

Energy Management Using Blockchain Technology

Mr. Venkat Kumar Tangirala

President of WindStream Energy Technologies India Pvt. Ltd

Intl. Business Development Lead for ImpactPPA Inc.

yktangirala@windstream-inc.com

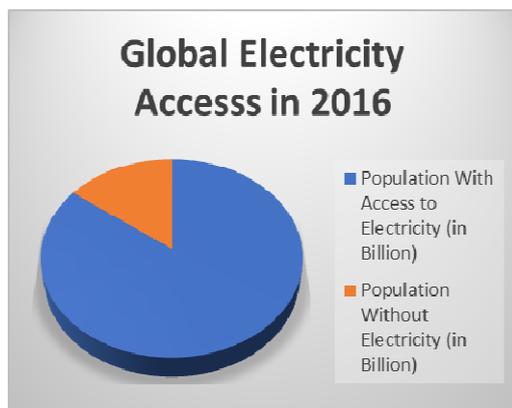
Electricity is one of the most important breakthroughs that science has given to mankind. It has become a part of modern life and it's hard to imagine a world without it. Electricity has played a vital role in rapid industrialization and modernization of humanity. Most aspects of modern day life rely on machines and equipment that are powered by electricity. To a larger extent, the world has been dependent on fossil fuels for the majority of our electricity production. In the last few decades, global energy consumption rates have grown at an exponential rate causing the extraction and burning of an unprecedented amount of non-renewable fossil fuels. The increased reliance on non-renewable fossil fuels has had many unintended negative consequences, most notably are the irreparable damages to earth's climate and elevated levels of pollution.

Universal Electrification by 2030

In September 2015, the United Nation's General Assembly adopted the 2030 Agenda for Sustainable Development that includes 17 Sustainable Development Goals (SDGs). Building on the principle of "leaving no one behind", the new Agenda emphasizes a holistic approach to achieving sustainable development for all. One of those goals is to Ensure access to affordable, reliable, sustainable and modern energy for all by the year 2030. What we need to understand in order to achieve this goal is:

- The task we have at hand, then
- Chart out a path to achieve the goal

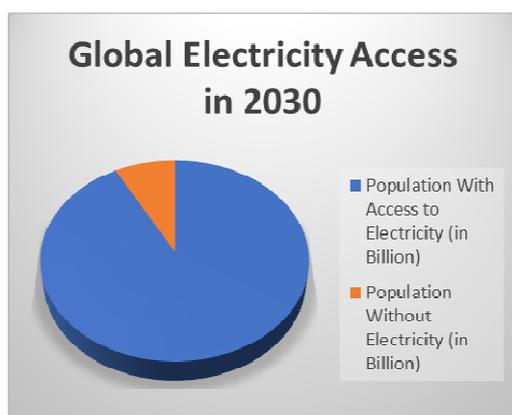
Understanding the task



According to the 2017 data sheet published by Population Reference Bureau, the world population in 2016 was about 7.46 billion. The same report estimates that the world population will be about 8.5 billion by 2030.

According to the Energy Access Outlook report published in 2017* there are still 1.1 billion people (14.37% of the world's population) without access to electricity. Out of those 1.1 billion people, a majority are from Sub Saharan region (590 million) and India (239 million).

* Energy Access Outlook published by the International Energy Agency in 2017



The IEA estimates that even by the year 2030, there will still be 674 million people living without access to electricity which will be about 7.93% of the world population in 2030.

What's alarming about those numbers is that 600 million out of the 674 million people without access to electricity will live in Sub Saharan Africa, majority of them in rural areas, while India will achieve universal electrification by 2022-23.

This estimate is based on the study of the implementation for the below factors in the most affected regions:

- Spread of electrification to newer areas via:
 - Newer mega power grids establishment
 - Acceptance of renewable energy as mini grids or off grid systems
- Modernization of old grids and equipment to curb transportation losses and improve efficiency, and
- Corresponding growth of population during the given time frame in urban and rural areas

The availability of electricity for everyone will no longer be the only metric used to measure the achievement of sustainable development goals by the year 2030. The UN has set more qualitative goals than quantitative ones.

In order to achieve sustainable development and inclusive growth of developing nations the UN believes that everyone on earth needs access to affordable, reliable, sustainable, and modern energy.

The Path Ahead

In order to achieve universal electrification by 2030 we need to create a multi-pronged approach:

- Increasing Power Generation by setting up newer mega, mini and off grid systems
- Better Energy Management for improved utilization of the power that we currently generate

Increased Power Generation

Mega Grids

Up until recently it was believed that mega power grids were the best and most efficient path to electrification of the world. A power grid, once in production, is able to provide energy to a substantial number of people, not just for personal use, but for industrial and commercial as well. But there are some glaring issues with using Mega Grids:

- **Its time consuming.** From planning, to building, and finally production - power grids of this size can take decades to start producing the power required to fulfill the needs of the local population.
- **Its costly.** To commission a power grid from scratch, the amount of money and land required, along with the resources needed to maintain and operate the grid, can cause the costs to run into the millions.
- **Its Polluting.** These grids are often run primarily off of fuel sources like coal, diesel, and/or gas, especially in developing countries. Running these Mega Grids on these fuel sources causes significant damage to the earth in the form air, water, and land pollution.
- **Resources guzzling.** Apart from the money and man power required to operate and run the grids, it is also putting extra pressure on the limited supply of non-renewable energy sources that we have left.

Due to the above stated issues, a mega power grid is not a sufficient to answer all electricity-based requirements in a swift, cost and resource efficient manner.

Decentralized solutions including mini and off grid systems

The major short fall of electricity is in non-urban, rural areas. The reason being is that centralized solutions like power grids and large-scale hydro lack the proper infrastructure to provide energy transmission to remote locations. Infrastructure like high tension power lines, power sub stations, transmission lines etc. are costly and historically inefficient. By using decentralized mini-grids and off grid systems we can reduce the need for substantial infrastructure, creating accessible and efficient energy solutions that can be utilized in the rural areas that are in need.

The implementation of mini grid and off grid systems, which are together considered as decentralized energy solutions, is crucial for bringing energy to the unreached and underserved. As technology costs continue to decline, off-grid and mini-grids systems are becoming an increasingly cost-effective solution in rural areas relative to mega grid extensions. As a result, over 20% of those who gain access to electricity by 2030 will do so from off-grid systems and 11% will do so from mini-grids, accounting for almost two-thirds of those living in rural areas who gain access.

Decentralized energy solutions alone are not enough to provide energy to all those in need. In order to reach all of the unpowered we need to increase efficiency, which is why we need better energy management system.

Role of Energy Management

To reduce the gap between the demand and supply of reliable, affordable, and clean energy, there is a need to be a plan to optimize the existing energy production and consumption in the world. The main objective of this energy management should be based on:

- Users to have permanent access to the energy they need
- Resource conservation
- Climate protection
- Cost savings

With a proactive, organized and systematic coordination of procurement, conversion, distribution, and use of energy, the above objectives can be achieved.

Energy management at its core is a challenge to systematize. We need to change the way we envision power grids and the way Energy Providers interact with consumers. The key to reducing the current gap between energy providers and consumers is to create a collaborative effort for streamlined and efficient energy delivery and consumption.

ImpactPPA and Blockchain by ImpactPPA

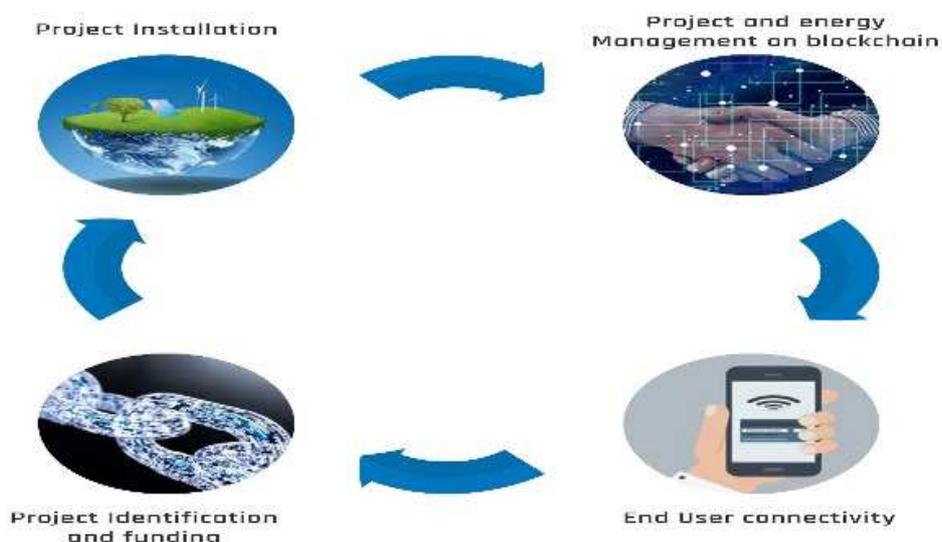


Fig: ImpactPPA is using Blockchain technology to promote access to renewable energy and enhanced energy management solutions.

ImpactPPA intends to shatter this bottleneck. We have developed a way to use the blockchain to empower the world, literally and figuratively. Our SmartPPA revolutionizes energy funding and dramatically accelerates the delivery of clean, renewable energy to the most remote regions of the globe. Tapping into the vast potential of the blockchain and cryptocurrencies, we disrupt and reimagine the energy project funding paradigm by decentralizing PPAs and eliminating layers of intermediaries between funding and consumption of energy. Blockchain, being a transparent system of record keeping brings in complete new synergies in the way records are kept and decisions are made using those records. The tools for accessing the platform are open and available for any project, anywhere in the world, and they are managed by the crowd.

ImpactPPA brings the power of blockchain and decentralized energy solutions where the need for clean energy solutions is most dire i.e. places where access to electricity does not exist, places where electrical power is inconsistent, places where electricity is expensive and places where companies and governments are migrating to clean renewable energy. ImpactPPA's innovative approach brings together capital and consumers in a way that is direct, responsive, and expedient. Apart from project funding, our platform also enables the consumers to purchase directly from the energy producer and hence removing all middle layers within the system.

Using Smart Contracts and a token-based, stake-weighted marketplace, ImpactPPA disrupts and reconfigures the current energy funding paradigm to provide governments, utility companies, municipalities, corporations, small businesses, villages and individuals with timely and direct access to clean renewable energy. Additionally, ImpactPPA topples the colonial system by empowering those who require energy and connecting them directly with those who fund the projects. Decisions on funding are taken out of the hands of the few at the top and instead distributed to the greater stake-holding community. The social impact that will result from ImpactPPA's toppling of an outmoded and unresponsive financial system cannot be ignored or over-estimated. For the first time, both the recipients of aid and the community that provides that aid will have a voice in the process.

The ImpactPPA Technology

Built on the Ethereum platform, we have created a decentralized energy platform using Smart Contracts and its energy protocol, the SmartPPA. The SmartPPA (Power Purchase Agreement or Personal Power Agreement) is the lynchpin of the system. It allows anyone, anywhere to create a proposal for a project of any size. The SmartPPA specifies the raw energy requirements of the applicant—whether it is an individual business owner who wants reliable energy to keep a factory running or a nation seeking to electrify whole communities. Upon execution of the agreement, ImpactPPA connects that applicant with the necessary funding for the project. That funding comes from the purchase of crypto assets by socially-conscious individuals who wish to make a difference in the world. The Token-holding community defines the merit of each project and facilitates the execution of the approved SmartPPA. The technology solutions required for a specific SmartPPA are outsourced to the most qualified provider, and the needed energy generation equipment is delivered and installed, either by the supplier or by a third-party engineering, procurement and construction (EPC) entity. The consumer of electricity pays for the power consumed on a simple “pay-as-you-go” model. Payment is made on a mobile device or in local fiat through a proxy via the project-specific GEN Credits which are minted when the PPA is approved. ImpactPPA makes this transformational technology available to developing countries using Smart Contracts and the blockchain community.

Blockchain-enabled energy finance and distribution provides:

- A disruptive funding model utilizing the crowd
- A decentralized mechanism for quickly supplying renewable energy products
- Automated processes for project identification and delivery
- A secure platform for transactions
- A trusted resource that is open and transparent

ImpactPPA's Smart Contract defines an energy financing structure that allows stakeholders to monitor the deployments of the Company's products worldwide and share in the knowledge that clean renewable energy is improving the lives of those whom the ImpactPPA technology is serving.

To Conclude

This shift towards project funding and energy management using ImpactPPA's Ethereum based technology will stimulate more decentralized energy solutions, ultimately facilitating our transition away from carbon-emitting electricity generation. Through its SmartPPA platform, the Company is developing a solution that decentralizes project finance and the issuance of PPA's (Power Purchase Agreements).

The ImpactPPA model of providing energy to this unbanked and unconnected population will lead to a host of additional technologies and services that benefit the Company as well as end users of the technology. The “payment rail” created by the GEN Credit will allow for 3rd parties to ride on top of ImpactPPA's energy generation, allowing for: clean water, healthcare, education, ISP and communication... Additionally, giving these unbanked populations access to a digital identity through credit and data will help them ascend to the middle class. ImpactPPA falls directly in line with the UN's goal to electrify the world with clean, reliable, renewable energy.

First Energy Project executed on BlockChian @ Les Irois, Haiti



Relevant links

- Rethinking Distributed Energy via the Blockchain – Chipin Web Magazine: <https://www.chipin.com/impactppa-ico-distributed-energy-blockchain/>
- How Impact PPA Is Going to Revolutionize Energy Using Blockchain <https://hackernoon.com/how-impact-ppa-is-going-to-revolutionize-energy-using-blockchain-9ddb6ea5b33a>



About the author: Mr. Venkat Kumar Tangirala is a graduate in Electronics & Communications Engineering from Vellore Institute of Technology in India. He has more than 19 years of experience in the renewable energy and IT sectors and has held management roles in various industries, including information technology, BlockChain, Defence, Manufacturing, and Alternative energy.

Mr. Tangirala is currently President of WindStream Energy Technologies India Pvt. Ltd., managing the company's operations in Asia, the Middle East, and Africa. He is also a Director for Syaton Global Services Inc., a software company with offices in India and the U.S. (www.siyaton.com). He has held positions as Head for Green Products Division and Defence Electronics at HBL Power Systems Ltd. in Hyderabad, India (www.hbl.in) and President for Sensorgrid, Inc., heading up Indian Operations.

His major accomplishments include: Headed the team for one of the major projects on integration of traffic and transportation in India, in collaboration with a US Billion Dollar Company ACS Inc while in SensorGrid Technologies; Headed a Software Company BlueLotus Inc that Lunched and marketed a full-fledged Office suit product in competition to MS Office in India and SE Asia; Speaker in Many national and International forums Like Confederation of Indian Industries(CII) - Green Building Congress, Dubai Smart Sky Scraper Summit 2016, IACC (Indo American Chamber of Commerce) National Conclave , The Tech Fest, Honduras Technology Congress etc., and IEEE International Conference in Innovations in Power and Advanced Computing, VIT.

[Elon Musk-backed startup's AI beats humans at Dota 2 game](#)

[Google Maps now zooms out to a globe instead of flat Earth](#)

[China's supercomputer runs quintillion calculations a second](#)

[Apple started from garage in 1976, now \(in 2018\) a trillion-dollar giant](#)