection between the investor and the project owner. Investors can track money streams, ensuring that their money reaches the project. This creates transparency and trust, which is crucial as the investment has to compete with other investment products. These models can ease cross border investment from individual investors in community-based projects.⁷

A distant dream or a near future

No doubt that blockchain technologies have proven to be next big thing with proven capabilities of transforming the energy sector. However, there are some challenges which can be foreseen.

- Successful operation of blockchain technology requires infrastructure in place that can enable high speed transactions and given that decentralisation of renewable energy generation is critical to the application of blockchain, which is still a growing segment in India. Therefore, adoption by all sector stakeholders will take time.⁸
- Blockchain technology is caught between three competing objectives: fast, low-cost, and decentralized. It is not yet possible to make one chain that achieves all three.⁹

⁵ http://timesofindia.indiatimes.com/articleshow/67400418.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

⁶ <https://www.infosys.com/oracle/white-papers/documents/carbon-supply-chain-blockchain-technology.pdf>

⁷ <https://www.asiapathways-adbi.org/wp-content/uploads/2018/10/adbi-podcast-blockchain-technology-could-raise-investments-green-energy-projects.pdf>

⁸ <https://renewablewatch.in/2019/04/25/power-to-disrupt/>

⁹ https://www.researchgate.net/publication/328919748_Blockchain_for_Energy_Utilities

- Although experts predict that India will be the next crypto hub, however, lack of skilled technical and operations workforce in blockchain domain will also impact rapid deployment.

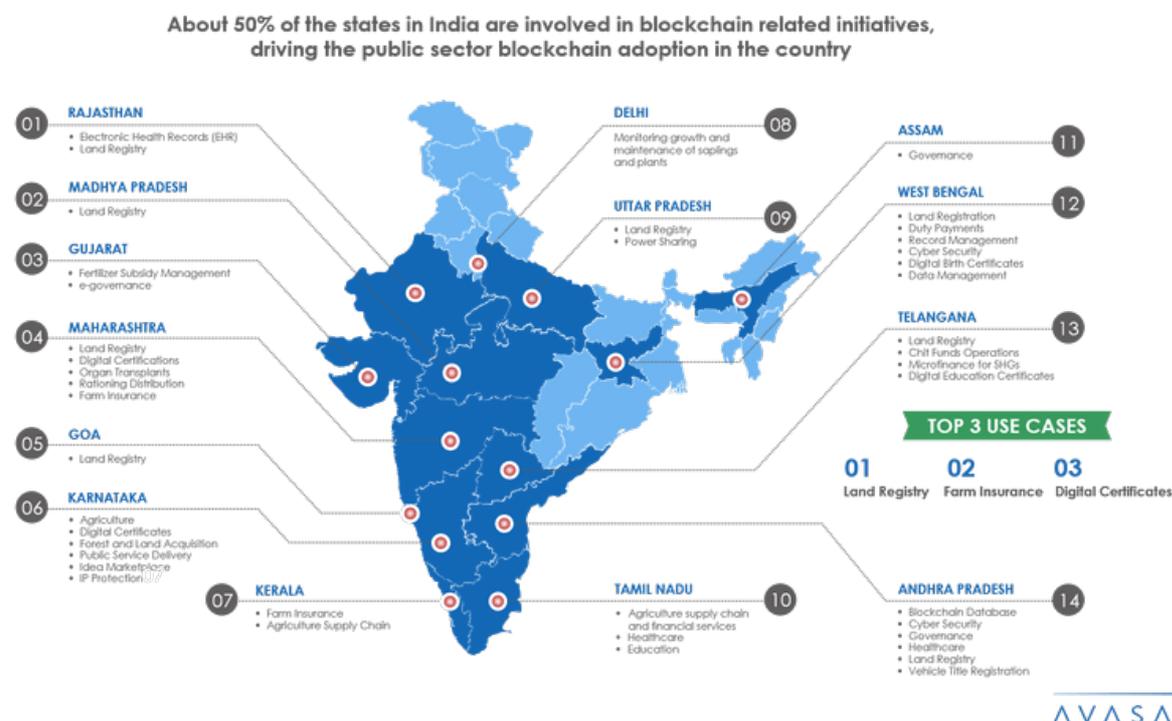
Stakeholders

Government & Associations	Research & Academia	Key players
<ul style="list-style-type: none"> • Ministry of Electronics & Information Technology (Meity) • Ministry of new and renewable energy • Ministry of Power • India smart grid forum • NITI Ayog • Energy Efficiency Services Limited • India Smart Grid Forum • the Ministry of Electronics and Information Technology (MeitY) 	<ul style="list-style-type: none"> • National Informatics Centre: Centre for excellence in Blockchain • The Centre for Development of Advanced Computing (C-DAC) • Indian Institute of Technology (IIT's) • TERI – The energy and Resource Institute • National Institute of Smart Governance 	<ul style="list-style-type: none"> • BSES LTD (PPP with Reliance Energy Limited) • Power ledger (Australian co.'s in India) • Uttar Pradesh Power Corporation Limited. • IBM India • Infosys India • Oracle India • NIMRAY Solar (Member of Solar Impulse Foundation) • Sofocle Technologies: OJUS P2P trading product

Key Regions

Apart from Uttar Pradesh, other states that provide comprehensive ecosystem for launching energy blockchain projects are Gujarat, Tamil Nadu, Telangana and Andhra Pradesh.

Blockchain hotspots in India.



Source: *NASSCOM Avasant India Blockchain Report 2019*

Opportunity for Swiss stakeholders ¹⁰

Blockchain initiatives within the energy industry can be categorised in the areas of metering/billing and security; cryptocurrencies, tokens and investment; decentralized energy trading; green certificates and carbon trading; grid management; IoT, smart devices, automation and asset management; electric e-mobility; and general-purpose initiatives and consortia.¹¹

At present, Swiss blockchain technology providers have potential to collaborate with Indian stakeholders in following areas to initiate pilots to demonstrate and build proven cases for adoption of blockchain in energy sector.

- **P2P Trading** – The trading of electricity produced by prosumers directly with their neighbours and to microgrids leveraging Blockchain based solutions is by far the most popular Blockchain application that is gaining traction in the sector.

¹⁰ <https://www.indigoadvisorygroup.com/blog/2017/3/6/global-energy-utilities-blockchain-pilots-and-use-cases>

¹¹ <https://cointelegraph.com/explained/blockchain-innovations-in-the-energy-sector-explained>

- **EV Charging, sharing and EV battery swapping** – The area of EV charging and sharing charging infrastructure or battery swapping infrastructure management could also be one of the potential near-term opportunities.
- **Wholesale Trading and Settlement** – Wholesale electricity trading and settlement market is another emerging area for Blockchain technology. This space has the scope for radical process improvement opportunities. Activities in this space is expected to gain momentum faster.
- **Consortia, Labs & Research** – Since Blockchain technology is still at the experimentation stage in the energy sector, there is a possibility of launching consortium projects with research labs and think tanks working on development solutions based on Blockchain for the energy industry.

Case Study ¹²

BRPL partnered with Power Ledger to launch blockchain solar energy trading in India

Electricity distributor BSES Rajdhani Power Limited (BRPL) partnered with Power Ledger, a global leader in blockchain-based renewable energy trading, to install a large-scale P2P energy trading trial in Delhi, India.

BRPL is the first electricity distribution company (discom) in India to use P2P solar trading technology powered by Power Ledger. The trial initially comprised 5-6MW of existing solar infrastructure, servicing a group of gated communities (CGHS) in the Dwarka region in Delhi.

During the trial, residents with rooftop solar infrastructure sold excess solar energy to their neighbours, rather than letting it spill back to the grid. This enabled participant access to cheaper, renewable energy and prosumers (those that own solar power infrastructure) to monetize their investment in solar assets.

BRPL was able to access a cost-effective energy alternative during the times of peak demand pricing leading to increased efficiency and reliability of the power supply. The trial will be expanded to include blockchain-enabled solutions for group net metering, virtual net metering, electric vehicle charging and virtual power plant applications in the near future.

¹² <https://energy.economictimes.indiatimes.com/news/power/bses-launches-blockchain-tech-platform-for-power-trading/72048457>