FOUNDATION TRAINING COURSE

Technological Opportunities for Improving Performance in Power Sector

(A research paper submitted in partial fulfilment of the requirements of foundation training course)

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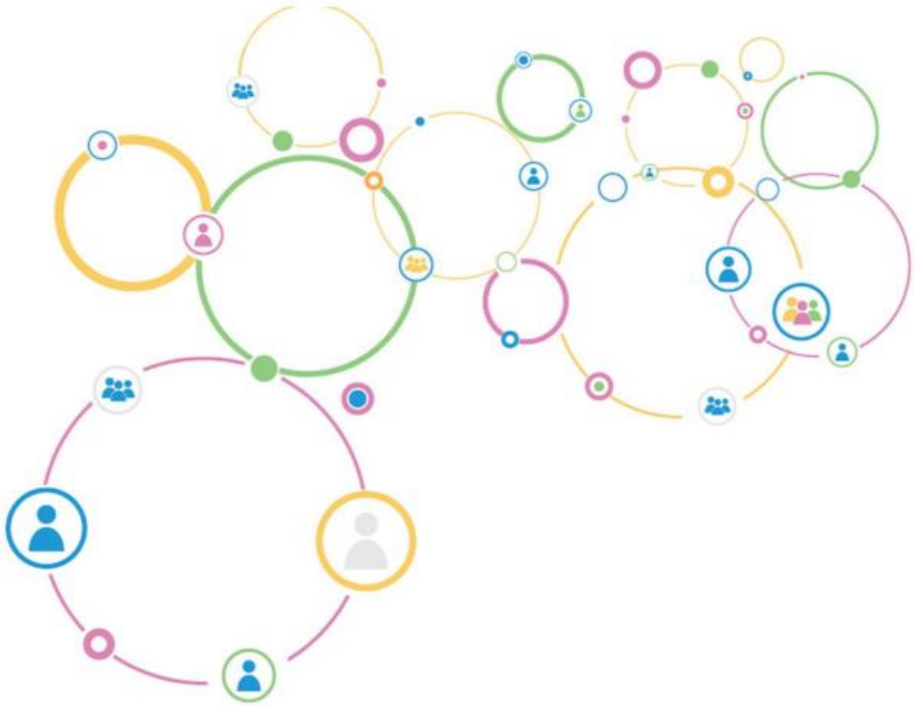

Abstract

The Bangladeshi energy sector has been characterized by low per capita commercial energy consumption, uneven distribution of energy throughout time, ballooning demand, inadequate energy infrastructure, and high fuel import dependence. Energy consumption in Bangladesh is expected to be more than double by 2030 to propel the development aspirations. Under such circumstances, Bangladesh needs to explore all the supply side and demand side technology in energy options along with the requisite infrastructure to bridge the demand–supply gap. This requires huge investment.

This paper is intended to study and show opportunities to improve the power sector of Bangladesh based on technology. The paper will cover all the three dimensions of the power system namely- generation, transmission and distribution. These individual topics will be discussed from an electrical, mechanical, IT, investment and performance viewpoint. Finally, the paper identifies some bottlenecks for implementing those technological opportunities in the present context.

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Chapter 1

Introduction

Bangladesh has set its goal in the power sector for the upcoming years. Power consumption capacity indicates the living standard of the country along with rising opportunities for industrial sectors. To achieve any goal there are certain challenges. Power system combines generation, transmission and distribution. All three of these need to function properly. In this era of modern technology, the power sector needs to absorb the latest technologies to keep pace with the increasing demand. We have many points in our overall power system to focus on. In this study, a possible opportunity of technology involvement has been introduced. If observed closely it could be realized that introducing technology could eradicate many problems in the power system. Bangladesh generated most of its power using natural gases but with time this resource will no longer be available. Alternative solutions are required immediately. From using coal, nuclear energy to wind and solar energy technological development is a must. As the goal is to produce energy efficiently and environment friendly so various measures to be adopted from the latest technology. As most of the power plants are located at remote places near the energy sources then power transmission with minimum loss is a big challenge. Transmission system involves transportation of power across the country. In this system technological exposure is a must to eradicate problems of longer channels. Several modern systems need to be engaged for improving performances. High end transformers, intelligent systems to locate faults instantly are the modern needs these days. The power generated and transmitted across the country is ensured home to home by distribution systems. For better performance and awareness of the consumers several technologies can be introduced. Along with system reliability, participation of consumers can also be initiated through technology. Particular functional cell phone or web based applications can involve consumers in their individual awareness along with a steady and reliable distribution system. It is to be mentioned that with the evolution of power, the idea of technology developed. Now it is technology that is to contribute to the evolution of the power sector. To keep pace with the global economy Bangladesh has to come up with its best plans and efforts. In this planning

power sector should be at the core. As the power sector is getting a boost in recent times, it is high time Bangladesh focused on technological involvement and development in the power sector.

Literature Review:

AC distribution

Now-a-days electrical energy is generated, transmitted and distributed in the form of alternating current. One important reason for the widespread use of alternating current in preference to direct current is the fact that alternating voltage can be conveniently changed in magnitude by means of a transformer.

Transformer has made it possible to transmit ac. power at high voltage and utilize it at a safe potential. High transmission and distribution voltages have greatly reduced the current in the conductors and the resulting line losses.

There is no definite line between transmission and distribution according to voltage or bulk capacity. This line also vary from country to country. However, in general, the AC distribution system is the electrical system between the step-down substation fed by the transmission system and the consumers' meters.

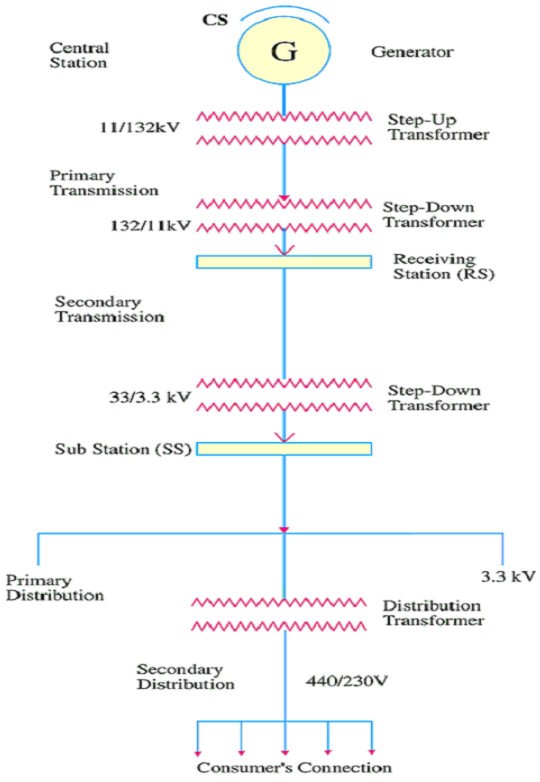

Figure 1: One line diagram of power system

The AC distribution system is classified into:

- Primary distribution system and
- Secondary distribution system.

Primary distribution system

It is that part of AC distribution system which operates at voltages somewhat higher than general utilization and handles large blocks of electrical energy than the average low-voltage consumer uses (Figure 1).

The voltage used for primary distribution depends upon the amount of power to be conveyed and the distance of the substation required to be fed. The most commonly used primary distribution voltages are 11 kV, 66 kV and 33 kV, but this differs from country to country.

One to economic considerations, primary distribution is carried out by 3-phase, 3-wire system.

Electric power from the generating station is transmitted at high voltage to the substation located in or near the city. At this substation, voltage is stepped down to 11 kV with the help of step-down transformer.

Power is supplied to various substations for distribution or to big consumers at this voltage. This forms the high voltage distribution or primary distribution.

Figure 2 – Air-insulated primary switchgear equipped with Feeder Terminals (type UniGear ZS1)

Secondary distribution system

It is that part of AC distribution system which includes the range of voltages at which the ultimate consumer utilizes the electrical energy delivered to him.

The secondary distribution employs 400/230 V, 3-phase, 4-wire system. The primary distribution circuit delivers power to various substations, called distribution substations.

The substations are situated near the consumers' localities and contain step-down transformers. At each distribution substation, the voltage is stepped down to 400 V and power is delivered by 3-phase, 4-wire system.

The voltage between any two phases is 400 V and between any phase and neutral is 230 V (Figure 5). The single-phase domestic loads are connected between any one phase and the neutral, whereas 3-phase 400 V motor, power transformer loads are connected across 3-phase lines directly.

Figure 3 – Secondary distribution switchgear in secondary network (photo credit: centredeformation-hta.fr)

DC distribution

It is a common knowledge that electric power is almost exclusively generated, transmitted and distributed as AC However, for certain applications, DC supply is absolutely necessary.

For instance, DC supply is required for the operation of variable speed machinery (i.e., DC motors), for electro-chemical work and for congested areas where storage battery reserves are necessary.

For this purpose, AC power is converted into DC power at the substation by using converting machinery e.g., mercury arc rectifiers, rotary converters and motor-generator sets.

The DC supply hum the substation may be obtained in the form of:

- 2-wire or
- 3-wire for distribution

Wire DC system

As the name implies, this system of distribution consists of two wires (+ and -). One is the outgoing or positive wire and the other is the return or negative wire. The loads such as lamps, motors etc. are connected in parallel between the two wires.

This system is never used for transmission purposes due to low efficiency but may be employed for distribution of DC power.

Wire DC system

It consists of two outer and a middle or neutral wire which is earthed at the substation (see Figure 6). The voltage between the outers is twice the voltage between either outer and neutral wire.

The principal advantage of this system is that it makes available two voltages at the consumer terminals between any outer and the neutral and between the outers.

Loads requiring high voltage (e.g., motors) are connected across the outers, whereas lamps and heating circuits requiring less voltage are connected between either outer and the neutral.

Most common distribution arrangements

Radial System

In this system, separate feeders radiate from a single substation and feed the distributors at one end only. A single line diagram of a radial distribution system is shown in Figure 7. The radial system is employed at low voltage and the substation is located at the center of the load. This is the simplest distribution circuit and has the lowest initial cost.

However, it suffers from the following drawbacks. The end of the distributor nearest to the feeding point will be heavily loaded. The consumers are dependent on a single feeder and single distributor.

Therefore, any fault on the feeder or distributor cuts off supply to the consumers who are on the side of the fault away from the substation. The consumers at the distant end of the distributor would be subjected to serious voltage fluctuations when the load on the distributor changes.

Due to these limitations, this system is used for short distances only. The radial system can be extended by introducing more laterals and sub-laterals.

Ring main system

In this system, the primaries of distribution transformers form a loop. The loop circuit starts from the substation bus-bars, makes a loop through the area to be served, and returns to the substation.

The ring main system has the following advantages:

There are less voltage fluctuations at consumer's terminals.

The system is very reliable as each distributor is fed via two feeders. In the event of fault on any section of the feeder, the continuity of supply is maintained.

For example, suppose that fault occurs at any section of the feeder. Then the faulted section the feeder can be isolated for repairs and at the same time continuity of supply is maintained to all the consumers via the other feeder.

Interconnected power systems

When the feeder ring is energized by two or more than two sources, it is called interconnected system. The single line diagram of interconnected system is shown in Figure 9 below.

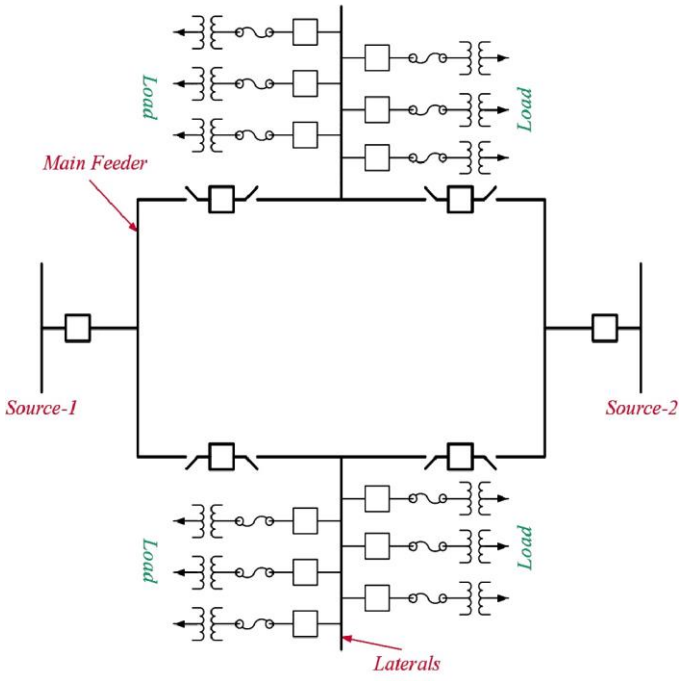

Figure 4 – Interconnected power systems

The interconnected system has the following particular advantages:

It increases the service reliability.

Any area fed from one generating station during peak load hours can be fed from the other generating station. This reduces reserve power capacity and increases efficiency of the system.

Chapter 2

Technological aspect of improvement in power sector

Improvement of the power system is the key role of the future challenge of power system. This can be achieved by individual refinement of each sector. We know that the power sector runs through three sector generation, transmission & distribution. For overall improvement, our main target is to improve individual improvement in these three sectors.

Technological opportunities to improve generation sector:

Improvement of the power sector starts with the idea of power generation capacity. Power generation involves use of technologies to do it in a more efficient way. Nowadays, the development of high efficiency energy generation technologies is of top priority around the world due to the volatility and the rising costs of energy resources, the depletion of fossil fuel resources and the severe environmental pollution. Bangladesh has always tried to cope with the latest technologies in the power generation sector but there are upcoming newer technologies every now and then. In the last ten years Bangladesh has increased its power generation from around 4.5 thousand megawatts to 22 thousand megawatts [1] along with many generation units are in the installation process.

The distribution of power generation through different sources, however, is uneven. The contribution of natural gas is 55.12%, furnace oil 26.34%, HSD fuel 9.04%, coal 2.55%, hydro 1.12% followed by imported power contributing around 5.65%. The share of nuclear power is yet to come, and the power generation through renewable sources is also in less percentage which is 0.19% [1].

Efficiency Improvement in Natural Gas plant

Bangladesh is mostly dependent on natural gas and distribution of gas-based generation units among various regions in Bangladesh is also highly uneven. Most of the existing natural gas-based power plants are located around the sources of natural gas. Bangladesh has set up combined cycle power plants to increase efficiency of the steam turbines. In the upcoming years Bangladesh has forecasted high demands and scarcity of natural gas has brought a situation to find alternative power sources in the future.

Latest technology in Coal power plant

To reduce the gap between the increasing demand and limited source of natural gas, the country is focusing on coal-fired thermal power plants. Since coal is considered to hamper the environment in the typical coal-based power plants. So Bangladesh is taking initiative to set up new coal based power plants with supercritical and ultra-supercritical technology which are higher in efficiency and have less harmful effect on the environment. But importing coal from other countries and transporting within the country is also a major issue in this initiative. Bangladesh has coal mines in the Dinajpur district which are of very high quality but not being able to extract it. If proper measures are taken with the help of latest technology then coal based power plants with our own coal can contribute to the power dispute in the northern regions of the country. If we can extract our coal then gasification and liquefaction of coal can be experimented like many other countries to use it as an alternative fuel to utilize in power generation.

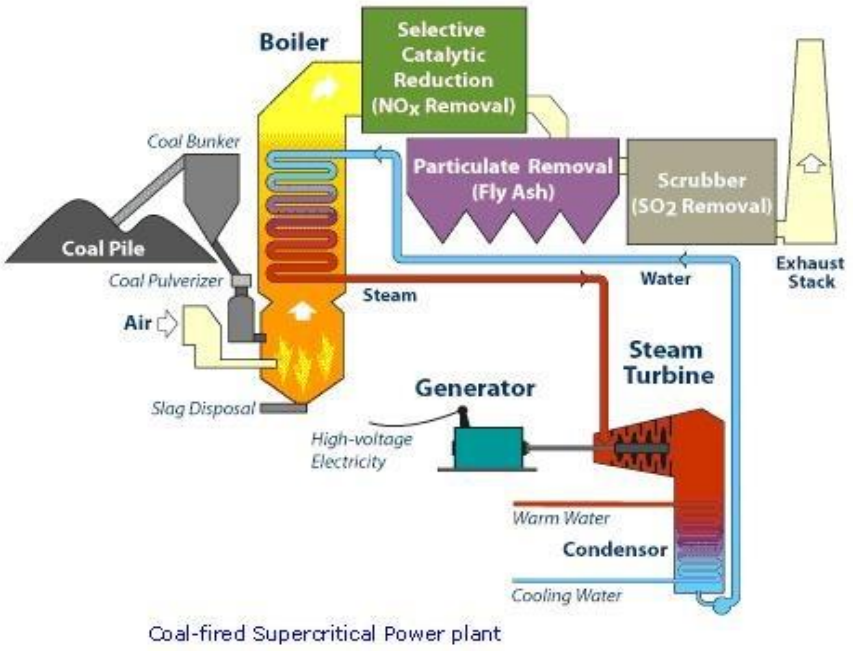

Figure 5: Coil -fired Supercritical power plant

Waste biomass as an energy source

Solid waste generation is an increasing trend considering Bangladesh as a developing country. The country is generating about 8000 tons of solid waste each day of which Dhaka city alone is contributing about 70%. The per capita waste generation is about 400 g/day [3]. Efforts are being paid to improve the system of collection, transportation, recycling, incineration and landfilling. However, we can use the latest technology to make that useful waste into energy. WtE technology in an energy recovery process that converts chemicals from waste residues into practical forms of energy like electricity, and steam. Thermal conversion techniques lead the market among WtE technologies. New WtE technologies like Hydrothermal Carbonization (HTC) that fast-tracks the slow process of geothermal conversion of wet waste with an acid catalyst at high pressure and heat to simulate the production of hydro-char which is similar to fossil fuels. It has a lower processing time and operational process to generate the same amount of energy as well. It is said to be four times more efficient than Anaerobic Digestion (AD)

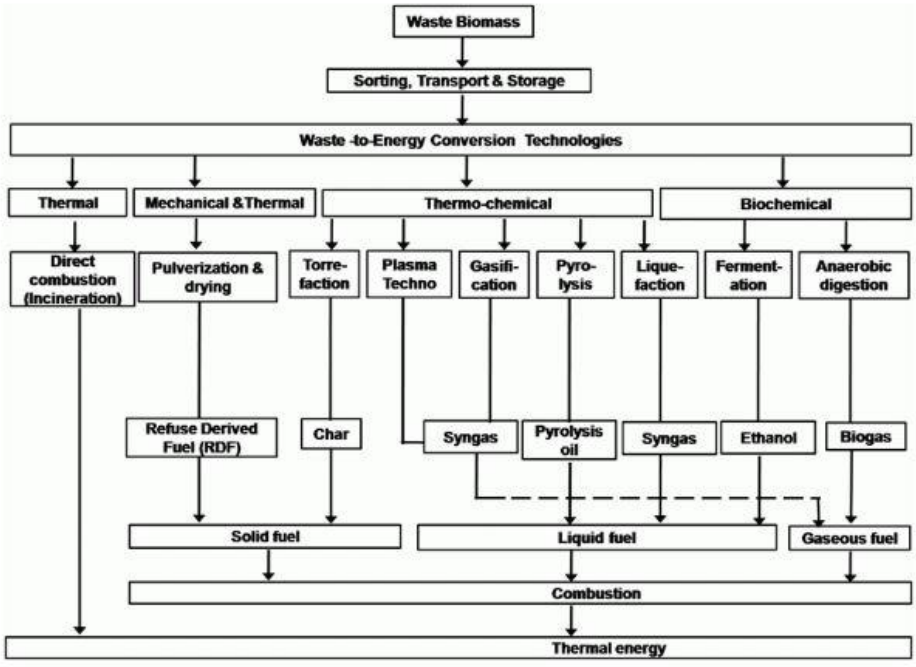

Figure 6: How to process waste into thermal energy.[4]

Wind energy Opportunities

Wind energy potential in Bangladesh is over 20,000 MW and the wind speed being < 7 m/sec[5]. In Bangladesh, research in the field of wind energy began only a few years ago, which had shown that some southern districts of Bangladesh have a very good potential of wind energy. Bangladesh is a densely populated country and being situated in the Bengal Delta, which makes large areas not usable for most activities, results in land being a scarce commodity. Bangladesh consists mainly of flat lands. Three-quarters of the land has no elevation higher than 30 meters. The north and southeast are more elevated, in which the division of Chittagong is the most elevated land of the country. With the active Ganges, the Brahmaputra and the Meghna rivers, fluvial sedimentation processes are current throughout the coastal line, with an exception off of the Chittagong coast. Partly by these processes, the first kilometers from the coast are relatively shallow. The 20 meter depth line is at its farthest ca. 110 kilometers from the coast of Patuakhali. Being fluvial sedimentation, it is anticipated that the soil of the seabed mainly consists of mud and loose sand. Offshore from the Chittagong division, the sedimentation processes seem to be of a lesser strength, but therefore the seabed is deeper, closer to shore. Next to this presumed solid seabed, the harbour of the City of Chittagong is also nearby, which can be a useful base for offshore contractors.

Some new technologies are being introduced by largest utility company JARA and French state-owned investment firm Ademe Divertissement which is called Damping pool technology[6]. These several floating offshore wind projects can be a light of hope considering the geographical location of our country. Here a big-sized rotor is more suitable but in a country like Bangladesh Micromechanical modeling of wind turbine will be appropriate.

Figure 7: Damping pool technology.

Grid connected rooftop-based buildings solar system with central control

In our country, a significant number of housing Society are going to build now a days. Normally, those are high rise and have a big rooftop in those buildings. We can use those buildings as a unit cluster. A significant number of that cluster will connect with central control. This central control station can connect with grid system and it will provide active power into the system. we can also connect this system with building loads. It can also operate as net metering ways. So, this is the ways of converting a small area into green area.

Solar Power transportation

An innovative practice to effectively make use of the sunshine is with transportation powered by photovoltaic (PV) energy [16]. Railroads, subways, buses, planes, cars and even roads can all be powered by solar, and solar transit is becoming a popular offering in the renewable energy sector. Recently, the solar powered-aircraft Solar Impulse 2 made its way around the world, soaring across the Pacific and making big splashes in iconic photographs. Meanwhile, solar buses are helping China reduce its carbon footprint while simultaneously maintaining efficient mass transit in densely populated cities like Beijing.

Figure 8: Solar Based Transportation

Finally, solar cars are starting to play a role in racing competitions around the world, especially in Australia where the Solar Spirit model has gained major recognition. With these advances and more, there's no question that solar power is the transforming transportation sector around the world.

Concentrated Solar Power

Solar energy can be harnessed in two ways. One is solar photovoltaic, and another is solar thermal, which is generally known as concentrated solar power (CSP). Power extracted from CSP technology is reliable, clean and environmentally friendly [17]. the Cox's Bazar region is the best location for CSP due to its lower low-cost optimum electricity of 9.86 ¢/kWh and higher annual

power generation of 171.1 GWh. Based on this study, it is recommended that by utilizing CSP, the present power crisis in Bangladesh can be substantially lessened. The government should take necessary steps and adopt strategies to generate power from this emerging parabolic trough solar power plant technology [18].

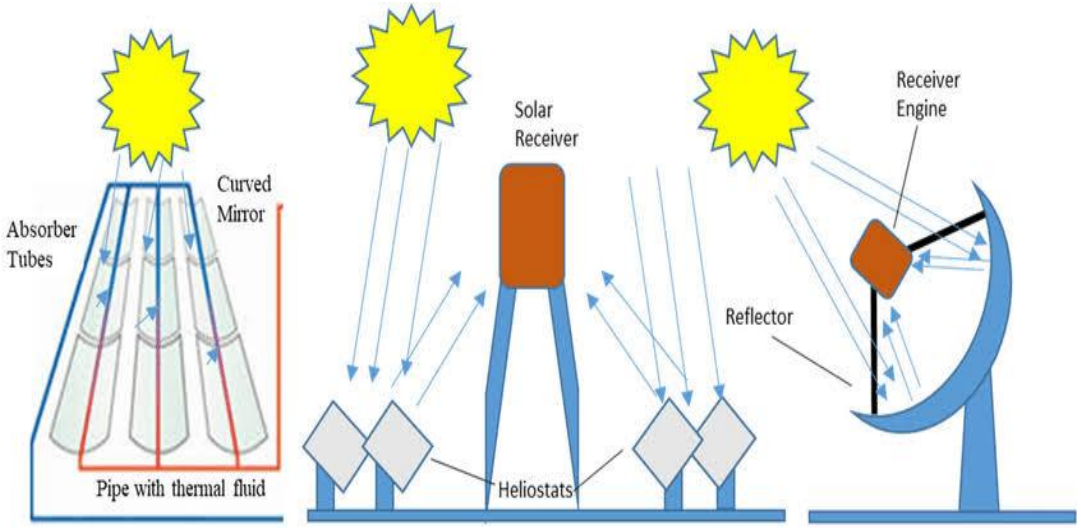

Figure 9: Three different configurations of concentrated solar power plant.

Technological Improvement in Transmission Sector of Bangladesh

Transmission Efficiency:

Different types of conductors are used at different voltage levels in PGCB. For 400kV line they use mainly Twin Finch along with Quad Egret and Quad ACCC Finch. For 230 kV line there are also so much variations using conductor. These types of conductors are mainly used for 230kV such as Finch, Mallard, Twin Mallard, Quad Mallard, and Twin AAAC etc. Most of the conductors are used for 132 kV transmission line are Grosbeak, HAWK, AAAC, XLPE etc. [10]. Efficiency in transmission line is very important. Transmitting electricity at high voltage reduces the fraction of energy lost to resistance, which varies depending on the specific conductors, the current flowing, and the length of the transmission line. For example, a 160 km span at 765 kV carrying 1000 MW of power can have losses of 1.1% to 0.5%. A 345 kV line carrying the same load across the same distance has losses of 4.2% [11]. For a given amount of power, a higher voltage reduces the current and thus the resistive losses in the conductor. For example, raising the voltage by a factor of 10 reduces the current by a corresponding factor of 10 and therefore the losses by a factor of 100, provided the same sized conductors are used in both cases. fold.

Hence power transmission needs to increase the transmission voltage. In Bangladesh 400 KV line is only 861 kilometers where 132 KV line is 7614 kilometers. So, PGCB should give importance on

high transmission voltage. PGCB is going to build two 765kV lines. One is Madhunaghat-Bhulta 765kV Transmission line project and another is Madhunaghat-Moheshkhali 765kV transmission line project [12]. So for improving transmission efficiency Bangladesh should take more projects on high-voltage line such as 400KV and 765kV.

Sub Stations:

A transmission substation connects two or more transmission lines [13]. A transmission station may have transformers to convert between two transmission voltages, voltage control/power factor correction devices such as capacitors, reactors or static VAR compensators and equipment such as phase shifting transformers to control power flow between two adjacent power systems. According to insulation mechanism there is various type of sub stations in high voltage transmission. One of them is Air Insulated Switchgear (AIS) and another is Gas Insulated Switchgear (GIS). AIS of which all equipment are individually and independently installed; conventionally connected together by a form of wires, rigid bar or tube. GIS of which all live parts contained in SF6 gas-tight enclosures of steel or aluminum. Live parts are held by special support insulator inside the enclosure and filled with SF6 gas. The enclosure may also be sectionalized with insulating parts to further reduce such losses. Single phase bus bar arrangements normally use lighter aluminum alloy or stainless-steel corrosion-proof enclosures.

Bangladesh is a densely populated country. More than 160 million people live in this small country. 1106 people live here in per square kilometer area. Land is getting less day by day for the adjustment of habitation. As a result, getting a land for construction of a substation is becoming difficult and price is quite high of land. There is total 138 sub stations of PGCB and most of them are AIS type [14]. As AIS needs more land area, so PGCB should think more about GIS.

Frequency Stability:

Power system frequency in Bangladesh varies routinely on a normal day between 48.9-51.2 Hz and can go as low as 48.7 Hz and as high as 51.5 Hz under contingency [14]. This is a major impediment to system reliability and also causes a severe economic loss including our-of-merit dispatch. System frequency of Bangladesh power system is very unstable (50±1.2 Hz) which makes it insecure and unreliable. There have been grid failures including a major countrywide blackout event on 1st November 2014 [15].

Unstable system frequency has severe negative impacts on the power system as a whole. It hampers system security and stability. For power plants, off frequency increases vibration, causes overheating and damages turbine blades & shaft. Under frequency reduces efficiency of motors and damages other equipment of consumers. With such frequency variation it is almost impossible to add large generating units (500 MW or more) and nuclear power plants to the grid. Integration

of renewable energy to power network is also difficult. Both of these issues are vitally important for the Bangladesh power system as it embarks on building a nuclear power station and connect large scale solar and wind. Private power generators (IPPs) are not interested for investment with such system instability. High frequency implies higher rotation and more energy loss. In Bangladesh, most of the time system frequency actually remains higher than the desired value which causes a huge energy loss.

Free Governor Mode of Operation (FGMO) entails that the governor of a power plant is free to govern its regulation/droop characteristics. This primary regulation is autonomous and an inherent property of turbine governing system. The governing system senses the change in speed and adjusts the control valve of working fluid so that mechanical power matches with the changed load [16].

Automatic Generation Control:

In an electric power system, automatic generation control (AGC) is a system for adjusting the power output of multiple generators at different power plants, in response to changes in the load. Since a power grid requires that generation and load closely balance moment by moment, frequent adjustments to the output of generators are necessary. The balance can be judged by measuring the system frequency; if it is increasing, more power is being generated than used, which causes all the machines in the system to accelerate. If the system frequency is decreasing, more load is on the system than the instantaneous generation can provide, which causes all generators to slow down.

Technological opportunities in power distribution system

AI services to customers:

Utility companies are facing an increasing demand from customers to provide artificial intelligence (AI) services in order to simplify and enhance interaction with customers. Companies currently engage with customers via channels such as phone or text. However, opting in for AI services will increase customer flexibility with consumers gaining access to platforms including in-home display systems and web portals. The growth of smart homes (i.e. homes powered by IoT devices), will result in the development and integration of new smart home devices and technologies which

utilities will include in business models – allowing consumers to access information such as power restoration times, how much energy an appliance is using or how much money is left on their prepaid accounts.

Integration of consumer to generate power:

The distribution network can be used to integrate generated power in a consumer's house by using solar, small wind or small hydro generators. If we can provide beneficial returns it can create a huge surge in the consumer power generation sector. This will further strengthen the renewable power portion of total generation.

Customer review system:

Rating the customer based on their bill paying behavior, instructiveness with given information from the control center. This will enable the distribution center to estimate decisions about the customer's future action.

Reward based uses alert to customers:

To flatten the demand curve, consumers can be alerted to use some of their demand in a specific time frame of a day. If it can be applied then consumers can be rewarded with low tariff and distribution network can be more stable in terms of temperature rise in its different devices. Also, total investment of bigger equipment can be made lower by reducing maximum demand at certain times of a day.

Social media automated messaging:

This platform enables companies to reduce expenses incurred in operation of call centres and call center time. Utility providers are trending towards increasing the use of automated social media direct messaging to inform customers about outages and status of bill payments.

Distribution System automation:

With the inclusion of distribution automation, companies will be able to make real-time adjustments to changing loads, generation and failure conditions of the distribution system without operator intervention. The system will support local power grids and ease the load across long-distance transmission lines.

Smart distribution network:

By using internet & IOT technology, updating customers about offers, balance, opportunity of reward consumption, any relevant news or action plan.

Stable power quality:

We can tap huge amounts of consumers in the industrial sector if we can provide stable voltage and frequency that is stable power quality.

Dual circuit distribution:

This is to provide 100% reliable power to the customer. In the first phase we can facilitate this to big industrial customers.

Underground distribution system:

This will enable almost fault free power distribution. For example, 80% of the power distribution line in Germany is underground.

Smart Grid:

"Smart Grid" is a modern concept which refers to the conversion of the mainstream or typical electric power grid to a modern power grid. In Bangladesh smart grid system has not been implemented inclusively. In Distribution system, it has been implemented to some extent. If the distribution system is running on smartly with least human intervention then it can be called as smart distribution system [18]. The main elements of smart distribution system are shown in Fig.1. When the distributed power generation is connected to the main power stream in the network, the network is no longer considered as a single supply power network.

The existing protection and control system must be changed and redesigned to adjust the two-way power flow through the Smart Grid. Supervisory Control and Data Acquisition System (SCADA), Geographic Information Systems (GIS) etc. technologies can be used in this smart platform by the utility operators, designers, planners and engineers to facilitate the distribution system with more benefits [19].

Figure10. Schematic diagram of smart distribution system.

Blockchain Technologies:

As we are entering the days of 4th Industrial Revolutions, the energy sector is undergoing a transformational change accelerated by the advancement of distributed energy resources and information & communication technologies (ICT). Decentralization and digitalization of the energy system has become one of the main challenges, which requires the consideration, exploration and adoption of distributed technologies. Due to their inherent nature Blockchains could provide a promising solution to control and manage increasingly decentralized complex energy systems and microgrids. [20] [21]

In simple language, blockchain is a digital data structure, a shared and distributed database or a ledger that contains a continuously expanding log of transactions and their chronological order. The data structure is in other words a ledger that may contain digital transactions, data records and executables. Transactions are aggregated into larger formations, called blocks, which are time-stamped and cryptographically linked to previous blocks forming a chain of records that determines the sequencing order of events or the 'blockchain'.

Blockchain technologies could be applied to a variety of use cases related to the operations and business processes of energy sectors. According to recent research papers, some of the potential applications and aspects of business models that might be affected, as summarized below [23]:

- Billing: Blockchains, smart contracts [24] and smart metering can automate and more secured billing for consumers and power generators.
- Security, identity management and transparency: Protection of transactions and security can be assured from blockchain cryptographic techniques. Blockchain could safeguard privacy, data confidentiality [25] and identity management. Moreover, immutable records and transparent processes can significantly improve auditing and regulatory compliance.
- Grid management and data transfer: Blockchains could improve control of smart grid, decentralized energy systems and microgrids. In addition to providing secure data transfer among smart equipment used in smart grid applications can further benefit from data standardization enabled by blockchain technology.
- Popularizing Electric Vehicles (EV): Scarcity of public charging infrastructure is hampering the popularization of EVs. Using blockchain networks can reduce the operational cost of charging stations and that can enable private owners of charging infrastructure to seamlessly sell charging services to EV owners could improve the appeal. Finally, smart contracts could also enable EVs to charge up or discharge based on the grid's needs, enabling the vehicles to act as mobile batteries and to help stabilise the grid while netting their owners income in the process. [26]

Numerous researches are going on applications of blockchain technologies in power sectors worldwide. We should emphasize to carry on these researches and apply in small scale projects in Bangladesh perspective.

Block diagram of all improvement aspect

Apart from the discussed opportunities, there are hundreds of on-tests based future opportunities in power sector in research. To keep our eye focused, if we summarize our whole discussion and methodologies in a nutshell, we can find a similar figure as shown in figure.

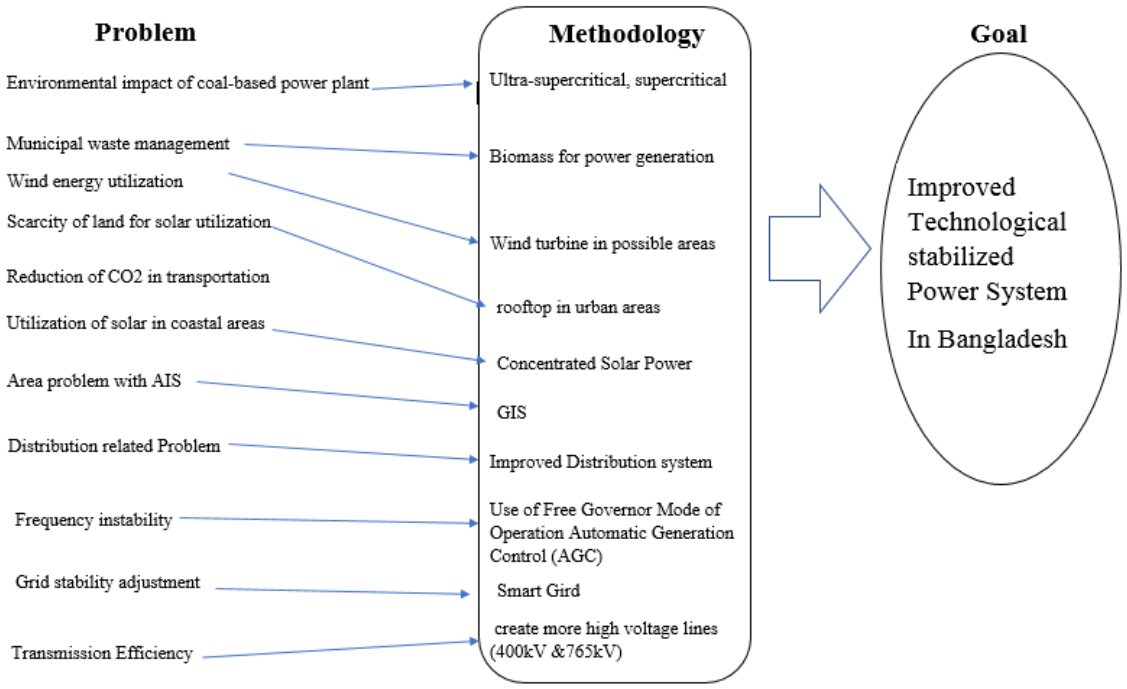

Figure 11. Simplified of all methodology for improved power system in Bangladesh.

Chapter 3

Conclusions

Bangladesh will face a huge demand of load in power sector in future. And Environment also demands a clean energy for its ecological stability and unwanted Climate change. That is the reason power sector of Bangladesh should be planned to take proper step and suitable technological improvement. As well as environment issue should also be kept in mind. This paper is trying to focus on that issue for improvement of power system in Bangladesh based on individual work in each sector i.e. Generation side, Transmission side and Distribution side. We try to introduce those steps which act as a technological advancement as well as ecofriendly. Those improvements will also satisfy the best use of current energy resources which we have in our country. Taking those steps as project is the time of demand for power sector in Bangladesh. As 100% electrification, sustainable, eco-friendly and advanced technology is our goal to achieve, those given projects should be taken as early as possible.

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