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THE BENGAL CHAMBER

ENERGY TECH

Disruptive Innovations in Energy Transition

11th edition

Environment and Energy Conclave

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Renewables, Electric Vehicles, Battery Storage, Smart Metering and Blockchain are a few examples of disruptive innovations that are shaping the transition on the energy landscape.

Technological breakthroughs are needed to reduce carbon emissions in the energy sector. Even with economically viable and scalable renewable-based solutions available for around two-thirds of the world's energy supply, population growth and rising energy demand could outpace energy decarbonisation without urgent investments in research and development (R&D). **Successful innovation should encompass the complete technology lifecycle. The policy framework for innovation, similarly, must provide balanced support, addressing both technologies themselves and factors beyond technology, including system operations, market design and regulations, and the enabling infrastructure to scale up renewables.**

The 'three Ds' of renewable energy — **decarbonisation, decentralisation and digitalisation** — are **bringing new opportunities and transforming the energy sector**. Innovations in technology, operations, policy, regulation, and business, are all interacting and re-enforcing each other's contributions to the power system transformation towards low-carbon energy.

Favourable economics and technological innovations are yielding enormous opportunities for transition to a clean, affordable, and reliable electricity grid. Renewable energy technologies like wind and solar have become quite cost-competitive.

Major utilities are announcing rapid transitions to clean energy with customer affordability in mind as economics and policy are driving variable wind and solar to become the electricity grid's new backbone.

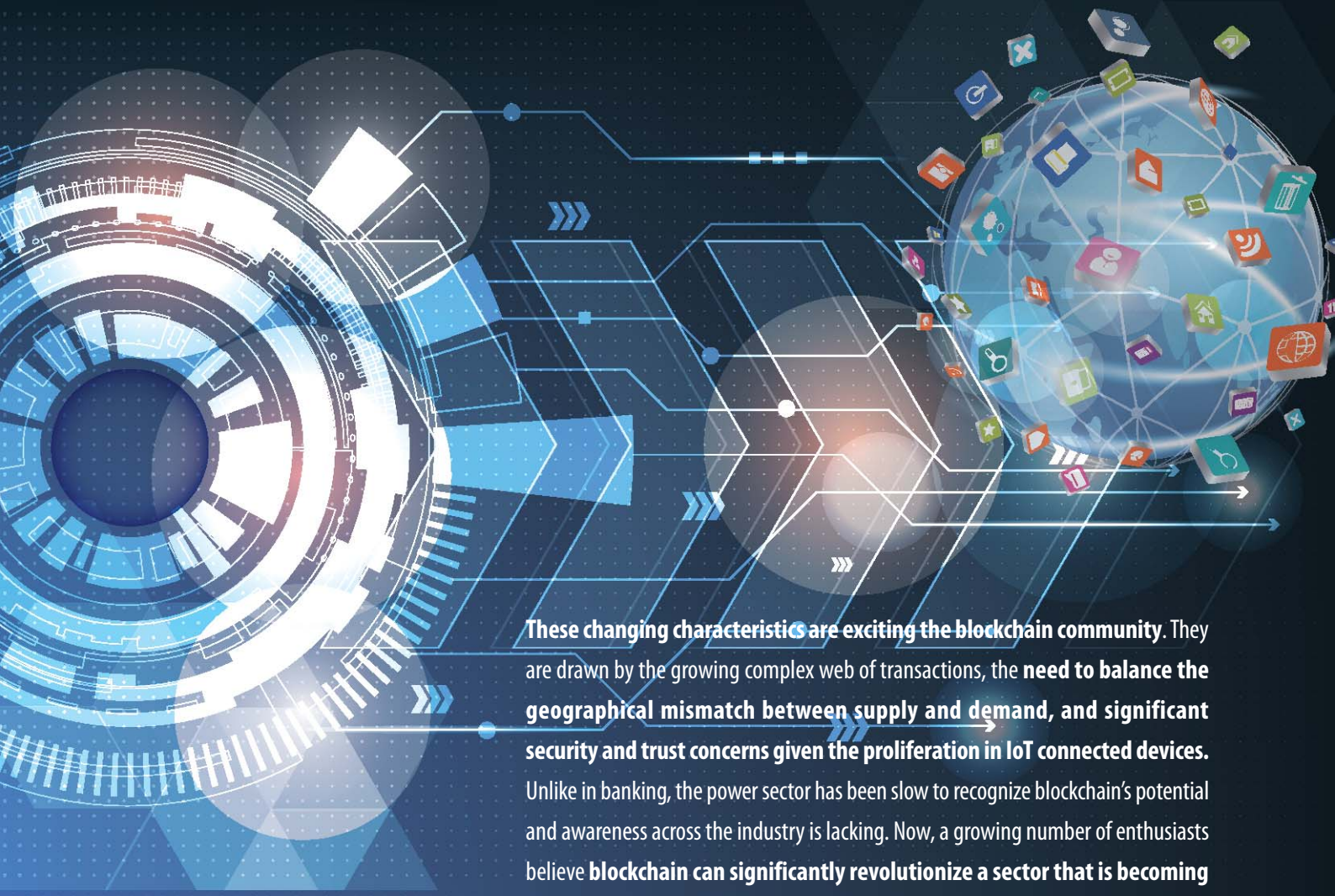
EVs may constitute almost a third of new-car sales by the end of the next decade. It is reported that electric cars would become cheaper than conventional cars without government subsidies between 2025 and 2030. At the same time, auto companies like Tesla, are planning a slate of new models that they say will be not only more affordable but also more practical than earlier versions. Electric cars face challenges, yet they have caught on much faster than was thought likely just a few years ago. There were two million of them on the world's roads last year, up 60 percent from 2015. The cost of batteries, the single most expensive component of the cars, fell by more than half between 2012 and 2016. **It is found that it is much more difficult to reduce planet-warming gases from transportation than from power plants. The switch to electric cars is good for the climate because petroleum vehicles produce more greenhouse gas emissions per unit of energy than power plants fueled by natural gas, according to the Energy Information Administration.**

Alongside the **rollout of smart meters** and continued development of demand side response measures, new digital peer-to-peer platforms are starting to emerge that cut out the middle man and seamlessly connect green energy producers directly with those wanting it. Power shift in the advent of an energy sharing economy is taking place. **These changes are empowering consumers to take control of their energy usage and reduce energy bills.**

Advances in battery storage technology now mean households can store electricity for back up or load shifting, allowing for greater flexibility to buy and store electricity when rates are low, and consume it as needed. ***This plays a major role in creating a new genre –Prosumers***

Smart meter rollout programs are in their infancy, huge investment is needed to digitize the grid and global battery storage capacity requirement is exponentially increasing to gigawatts.

Continuous power supply is a major element in the smart city development. **For a continuous supply of power in the smart city it is very essential to have strong and smart transmission and distribution (T&D) systems.** The objective of a smart city is to use **digital communication and technology to optimize the usage of resources** such as energy, water, and roads and infrastructure and improve governance, transportation, health care and waste management. From energy perspective, a smart city will be able to optimize the electricity consumption of the city by being able to record the real-time data pertaining to different residential, commercial and industrial spaces. A smart city is equipped with smart grids which facilitate this collection and transferring of electricity related data throughout the city, free from all hassles and wouldn't even require manual labour. Automation in the power distribution system facilitate utilities to implement comprehensive electric network control & monitoring of distribution systems, which can be used to enhance efficiency, quality, reliability, safety & security of electric service. To secure uninterrupted power distribution to critical areas, it is necessary to monitor the power system continuously, generate early pre-fault warnings and to have a network where alternative supply routes are arranged. It is also imperative to have fast and accurate fault localization, fault isolation and power restoration via remote network reconfiguration. Further, **emerging needs such as energy savings, demand response, integration of distributed generation, electric storage and charging of electrical vehicles have to be met with real-time grid information.**



These changing characteristics are exciting the blockchain community. They are drawn by the growing complex web of transactions, the **need to balance the geographical mismatch between supply and demand, and significant security and trust concerns given the proliferation in IoT connected devices.** Unlike in banking, the power sector has been slow to recognize blockchain's potential and awareness across the industry is lacking. Now, a growing number of enthusiasts believe **blockchain can significantly revolutionize a sector that is becoming increasingly decentralized and connected.**

Smart contracts can be set to allow prosumers to feed surplus energy into the grid through a blockchain-enabled meter.

A snapshot of Blockchain in Energy

Blockchain is an immutable distributed ledger that verifies and records peer-to-peer transactions without a central authority. It promises more efficient transactions with lower costs based on disintermediation of identity verification. While it has been around since 2009, 2017 marked a turning point in global recognition for its potential applications.

The first blockchain in energy transaction took place in April 2016 in Brooklyn, New York. Today, less than two years later, there are 122 organizations involved in blockchain technology and 40 deployed projects. Between Q2 2017 and Q1 2018, over $300 million was invested in the blockchain in energy industry.

The ability to support a globally connected network of energy transfer, where smart devices will be able to securely send and receive data while autonomously reacting to market signals, is a reality some believe is still 5-10 years away.

A new ecosystem of energy blockchain start-ups is emerging, and venture capital, so far, has raised over US$1b to scale business models of the future.

Advancements in new technology and innovation through techniques and materials will directly have an impact on affordable energy prices. The popularity and increasing affordability of traditional energy and renewable resources, coupled with the race to optimize access to the resources and build smarter cities, is ushering in a new era for energy development.

The following are some of the tech innovations projected in energy sector :

- **Increased Popularity of Solar, Wind and Other Renewables –** Building a smarter energy future means putting sustainability first and bridging the gap between new technology and natural resources;

- **Offshore Development –** Energy independence and more competitive pricing to help keep economies strong and prices affordable;

- **Pipelines –** The new regulatory and policy backdrop, coupled with greener energy standards, are helping leverage this key piece of infrastructure to help keep the cost of energy low for consumers;

- **Grid Modernization –** New energy infrastructure will be more resilient, efficient and environmentally friendly; and

- **Smart City –** The ability to leverage advanced technologies to connect communications networks and integrate renewables into a modernized electric grid.

The eleventh edition of the Annual Environment and Energy Conclave aims to create the most relevant forum to discuss, brainstorm and share knowledge and business practices involved in the transition of energy riding on the emerging technologies.

Each of the previous editions created benchmark of its own culminating into the grand tenth edition themed on **'The Transforming Face of Energy – A Convergence towards Sustainability' held on 23rd and 24th August 2017. The Conclave reached a greater dimension showcasing exhibition stalls and B2B Pavilion. UK was the Partner Country having Delegation Members participating in the Conclave. There was participation also from Germany, Italy, Georgia and Luxemburg.** The Energy and Resources Institute **(TERI) was the Knowledge Partner.International Solar Alliance (ISA)** also partnered in the Conclave.

The archive of all the previous editions is available in our website
http://www.bengalchamber.com/environment-and-energy-conclave.html

Some of the notable speakers who have graced The Bengal Chamber Environment and Energy Conclave in the last ten years are:

- **Shri Piyush Goyal,** Hon'ble Minister of State with Independent Charge for Power, Coal and New and Renewable Energy
- **Shri Manish Gupta,** Hon'ble Minister-in-Charge, Power & Non-Conventional Energy Sources, Government of West Bengal
- **Shri Sovandeb Chattopadhyay,** Hon'ble Minister-in-Charge, Power & Non-Conventional Energy Sources, Government of West Bengal
- **Shri Gireesh B Pradhan,** Chairperson, Central Electricity Regulatory Commission
- **His Excellency ArchilDzuliashvili,** Ambassador of Georgia to the Republic of India, the Kingdom of Thailand, the Federal Democratic Republic of Nepal, the Democratic Socialist Republic of Sri Lanka, and the People's Republic of Bangladesh
- **His Excellency Sir Dominic Asquith KCMG,** High Commissioner of the United Kingdom in India
- **H.E. Peter Varghese,** High Commissioner of Australia in India
- **Dr. R K Pachauri,** Chairman, IPCC and Director General, TERI (Video Address)
- **Shri Shyam Saran**, Special Envoy of the PM on Climate Change
- **Dr. Kirit Parikh**, Member, Planning Commission
- **Shri Anil Razdan**, IAS, Secretary to the Government of India, Ministry of Power
- **Shri Upendra Tripathy**, Director General, The International Solar Alliance (ISA)
- **Dr. Ajay Mathur**, Director General, Bureau of Energy Efficiency/Director General, TERI
- **Dr. R K Pachauri**, Chairman, IPCC and Director General, TERI (Video Address)
- **Smt. Medha Patkar**, National Convener, National Alliance of People's Movements
- **Dr. Sunita Narain**, Director General, Centre for Science and Environment (CSE); Director, Society for Environmental Communications; & Publisher, Down To Earth
- **Mr. Pradeep S Mehta,** Secretary General, CUTS International
- **Shri Partha S Bhattacharyya**, Chairman, Coal India Limited
- **Shri Sutirtha Bhattacharya,** Chairman and Managing Director, Coal India Limited
- **Shri S Narsing Rao**, IAS, Chairman-cum-Managing Director, Coal India Limited
- **Ambassador C Dasgupta**, Distinguished Fellow, TERI
- **Mr. Franzjosef Schafhausen**, Member and Chairman of the Trustees of the "Institute of Energy Economics of the University of Cologne – ewi; Managing Director, "E.U.K - Consulting", Neuss; Former Director General Department of Climate Change Policy, European and International Policy Federal Ministry: Environment, Nature Conservation, Building & Nuclear Safety (BMUB)
- **Mr. Anirban Ghosh**, Chief Sustainability Officer, Mahindra Group
- **Mr.MiteshDhanak**, Managing Director, Cenergist Limited UK
- **Dr. Arup Roy Choudhury**, Chairman & Managing Director, NTPC Limited
- **Shri Sanjay Seth**, Energy Economist, Bureau of Energy Efficiency
- **Mr. Deepak Amitabh,** Chairman and Managing Director, PTC India Limited
- **Mr. Saurabh Kumar**, Managing Director, Energy Efficiency Services Limited
- **Dr.Bikash Sinha**, HomiBhabha Professor, DAE, Former Director, Saha Institute of Nuclear Physics and Variable Energy Cyclotron Centre, Department of Atomic Energy, Government of India
- **Mr. Jonathan Ward**, Principal Commercial Officer, US Consulate, Kolkata
- **Dr. Prodipto Ghosh**, Distinguished Fellow, Earth Science and Climate Change Division & Director, The Energy and Resources Institute (TERI)
- **Mr. Richard Rekhy**, CEO, KPMG India

- **Prof. B K Dutta**, Chairman, West Bengal Pollution Control Board
- **Mr. PavanSukhdev**, Founder-Director of Corporation 2020; Founder-CEO, GIST Advisory; Visiting Fellow, Yale University; and Former Special Advisor and Head of UNEP's Green Economy Initiative
- **Mr. A Krishnakumar**, Vice Chairman and Managing Director, Philips India Limited
- **Shri A K Debnath**, Chairman-cum-Managing Director, Central Mine Planning & Design Institute Limited (CMPDI)
- **Shri M K De**, IAS, Principal Secretary, Dept. of Power and Non-Conventional Energy Sources, Government of West Bengal
- **Shri Sunil Mitra**, Former Revenue and Finance Secretary, Government of India and Former Power Secretary, Government of West Bengal
- **Mr. M S Unnikrishnan**, Managing Director, Thermax Limited
- **Dr. R RSonde**, Chief Technology Officer and Executive Vice President, Research, Innovation & Technology, Thermax Limited
- **Mr. Sumit Mazumder**, Vice Chairman and Managing Director, TIL Limited
- **Mr. ShishirJoshipura**, Managing Director & Country Manager, SKF India Limited
- **Mr. Nazeeb Arif**, Vice President – Corporate Communications, ITC Limited
- **Ms. MaliniThadani**, Head, Group Communications, Public Policy and Corporate Sustainability, HSBC India
- **Shri S P Gon Chaudhuri**, Ashden Award Winner and Special Advisor, Renewable Energy, Govt. of West Bengal
- **Mr. Poul V Jensen**, Director, European Business and Technology Centre
- **Mr. Phil Marker**, Counselor and Head, Energy, Climate and Growth Unit, British High Commission, New Delhi
- **Ms. Nicola Watkinson**, Senior Trade & Investment Commissioner, South Asia, Australian Trade Commission
- **Mr. Scott Furssedonn-Wood**, British Deputy High Commissioner in Eastern India
- **Mr. Sanjay Wadvani**, OBE, Deputy High Commissioner of the UK in the Eastern Region, and many others
- **Mr. Rana Som**, Former Chairman and Managing Director, NMDC Limited
- **Shri Narayan Swaroop Nigam**, IAS, Chairman and Managing Director, West Bengal State Electricity Distribution Company Limited
- **Dr. A. Anurag Danda**, Head -Climate Adaptation & Sundarbans Landscape, WWF-India;
- **Mr. Subir Gupta**, CEO, ERM India Private Limited
- **Dr. Mohsen Assadi**, Professor, Faculty of Science and Technology, University of Stavanger
- **Prof. Rahul Tongia**, Fellow Brookings India , Adjunct Professor, Carnegie Mellon University, Tech Advisor, Smart Grid Task Force, Govt. of India
- **Mr. Jan Grimbrandt**, Chairman and CEO, Boson Energy SA, Luxembourg
- **Mr. Aloke Mookherjea**, Past President, The Bengal Chamber of Commerce and Industry & Chairman,HowdenSolyvent (India) Private Limited

(Offices are mentioned as at the time of addressing)

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