

LOCALIZED SUSTAINABLE AND ECOFRIENDLY ENERGY GENERATION AND DISTRIBUTION USING BLOCKCHAIN NETWORK: BANGLADESH PERSPECTIVE

A New Dimension in the Power Industry

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY

ABSTRACT

The power industry of Bangladesh is not enough sustainable and eco-friendly which is governed by a number of centralized authorities. The energy is received from various power plants and then route the energy to substations and eventually to the consumers which is palpably inadequate to meet the far-reaching demand. This leads to the load shedding in many areas which is still a burning question from the socio-economic perspective of Bangladesh. A significant percentage of people are still deprived of uninterrupted energy supply and a many more are still out of the energy distribution network due to lack of resources. The energy currently available in the country is mainly fossil fuel energy which is neither sustainable nor eco-friendly and the centralized distribution of energy requires the transmission of energy at high voltages which has a lower efficiency and adds to the wastage of energy. Another core problem is unauthorized connection of energy and intentional faulty meter reading submission by operators which eventually leads to a momentous loss of revenue, and this creates a sense of skepticism among the mass users on the local authorities responsible for proper energy management. From the economic perspective, it is imperative to create a sustainable sector of investment for mass people due to the current fragile state of stock market and banking system. Addressing these issues is obligatory to maintain the economic growth of Bangladesh as well as to elevate the lifestyle of mass people. The aim of our project is to attain these milestones by creating a localized energy generation, storage, transmission and distribution system using blockchain which exhibits some genuine concern on pertinent areas and solution of the issues.

RENEWABLE POWER INDUSTRY OF BANGLADESH

- The government of Bangladesh has set a target to attain 10% of the national energy demand from the renewable energy sources
- The inclination toward renewable energy is a must as the fossil fuel reserve will be finished by next 25 years.
- The current capacity of renewable energy is below 3% which creates an opportunity to work with efficient renewable energy projects

Current Renewable Energy Sectors With Capacity in Bangladesh			
Technology	Off-grid (MW)	On-grid (MW)	Total (MW)
Solar	311.84	80.92	392.76
Wind	2	0.9	2.9
Hydro	0	230	230
Biogas to Electricity	0.63	0	0.63
Biomass to Electricity	0.4	0	0.4
Total	314.87	311.82	626.69

MAJOR CONCERNS

- Depression of uninterrupted energy supply
- Out of the energy distribution network due to lack of resources
- Unustainable and non-eco-friendly power source
- The transmission of energy at high voltages in a centralized distribution with lower efficiency and wastage of energy
- Unauthorized connection of energy and intentional faulty meter reading submission by operators
- Corruption in different positions and the dominance of red tape have degraded the reliability of the system

SOLUTION APPROACH

- Fulfill the energy demand of each locality under the blockchain network by supplementing the supply of energy from national grid
- No dependency between the centralized authorities and of localized blockchain governed energy distribution system
- Coordination between local generators and consumers via hubs using the blockchain network
- Using a blockchain for such system to ensure the prevention of unauthorized connections and also to assure the investors of their investment
- All the user of the blockchain system will be provided with a smart meter
- Controlling the transmission of energy from peer to peer and report the current status of the energy level automatically to the server by a smart meter
- An IoT device which will be connected with internet to interchange information
- Offer various schemes to the generators and consumers to encourage sustainability in energy consumption considering the prospects of Bangladesh
- The set-up of devices and transmission lines will be coordinated by the network administrator

MARKET SIZE

162 M

People is potential target customer of the blockchain

22.3 %

People still does not have access to electricity which can be reduced by the project

50 M

BDT will the annual revenue from the potential market

5 %

Of the total energy demand can fulfilled through the blockchain project

COMPETITIONS

As there is no such business model in Bangladesh, this project will have no similar competitor. But within next decade, blockchain models with smart grid will be a potential competitor of such projects. In broader sense, biomass and biogas energy generation projects can be competitors of the project in upcoming years.

PARTNERS

- Local power distribution companies like DESCO, DPDC,PGCB
- Solar utility companies
- Sustainable And Renewable Energy Development Authority (SREDA)
- Battery Companies
- National Power Grid Authority

DISTRIBUTION CHANNEL

Pilot Phase

- 2 Upazilas
- 1 District Headquarter

Primary Phase

- Metropolitan Areas
- Divisional Headquarters

Secondary Phase

- District Headquarters
- Some Upazilas

Tertiary Phase

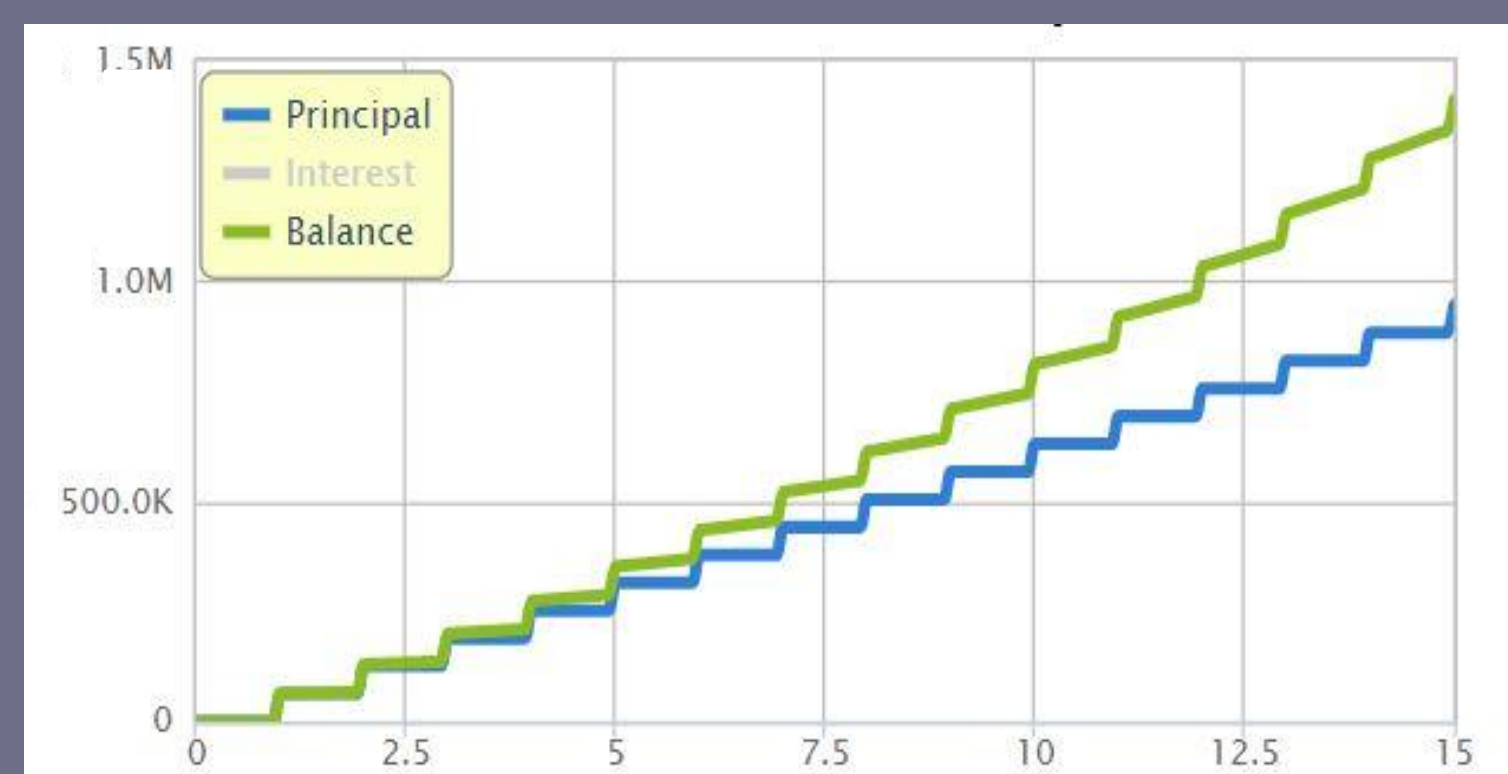
- Most of the Upazilas
- Hilly and forest regions

The distribution channel will be collaborated by the local power distribution authorities and the blockchain company. The pilot phase will be run to test the accuracy of the blockchain.

REVENUE MODEL

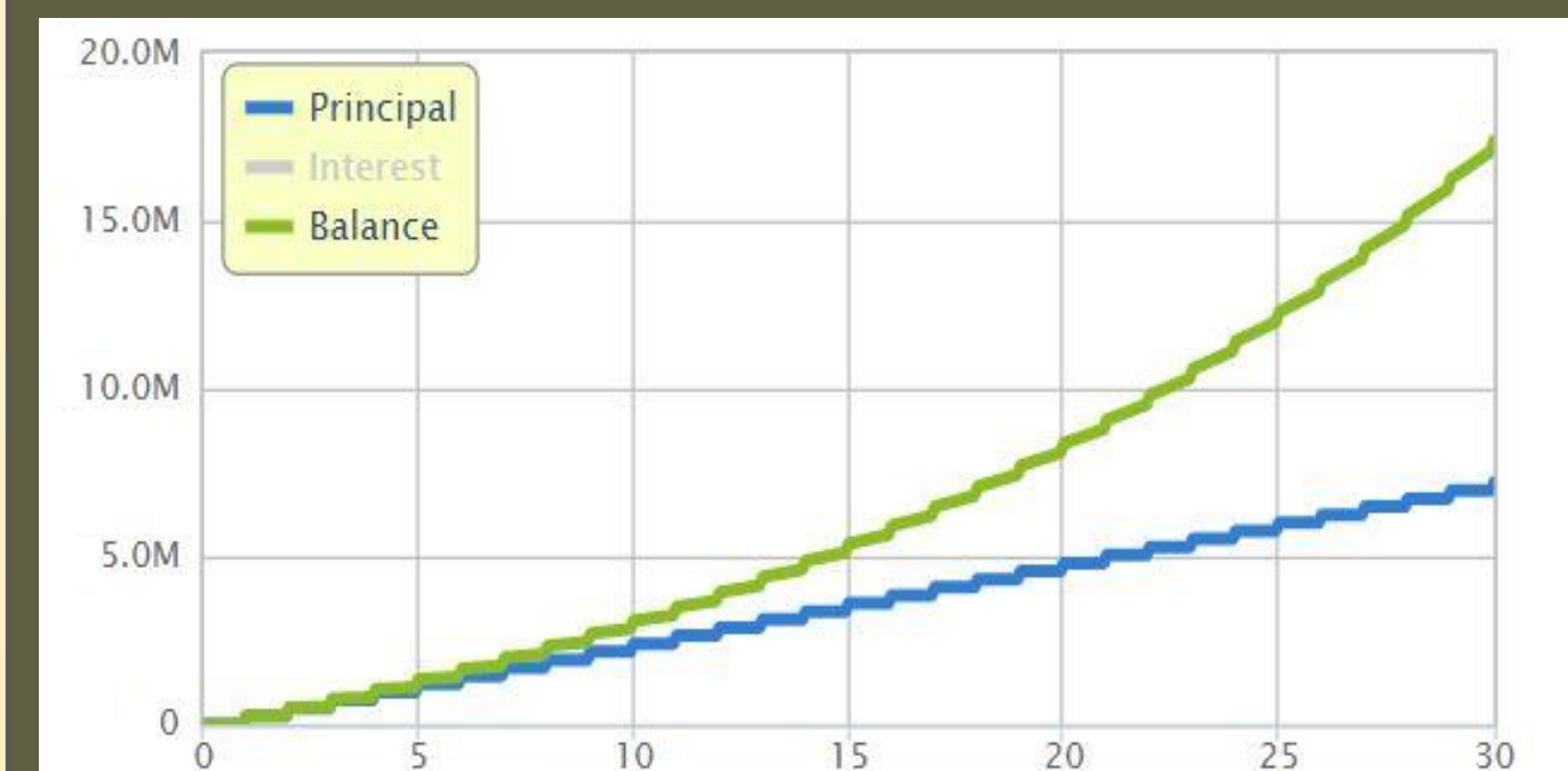
Generator Revenue

Investment: 0.5 Million BDT
Annual Revenue: 63,000 BDT
Payback Period: 9 Years
Estimated Life Cycle: 15 years
Net Present Value: 0.15 Million BDT



Blockchain Revenue

Investment: 15 Million BDT
Annual Revenue: 2.4 Million BDT
Payback Period: 9 Years
Estimated Life Cycle: 30 years
Net Present Value: 19 Million BDT



MERITS

- The blockchain network will supply a sustainable and ecofriendly energy
- Aligning with our project with undertaking policies for renewable energy sources by The government of Bangladesh
- Enlarging the coverage of energy within the country especially in north Bengal region where power transmission from national grid is difficult by the blockchain network
- 75 blockchains can be established across the country providing 335-megawatt energy daily which is almost 2.57% of present energy demand
- Variable costing of per unit electricity in peak time and off-peak time will help to save more energy during
- Reducing transmission wire cost by adding hosts in hubs
- Low depreciation rate of solar panels will make the system more reliable
- Establishing transparency by using of IoT in transmission control

RISKS

- Not enough participators in a block chain network will lead to reach the goal of generating revenue
- The section of our population below poverty line may not have direct access to technology devices
- Inadequate internet availability in remote areas
- Conflict of interest between parties as there will be local energy distribution companies and authorities
- The sustainable energy ecosystem is quite new in Bangladesh though the technology is there

FUTURE PROSPECT

- Assimilating National grid line and localized blockchain network for optimization in energy distribution
- Including other renewable energy sources like biogas plants
- The subsidiary industries will have an upsurge which will directly have a positive impact on national economy
- Introduction of wi-fi facilities in remote areas may be possible by the blockchain as the participants which leads to nationwide economic development in Bangladesh

CONCLUSION

In the question of sustainability and eco-friendliness, our project can ensure a huge impact in the power sector of Bangladesh. This can be useful by making transparency by engaging mass people in power distribution system. Proper distribution of extra power can lead a sustainable power-eco-system which can be a great help for overcoming power shortage in Bangladesh.

REFERENCES



Sustainable and Renewable Energy Development Authority



Dhaka Power Distribution Company Ltd.



Power Grid Company of Bangladesh Ltd.



Muspana

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LOCALIZED SUSTAINABLE AND ECOFRIENDLY ENERGY GENERATION AND DISTRIBUTION USING BLOCKCHAIN NETWORK: UNDERLYING MECHANISM EXPLAINED

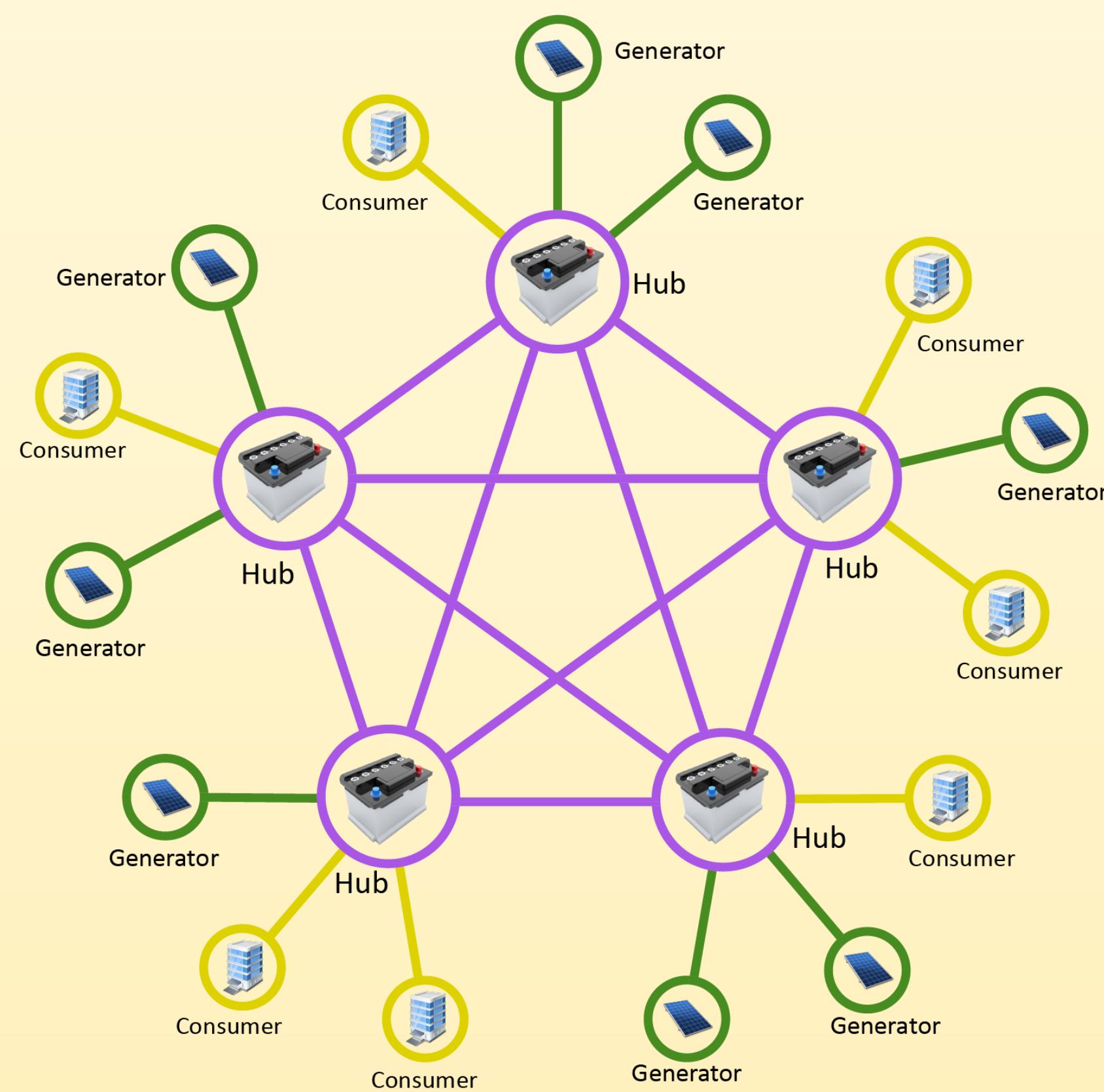
UNDERSTANDING THE BLOCKCHAIN NETWORK

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ABSTRACT

Blockchain technology has been emerged as a trustworthy system of trading in recent years. Merging the power sector with blockchain has numerous implications. Blockchain has some mandatory objectives and operation procedures while the power transmission system has its own policies and authorizations. This poster describes the technological aspects of the project with underlying systems. Blockchain based localized renewable energy generation and distribution is very much feasible due to its simplicity in structure than the traditional. The governance model of the blockchain is very significant as it will determine the reliability and transparency of the system.

BLOCKCHAIN MODEL

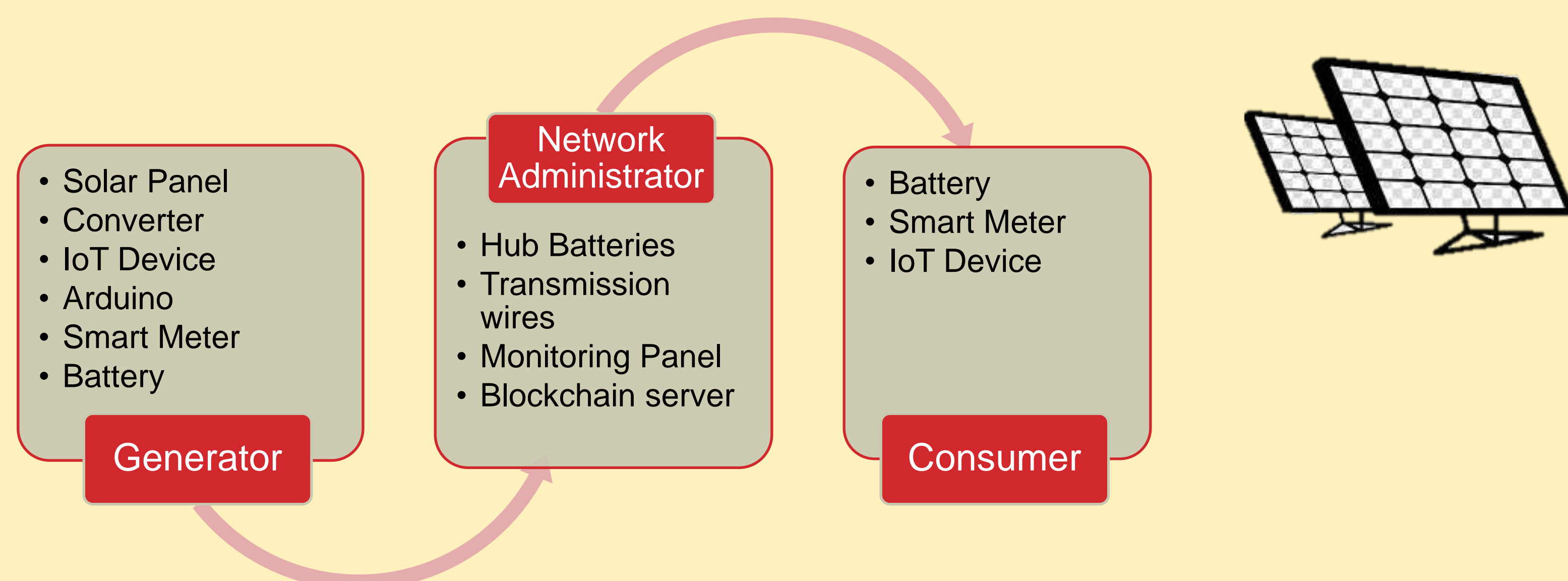


Participants

1. Generator
2. Authenticator
3. Consumer

- Each blockchain will have numerous hubs to connect the end participants
- Optimization algorithm will be used to minimize energy routing
- Hubs will be interconnected in mesh network
- Each participant will be connected to the blockchain server through internet

SYSTEM ELEMENTS

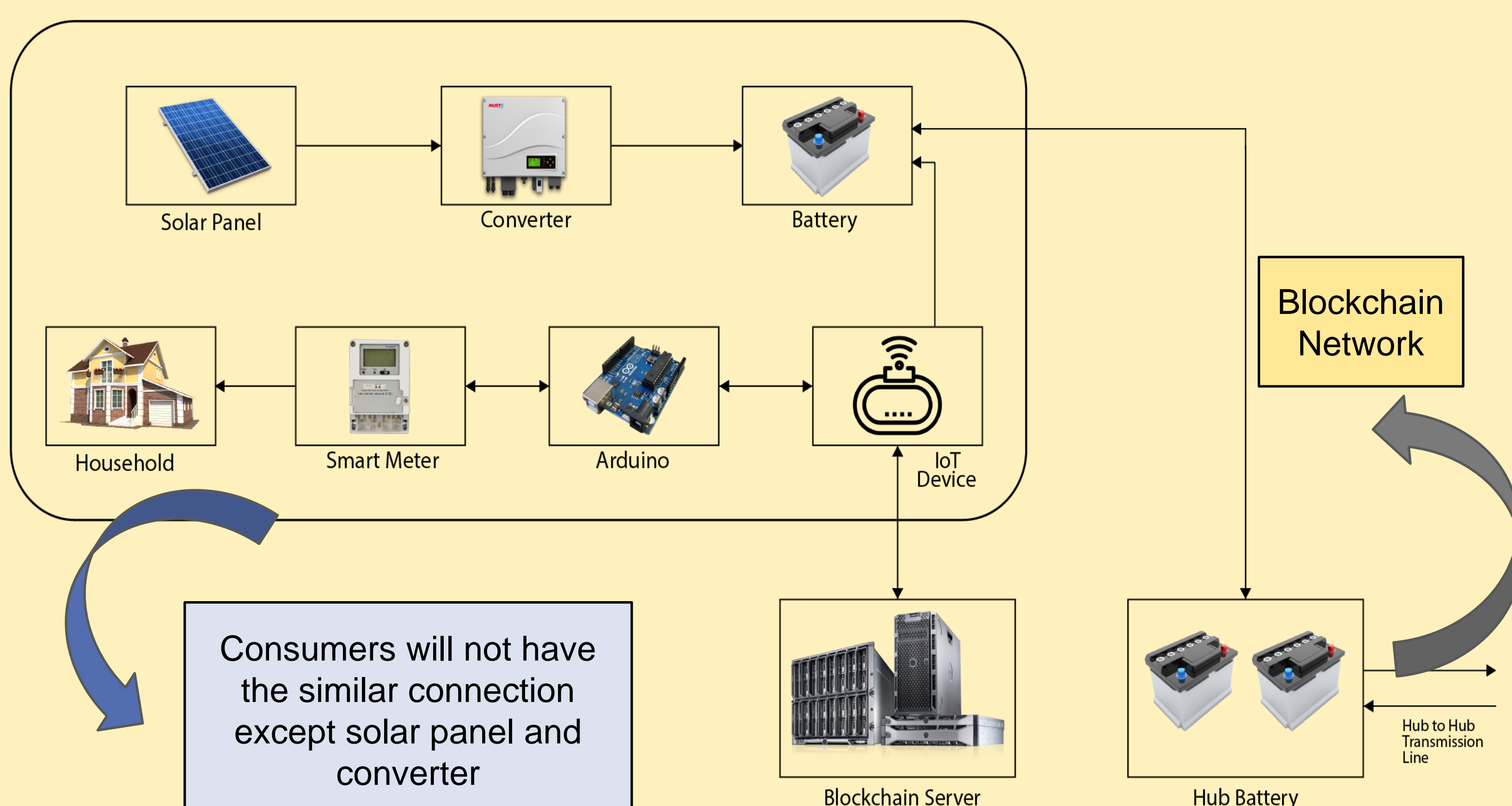


NETWORK ADMINISTRATOR

Local Power distribution authorities will held the responsibility of the respective regional blockchain .



GENERATOR SETUP



GOVERNANCE MODEL

Membership Governance

Join request through blockchain network with soft documents for all participants

Two stage verification for generators by field visit team, network administrator and authenticators, one stage verification for consumers

Yearly Maintenance, incentives under service level agreement

Regulation & Policy Governance

Blockchain administrators will implement the policies and regulations

The blockchain will accumulate the Govt. and SREDA policies

Data will be secured in the blockchain server. Only administrator will have a view access to the data

Role of Authenticators

Authenticators will verify each and every energy transaction through separate monitoring panel

50% or above authenticators have to authorize any particular transaction

Each hub will have an authenticator who will elected by the participants of that hub

AUTHORIZATION OF TRANSACTION

Energy consumption request will be generated for the consumers by the blockchain system according to the scheme or consumers can request real time energy transmission

Request in queue for authorization by the authenticators with a routing path suggested by the blockchain

Authenticator will verify that the requested amount of energy is available and authorize the transaction

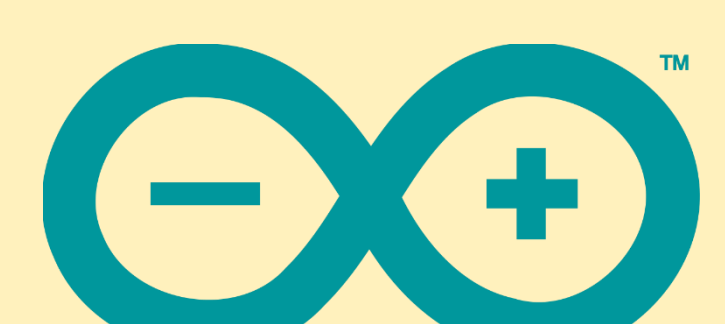
PAYMENT, SCHEMES & INCENTIVES

- Prepaid payment
- Balance stored in participant account
- No supply on debit balance
- Load shedding avoidance scheme
- Specific duration supply scheme
- Variable pricing and costing during peak load and off-peak load
- 50% incentive on initial installment for generators. The rest amount will be adjusted by annuity

SYSTEM DEVELOPMENT SOFTWARES



Corda for Blockchain Development



Arduino for IoT Integration

FEASIBILITY ANALYSIS

- Bangladesh government has undertaken initiatives to promote solar energy. A regulation has been imposed on mandatory installment of solar panels on the rooftop of each building within metropolitan areas. This will ensure the availability of participants.
- Hubs will significantly reduce the transmission wiring necessity. Multiple routing path availability is one of the major goals of efficient blockchain which will be achieved through these hubs.
- Engaging existing local energy distribution authorities will eliminate the need of a dedicated workforce for the blockchain at the primary and secondary phases.
- Digitalization of Bangladesh justifies the implementation of blockchain in important sectors like power industry

CONCLUSION

The reserve of fossil fuel is declining day by day which urges to implement renewable energy sources. The infrastructure for large scale blockchain implementation in power sector may require a couple of years more. But such projects actively involve mass people to participate in the journey of renewable energy.

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