

# *Transforming the power sector in Bangladesh*



# Preface

Bangladesh is one of the fastest growing economies in South Asia. Over the past decade, Bangladesh's economy has grown at an annual rate of around 6%,<sup>1</sup> which is better than the growth rate of many other Asian economies. The Government of Bangladesh now aims to achieve the status of a 'middle-income country' by 2021 and that of a 'high-income country' by 2041. It is well known that electricity plays a vital role in poverty eradication, sustained economic growth, infrastructure development and security of any country. Thus, Bangladesh will need to address the barriers to higher growth posed by low access to reliable and affordable power, limited availability of serviced land, rapid urbanisation, vulnerability to climate change and natural disasters, etc., to achieve its socioeconomic growth targets.

The performance of Bangladesh's power sector in the last five years has been impressive due to the progressive efforts of policymakers, support from developing partners, and effective project implementation by public and private developers. The growth in terms of capacity addition in the last 10 years has been remarkable, from around 4.5 GW in 2007–08 to 12.8 GW in 2016–17. Private sector participation in generation accounts for about 60% of the total installed capacity.<sup>2</sup>

However, further actions need to be taken to match the demand-supply gap of electricity in a sustainable way and thus match the pace of the economic growth of the country. Massive capacity enhancement and expansion projects of the power sector are being undertaken. It has been planned to increase the installed capacity to 24 GW by 2021, and about 8,000 km of new transmission lines and 1,20,000 km of distribution lines have also been planned to be constructed by 2020.<sup>3</sup>

In accordance with the recent Power System Master Plan, Bangladesh aims to add 2 GW renewable energy (RE) projects to achieve installed capacity of 2,470 MW by 2021, and 3,864 MW by 2041. Solar and wind will be the key focus areas for future capacity addition, which shall account for about 50% and 40% of the 2,896 MW of RE-based installed capacity by 2021, respectively.<sup>4</sup>

Given the shift in generation mix and advancement in technological interventions that the Bangladesh power sector is witnessing, significant skill upgrade and capacity building of the workforce are required to enable successful transformation. The interventions need to be planned, designed and implemented by factoring in process, technology, information requirements, organisation structure, people capabilities, and customer requirements.

This report provides our views on the megatrends in the global power sector and how they will impact Bangladesh in its power sector transformation journey. It is important for stakeholders (the government, regulators, utilities, investors and development partners) to assess their strategy and implement the changes they need to make in time or, even better, ahead of time. The report provides suggested actions for Bangladesh on thematic areas such as government and regulations, financing and investments, RE, and technology in which disruptions are impacting the country's power sector.

<sup>1</sup> World Bank national accounts data and OECD National Accounts data files (2017). Retrieved from <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2016&locations=BD&start=2007> (last accessed on 11 March 2018)

<sup>2</sup> Bangladesh Power Development Board (BPDB) Annual Report for respective years

<sup>3</sup> Bangladesh's 7th Five Year Plan (2016–2020). Retrieved from [http://www.lged.gov.bd/UploadedDocument/UnitPublication/1/361/7th\\_FYP\\_18\\_02\\_2016.pdf](http://www.lged.gov.bd/UploadedDocument/UnitPublication/1/361/7th_FYP_18_02_2016.pdf) (last accessed on 11 March 2018)

<sup>4</sup> Power System Master Plan (2016). Retrieved from <http://powerdivision.portal.gov.bd/site/page/f68eb32d-cc0b-483e-b047-13eb81da6820/Power-System-Master-Plan-2016> (last accessed on 11 March 2018)



# Introduction

Globally, power systems are undergoing a phase of disruptive transformation. In fact, the power sector has never faced the rapid pace of change it does today. The interaction between technological, economic and political forces is catalysing what could be the most dramatic transformation of the sector in the past century.

Historically, the sector has been characterised by a stable legal and regulatory framework and mature technology where utilities were managed based on their technical excellence while ensuring adequate business profitability. However, sector players are now under immense pressure to achieve cost competitiveness and sustainability.

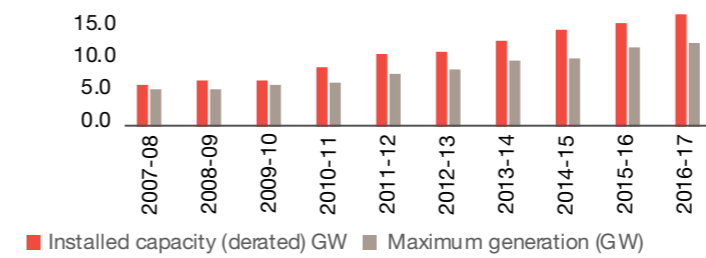
The world population is expected to reach 9 billion by 2040, and this is expected to drive the growth of global electricity demand by about 30%.<sup>5</sup> A shift in consumption patterns is also envisaged—for example, carbon emission reduction and energy efficiency (EE) are expected to be focal points in the future, driven by policy and technological interventions. Similarly, the power sector's evolution in the future would be heavily dependent upon technology, with South Asia and China likely to become the major electricity demand centres.



## 1.1. Bangladesh power sector scenario

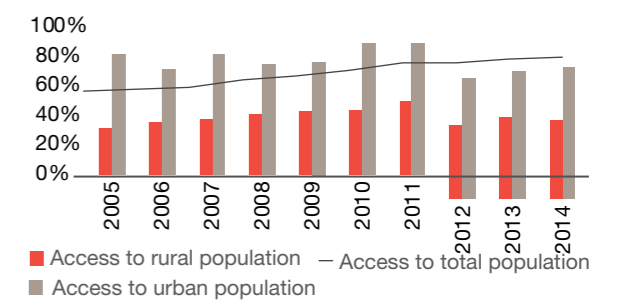
Bangladesh's power sector is one of the fastest growing in the South Asian region. The growth in terms of capacity addition in the last 10 years has been remarkable (from around 4.5 GW to 12.8 GW). Private sector participation in generation has been significant and now accounts for about 60% of the total installed capacity.

Installed capacity growth (annual GW)



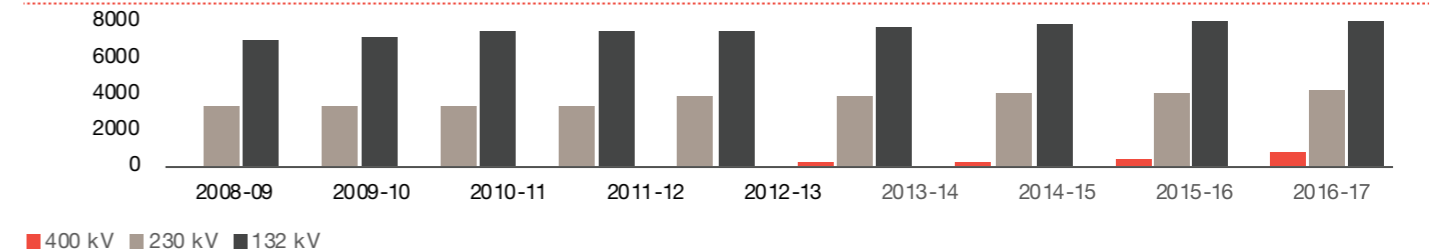
Source: BPDB annual reports for respective years (excludes captive generation)

Electricity access in Bangladesh (%)



Source: World Bank

Transmission network (annual ckt km)



Source: PGCB annual reports for respective years

The transmission sector has also gone through significant capacity addition in the last five years. The focus has shifted to higher voltage operating levels to reduce losses. The distribution sector, with a clear focus on increasing electricity access, has registered significant growth in terms of distribution network and substation capacity.

<sup>5</sup> World Energy Outlook (2017). Retrieved from <https://www.iea.org/weo2017/> (last accessed on 11 March 2018)

Outlook of the power sector	2017	2041
National population (million)	More than 163#	About 200
Electricity demand (MW)	9,479	61,681
Installed generation capacity (MW)	16,289 (including off-grid RE)	60,000
Per capita electricity consumption (kWh/year)	478	-
Share of renewable-based power generation capacity (%)	2.91	17

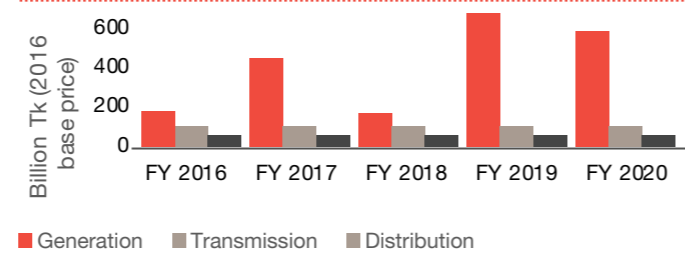
Source: Power Sector Master Plan (PSMP) 2016, SREDA and BPDB website, # 2016 data

The above table briefly captures some key transition milestones envisaged to be achieved over the next 20–25 years. Further, while Bangladesh paves the way for rapid economic and industrial growth, its Intended Nationally Determined Contribution (INDC) commitments to reduce greenhouse gas emissions by 5% from business-as-usual levels (and another 15% subject to adequate financing and technology support) are a major development that is likely to shape the country's energy future.<sup>6</sup>

In order to meet these objectives in a phased manner, the 7th Five Year Plan (FYP) of the Government of Bangladesh (GoB) has envisaged an investment of about 3,075 billion BDT between 2016 and 2021, with the private sector contributing more than 50% of the total. Capacity addition across the

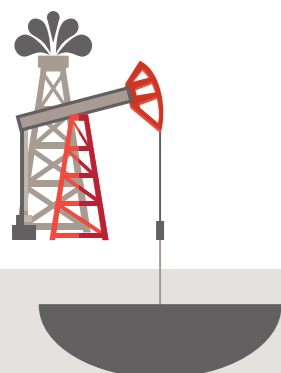
generation, transmission and distribution sector, along with infrastructural improvements by adopting superior technology, are the key focus areas for investments.

Projected investment in Bangladesh's power sector as per 7th FYP



Source: Seventh FYP, Bangladesh

## 1.2. Global megatrends and their impact on Bangladesh



The transformation of the power sector is being driven by the interaction between five global megatrends and is amplified by a set of shifts taking place within the sector. The five megatrends—technological breakthroughs; climate change and resource scarcity; demographic and social change; a shift in global economic power; and rapid urbanisation—are challenges for all businesses. While it is not uncommon for megatrends and disruptors to impact markets and businesses, they are increasingly testing the sector's ability to plan for the future.<sup>7</sup>

<sup>6</sup> Bangladesh's Intended Nationally Determined Contributions (INDC) (2015). Retrieved from [http://www4.unfccc.int/ndcregistry/PublishedDocuments/Bangladesh%20First/INDC\\_2015\\_of\\_Bangladesh.pdf](http://www4.unfccc.int/ndcregistry/PublishedDocuments/Bangladesh%20First/INDC_2015_of_Bangladesh.pdf) (last accessed on 11 March 2018)

<sup>7</sup> PwC's report on 'The road ahead: Gaining momentum from energy transformation' (2014). Retrieved from <https://www.pwc.com/gx/en/utilities/publications/assets/pwc-the-road-ahead.pdf> (last accessed on 11 March 2018)



### Shift in global economic power

The focus of global growth has shifted. The challenge for many investors is access to scarce capital from this global flow of capital, minimising the risk of stranded investments and seeking innovative ways of securing investment in replacement assets. Chinese state-owned power and utilities companies have been active in their search for suitable international power utility and grid investment opportunities.

**Impact on Bangladesh:** Since 2014, the FDI inflow to the country has been growing. In FY 2017, the power sector accounted for around 14% of the total FDI inflow. The FDI inflow to Bangladesh in the last five years has registered a CAGR of around 9%, whereas the FDI inflow to the power sector has registered a CAGR of 47%.

(Source: FDI Investment in Bangladesh, Survey Report, Statistical Department, Bangladesh Bank [<https://www.bb.org.bd/pub/halfyearly/fdisurvey/fdisurveyjanjun2016.pdf>]) (last accessed on 11 March 2018)



### Rapid urbanisation

Over the next two decades, nearly all of the world's net population growth is expected to occur in urban areas, with about 1.4 million people added each week. By 2050, the urban population will increase by at least 2.5 billion, reaching two-thirds of the global population. The speed of urban growth puts a big strain on infrastructure development. Power companies can play a pivotal role in ensuring future cities become 'urban smart' rather than 'urban sprawl'.

**Impact on Bangladesh:** As per World Bank data, around 25% of Bangladesh's current population lives in urban areas. The power utilities need to be lead players in future city infrastructure as the government strives to establish Digital Bangladesh, with the objective of converting all the major cities to smart cities. However, it will require a new mindset and business model.



### Demographic and social change

Explosive population growth in some areas set against declines in others have resulted in very different power market growth potential in different parts of the world. Transformation led by demographic changes is perhaps more relevant for developing countries, many of which face the triple challenge of being unable to meet the existing demand for electricity while also facing huge demand growth and the need to extend access to those who don't have electricity.

**Impact on Bangladesh:** Electricity access in rural areas of Bangladesh has improved over the years, thanks to various rural electrification investments and programmes of GoB, which has set a target of 100% rural electrification by 2019. However, growth and demographic pressure have resulted in a persistent D-S gap which needs to be addressed.



### Climate change and resource scarcity

The energy sector is on the frontline of concerns about climate change. The sector as a whole accounts for more than two-thirds of global greenhouse-gas emissions, with just over 40% of this stemming from power generation. Resource scarcity or availability, and the associated geopolitics and economics of gas, oil and coal supply, are key factors shaping the power market policy.

**Impact on Bangladesh:** The master plan of Bangladesh's power sector envisages that around 35% of the country's power generation will be from RE sources or clean power import by 2041, from the current level of 3%. A Skilled workforce, conducive policy and regulatory mechanisms, and innovative business model that encourages investments can serve as key enablers of RE growth and development.



### Technological breakthroughs

Technological innovation is at the heart of the shifts that are occurring in the sector. Advances are happening in many parts—e.g., in large-scale technologies such as offshore wind and high-voltage DC transmission, in distributed and small-scale customer-based energy systems, and on the load side. Power is being transformed from a top-down centralised system to one that is much more interactive, decentralised and fragmented.

**Impact on Bangladesh:** The government have been focusing on increasing digital access in the country. Currently, various initiatives of prepaid metering, enterprise resource planning (ERP) and supervisory control and data acquisition (SCADA) implementation, implementation and upgrade, of geographic information system (GIS) and underground cabling and substations in distribution utilities, consumer billing system, etc., are under various stages of implementation.



# Power sector transformation: A different future

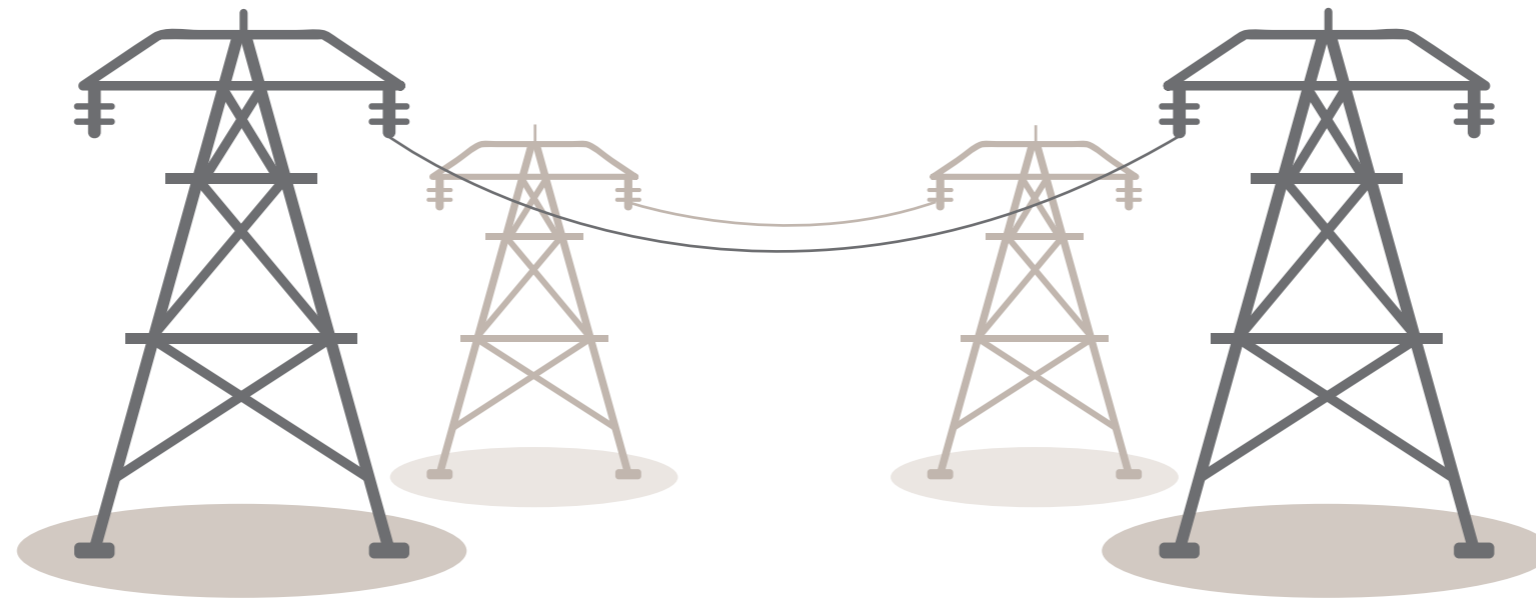
## 2.1. Delphi Energy Future 2040

Delphi Energy Future 2040 is a catalogue of 56 theses on how energy systems might evolve in the future. These theses were developed out of interviews with more than 80 experts from different disciplines and were then evaluated by more than 350 international energy experts. We have shared findings that reflect a considerable consensus in terms of outlook across various heads.<sup>8</sup>



### Energy systems

- An 'all electric society' will have become a reality. Electricity, especially power generated from renewable sources, will also provide mobility and heating, and will have displaced petroleum and natural gas in many industrial processes.
- The energy supply system will be structured in a cellular way—interconnected cells and 'islands' of cities/regions will generate power from solar/wind/storage and a minor share of conventional plants.
- Highly efficient 'sustainable cities' will have emerged, with populations that have sharply reduced their individual mobility needs and that satisfy their energy demand by acting as prosumers in smart microgrid systems ('neighbourhood generation').
- Economic profitability, investors' interests and independence from imports will be the key considerations driving the trend to build sustainable energy systems.
- Distributed generation with RE using battery storage will have led to the emergence of new democratic self-governance structures at the local level. Municipalities and social bottom-up movements will have gained momentum.
- Chances of cyber security breaches will increase and pose grave threats to the reliability of power systems.



*After decades of limited application, a 'next generation' of energy storage with new technology options and new demand drivers is fast developing. The rapid growth in intermittent renewables on the grid has rejuvenated utility demand for energy storage not only to complement renewables but also defer transmission and distribution investment in congested parts of the grid and to improve local frequency regulation.*



### Demand

- It was found to be certain or at least likely that global energy demand will double by 2040.
- The vast share of energy demand growth will take place in developing countries and emerging economies, which might thus increasingly turn to cost-effective renewable solutions that are tailored to their demand.
- Energy consumption will have risen significantly as private households will have stepped up their use of convenience solutions (mobility, increased automation of homes, heating, etc.).
- The Internet of things will come close to coordinating power generation and consumption, with a majority of electrical appliances reporting their energy demand online and responding to supply and price movements.
- Electric vehicles (EVs) capable of travelling up to 3,000 km on single charge will be available.



### Policies

- Governments and consumers will be more concerned about carbon emissions and, therefore, will be more interested in sustainable energy systems.
- The influence of the middle classes in emerging economies, especially in countries like China and India, will be a significant factor that will lead to more climate- and environment-friendly policies.
- States will be involved in energy supply activities given that energy security and sovereignty will be the key goals underlying national energy policies.
- New multilateral governance structures will have been created to facilitate the cross-border integration of energy systems and joint infrastructure investments.

*The entry of new players has helped spur interest among car buyers who have begun to consider EVs over more conventional options. Expected new launches from most major automobile manufacturers offer renewed hope for the EV marketplace. Major global automobile players are expected to launch more than 20 different EV models in the next 24–36 months. EVs currently make up less than 0.1% of the total global vehicle stock, but sales are expected to increase tenfold from 1,64,000 in 2014 to 16,95,000 units by 2019. This increased focus is driven by both supply- and demand-side factors that are changing the equation on price, performance and value.*

<sup>8</sup> PwC's report on 'Delphi Energy Future' (2016). Retrieved from <https://www.pwc.com/gx/en/energy-utilities-mining/pdf/delphi-energy-future.pdf> (last accessed on 11 March 2018)



## Sources of energy

- By 2040, the falling demand for fossil energy sources in industrialised and emerging countries will have destabilised producing countries. There is no clear picture on the long-term development of the prices of fossil energy sources. It is very likely that many other producing countries will follow the example of the US and commit themselves to the exploration of shale gas, which will, in turn, increase the likelihood of the prices of fossil energy sources remaining at a low level.
- Thin-film and organic photovoltaic (PV) technologies will drive decentralised energy generation, and distributed generation with RE using battery storage will proliferate.
- Battery storage facilities providing frequency control services will have taken over the role of conventional power stations.
- Power generated from renewable sources will also provide mobility and heating and will displace petroleum and natural gas from many industrial processes.
- High-performance customer generation facilities will be sold in retail stores and can be installed in a matter of minutes.



## Power markets

- The power market will be characterised by a high level of disintegration, load-profile customers and real-time pricing; smart meters and appliances will enable users to optimise their consumption.
- Energy will be traded in fully automated trading systems based on complex algorithms.
- Generation and supply of energy will have been decentralised and made more flexible, which will have led to the emergence of structures that are more resilient to crises and acts of terrorism.



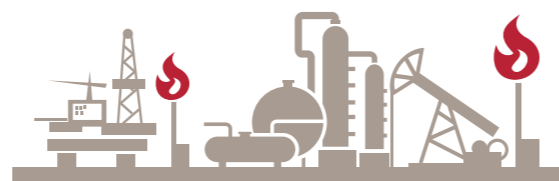
## Financing

- Decentralised energy systems will lead to a majority of energy projects being funded by small crowd- and community-based funds or microfinancing initiatives.



## Pricing

- Effective regional systems for pricing will in place.
- Unit price of electricity will become of secondary importance in view of the low marginal costs of renewable generation.
- Consumers will pay a flat rate of fees for electricity which will depend upon their average consumption.



**The regional supergrid market scenario represents a market which is pan-national and designed to transmit RE over long distances. The main challenge that will need to be overcome is regional regulations that apply across borders. We may see a new approach to generation investment decisions, where generators or governments will consider a regional merit order and interconnector access requirements as part of their business case assessment.**



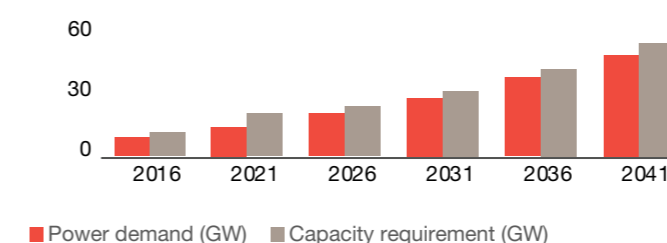
## 2.2. The transformation agenda for Bangladesh

Over the past two decades, Bangladesh's economy has grown at an annual rate of around 6%, leaving behind many of the Asian economies. Bangladesh has the potential to be among the leading emerging economies globally. But this will not be enough to achieve the status of a "middle-income country" by 2021 and 'high-income country' by 2041, as envisaged by the government.

The electricity sector shall play a crucial role in achieving these milestones and shall need to go through significant transformation.

### Infrastructure augmentation to achieve targeted growth objectives

Capacity requirement (GW) and demand projections (GW)



Source: PSMP 2016

To achieve the growth objectives, massive capacity enhancement and expansion projects of the power sector are being undertaken. It has been planned to increase the installed capacity to 24 GW by 2021, and about 8,000 km of new transmission lines and 1,20,000 km distribution lines have also been planned to be constructed by 2020.

Distribution network expansion plan by 2021

Distribution line (km)	4,80,000
Sub-station (MVA)	35,700
Prepaid meter	100%
Access to electricity	100%
Grid	90%
Off-grid (RE)	10%

Transmission network expansion plan by 2021

Voltage (kV)	Length (km)
132	10,297
230	5,081
400	3,711

Source: 'Investment opportunity in power sector of Bangladesh' (www.jetro.go.jp/ext\_images/world/asia/bd/seminar\_reports/20160413/p1.pdf)

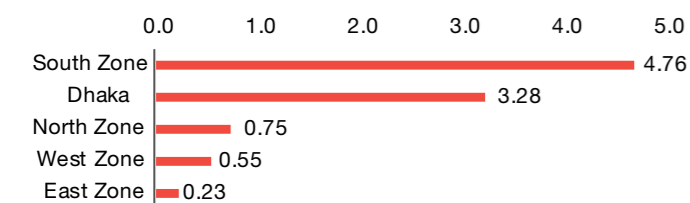


## Focus on industrial sector and its energy requirements

The industrial sector was one of the leading consumers of electricity in 2016, accounting for about 34% of the total electricity consumed. With the rapid advancement of industrialisation in Bangladesh, the industrial sector is expected to witness a shift from labour-intensive industries to more energy-intensive industries, leading to a greater demand for energy in future from this sector.

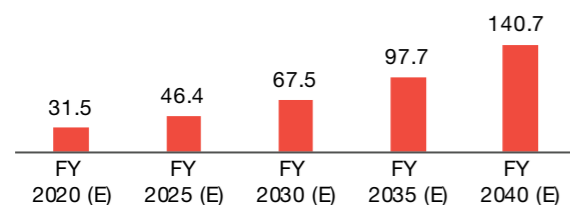
For example, according to Bangladesh Economic Zones Authority (BEZA), 59 economic zones (EZs) have been planned, which shall have a load requirement of 9,560 MW,<sup>9</sup> with the major electricity demand coming from Dhaka and the South Zone. As a result of all these factors, the industrial sector's demand for electricity is anticipated to grow to about 140 TWh by 2040.

### Zone-wise load requirement of EZs (GW)



Source: BEZA website and PwC estimates

### Projected electricity demand (TWh) of the industrial sector



Source: PSMP 2016

<sup>9</sup> Key assumptions considered to calculate the load requirement of different zones depending upon the number of planned EZs: Acre to hectare conversion factor = 0.404686, kVA to kW conversion factor = 0.8, load requirement = 450 kVA/ha

## Social upliftment and increasing access to electricity

The government's objectives of increasing electricity access and connecting every household to the national grid are expected to have multipronged benefits for society. Access to electricity shall enhance income and employment, which are the direct impacts. The indirect impact of electrification can be realised by improving the standards of education, health, social safety, modernisation etc. The direct and indirect benefits of electrification and increase in supply in Bangladesh together shall encourage economic growth, poverty reduction and human development

## Ensuring energy security and sustainable development

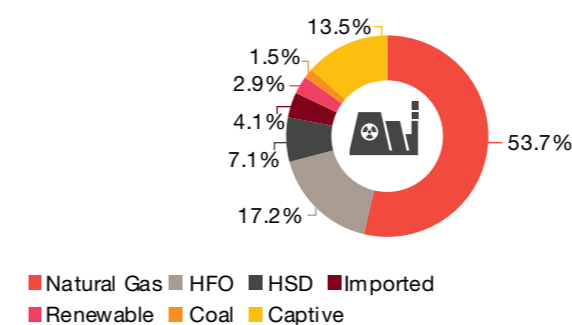
Ensuring energy security in this fast-transforming sector scenario is one of the key concern areas for Bangladesh. The depleting domestic reserve of natural gas is resulting in greater reliance on energy and power imports. The government, as well as many development partners and the private sector, has identified this challenge early and taken up various studies and plans to identify implementable measures for addressing energy security concerns while ensuring sustainability, affordability and reliability.

The identified focus areas include promotion of gas-to-power and usage of small-scale LNG terminals, cross-border power import, coal-based thermal power plants, energy efficiency and conservation (EEC), RE development and performance improvement of the distribution sector.

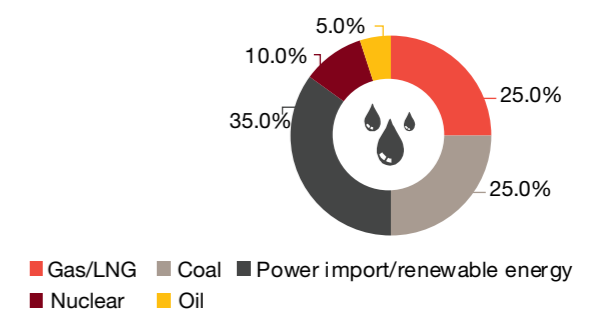
## Focus on RE development

The Sustainable & Renewable Energy Development Authority (SREDA) of Bangladesh has set a target to achieve about 2,337 MW of RE installation by 2020, which will ensure that the share of RE installation in the entire generation mix is 10%. Under the Power System Master Plan 2016, Bangladesh aims to add 2 GW RE projects to achieve installed capacity of 2,470 MW by 2021 and 3,864 MW by 2041.

### Fuel generation mix as on February 2018



### Optimum fuel mix by FY 2041 as envisaged in Draft PSMP 2016



Solar and wind will be the key focus areas for future capacity addition. They will account for about 50% and 40% of the 2,896 MW of RE-based installed capacity by 2021, respectively. Wind-based generation, which now accounts for only 0.6% of the RE-based generation in Bangladesh, would thus register the largest growth. SREDA is also encouraging energy savings by adopting energy conservation measures. It has a target to save 15% of the total energy consumption by 2021. A skilled workforce, conducive policy and regulatory mechanisms, and an innovative business model encouraging investments will serve some of the key enablers for this growth in RE installations.

# Looking ahead: Bangladesh's power sector

Disruptions in the power sector are catalysing the transformation journey and accelerating a change in paradigm. The pace of change will be different in each market and each situation. It is important for stakeholders (government, regulators, utilities, investors and development partners) to assess their strategy and implement the changes they need to make in time or, even better, ahead of time. Many of them have already reset their compasses and have changed their priorities and roles, and it is critical to assess what more needs to be done.

We see five areas in which disruption is having an impact on Bangladesh's power sector and where it will be important for stakeholders to assess their strategies and actions:

- **Government and regulations**
- **Financing and investments**
- **Renewable energy (RE) and EE**
- **Technology and efficiency**
- **Capacity building for the new age workforce**

Together, these areas set the context around which future markets and business models will be framed in Bangladesh. It is possible to identify developments for each area that are currently happening and which, if accelerated, could help in transforming the sector.

## 3.1. Government and regulations

Since independence, the power sector in Bangladesh has been represented by the Bangladesh Power Development Board (BPDB) which has been responsible for power generation, transmission and distribution in the country. Realising and recognising the need to improve the performance of the sector, GoB, in consultation with the major development partners, adopted a policy paper titled 'Power Sector Reforms in Bangladesh' (PSRB) in 1994. The PSRB outlined the reform process, as a part of which restructuring of BPDB was done and several successor companies were formed to distinctly carry out the functions of power generation, transmission and distribution.



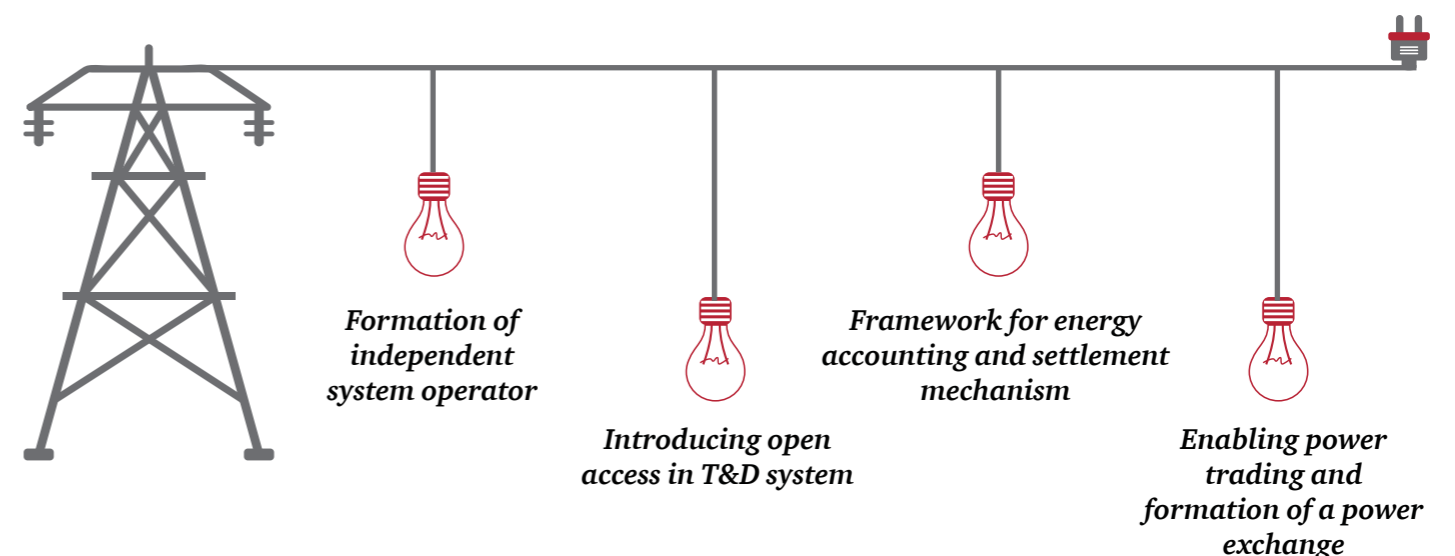
The government is envisaging further reform measures to meet the increasing demand for reliable, affordable and sustainable power. In our view, some of the key actions required in this context are discussed below.

### Facilitate development of a competitive power market

With the addition of new generating sources, a changing generation mix, increasing customer demand and increased operational efficiency, there is a need to develop a more efficient, transparent, deregulated and competitive power market for the supply of reliable and cheap power to customers. This will introduce competition on the supply side, resulting in an efficiency-driven decrease in electricity prices and pass-through gains to end consumers. In a competitive power market, participants can efficiently manage their portfolios by choosing different products available under a long-term, medium-term and short-term duration. Key action required to facilitate the development of a competitive power market is shown alongside.

#### Key drivers

- Options for suppliers and buyers to sell or purchase power at competitive price
- Provision for private players to explore an open market
- Provision for energy-intensive industries to buy power at a cheaper rate



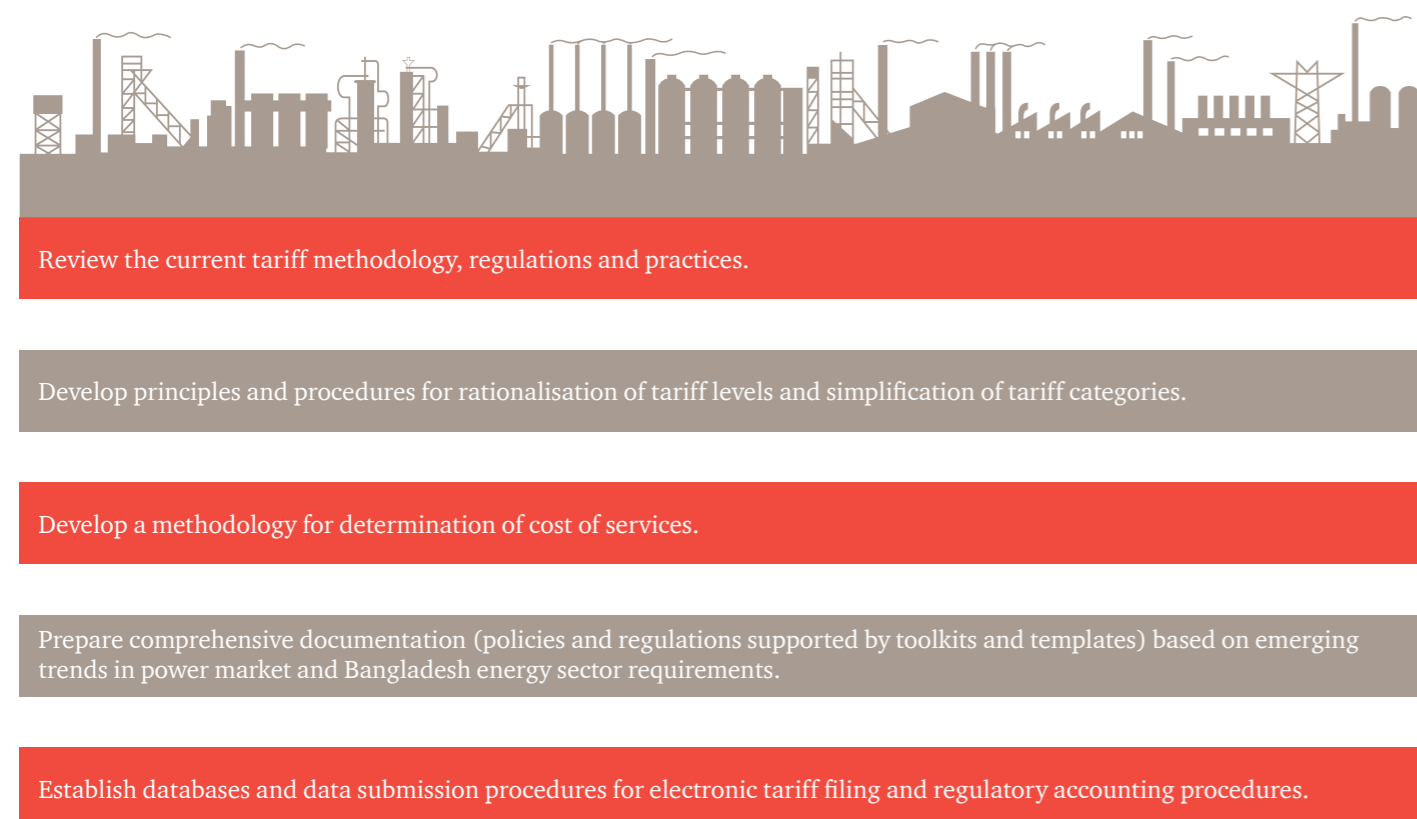


## Rationalisation of electricity tariff

As a single buyer, BPDB procures power from independent power producers (IPPs), small power producers (SPPs), corporatised generation companies and other publicly owned power plants based on negotiated bulk power tariff rates. These rates are based on fuel type, plant load factor and other operational parameters. On the other hand, BPDB sells electricity to the distribution utilities based on Bangladesh Energy Regulatory Commission (BERC) regulated wholesale tariff rates.

The overall objective of tariff rationalisation should be to develop a simplified tariff framework with a reduced number of tariff categories and tariff levels that would ensure cost reflectivity, affordability and progressivity, and at the same time would encourage competition, promote efficiency, economical use of the resources, good performance and investments in the sector.

The approach towards tariff rationalisation should involve the following steps:



The future tariff pricing structures of Bangladesh's power sector need to signal efficient consumption, demand-side management and use of alternative energy sources through the mechanisms of multi-part tariff, demand-based tariff, time-of-day tariffs, opt-in tariff and other novel solutions. A uniform and methodical process of tariff rationalisation is thus essential to adequately reflect costs, improve the financial health of DISCOMs/Palli Bidyut Samities (PBSs), optimise subsidies, and fulfil tariff principles of fairness, transparency and affordability.

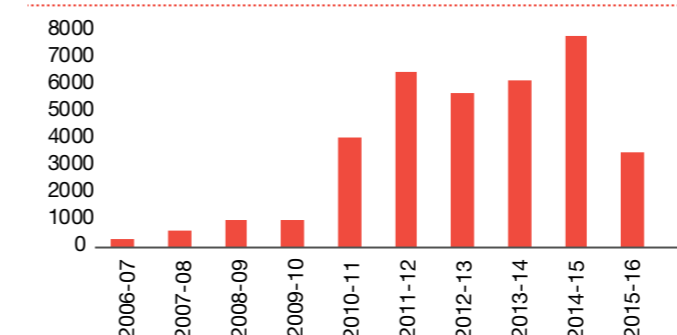
## Reforming subsidy arrangements: Direct Benefit Transfer (DBT)

There are two types of electricity subsidies in Bangladesh:

- For reducing the generation cost by subsidising the fuel (e.g. natural gas, coal, diesel, furnace oil) cost for electricity generation;
- For reducing electricity tariffs for consumers (including residential customers and farmers) and adjusting the losses incurred by BPDB through budgetary support.

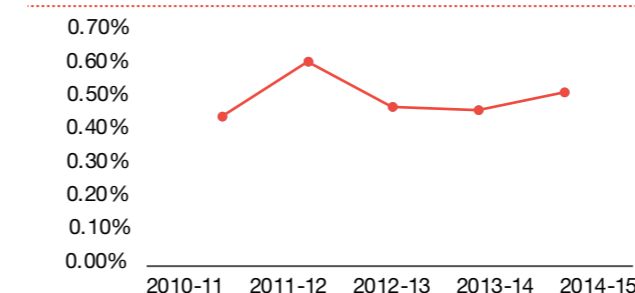
The total subsidy received from GoB from 2006–07 to 2015–16 on account of reduction in electricity tariffs amounts to 32,629 crore BDT. The sharp increase in the subsidy provided to the electricity utilities can be noticed in the graph below:

Subsidy received (crore BDT)



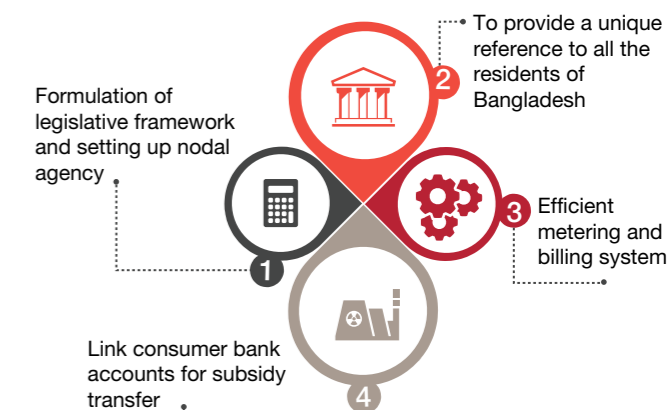
Note: 2015–16 is provisional data for subsidy received<sup>10</sup>

Subsidy as percentage of GDP



DBT is an attempt to change the mechanism of transferring subsidies to the end consumers and not to route them through utilities. It shall be designed to provide cash subsidies to lifeline customers, rural and poor families for the use of electricity and avoid subsidy leakage. Cash payments are made from the government directly to families covered under the electricity subsidy programme so as to decrease overheads and corruption. Large fuel subsidies make the country's fiscal position highly vulnerable to changes in global energy prices, which in a way provides benefits to low-, medium- and high-income groups. Energy subsidies are provided in order to help the poor and low-income household groups. DBT focuses on the low-income segment of households and thus can be a more accurate way to provide relief to such groups and will

also bring about savings through reduction in the subsidies provided by government. An indicative process which may be followed for DBT is illustrated alongside.



### Some examples of the use of DBT:

- Indonesia:** In 2005 and 2008, the Indonesian government used the Cash Transfer Assistance Program (BLT), providing two payments of 3,00,000 IDR (around 30 USD) directly to poor families. BLT, accompanied by short-term measures referred to as the Fuel Subsidy Reduction Compensation Program, provided targeted support for affected groups by increasing social spending.
- Thailand:** The Thai Energy Card was introduced by the government in 2011. This card allows taxi drivers to buy rationed natural gas for vehicles (NGV) volumes at subsidised prices. The energy card functions as a credit card that can be used to purchase 3,000 THB worth of NGV per month, and further provides a discount card for 6,000 THB. The policy has been adopted by other public sector vehicles, including minivans used for transport, three-wheeled tuk-tuks, and pickup trucks used for transportation. The objective of the policy is to maintain the costs of living within the reach of taxi drivers.

Source: [https://editorialexpress.com/cgi-bin/conference/download.cgi?db\\_name=SERC2013&paper\\_id=264](https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=SERC2013&paper_id=264) [http://vandainsights.com/wp-content/uploads/2017/07/SPGlobal\\_Fuel\\_Pricing\\_Reforms\\_2016-11-09.pdf](http://vandainsights.com/wp-content/uploads/2017/07/SPGlobal_Fuel_Pricing_Reforms_2016-11-09.pdf)

<sup>10</sup> SARI report on Power Sector Overview - Bangladesh (<https://sari-energy.org/wp-content/uploads/2017/04/Session-1-Bangladesh-By-Mr.-Golam-Kibria.pdf>) and Bangladesh Bureau of Statistics ([http://www.bbs.gov.bd/site/page/dc2bc6ce-7080-48b3-9a04-73cec782d0df/Gross-Domestic-Product-\(GDP\)](http://www.bbs.gov.bd/site/page/dc2bc6ce-7080-48b3-9a04-73cec782d0df/Gross-Domestic-Product-(GDP))) (last retrieved on 11 March 2018)

## 3.2. RE and EE

### Facilitating RE development

In order to increase the penetration of RE systems, the lead actors need to adopt a collaborative approach to address the key barriers and facilitate a conducive market environment. The key stakeholders who need to be part of the action plan are:

#### Government

Along with policymakers at the national, regional and local levels, the government need to remove deployment barriers; establish frameworks that promote close collaboration between the PV industry and the wider power sector; and encourage private sector investment alongside increased public investment. Establish RE targets and incentives to ensure a stable policy landscape with a predictable financing environment and low soft costs to boost investor confidence.

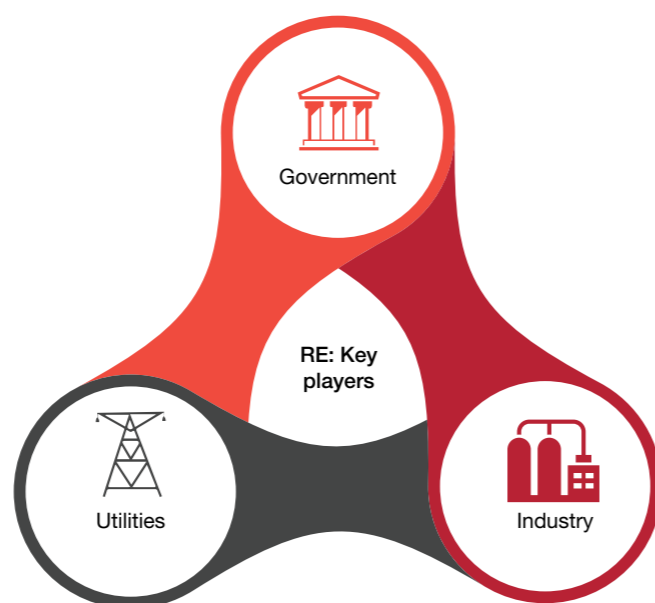
#### Utilities

The utilities, including power generation, transmission and distribution companies and power regulatory authorities, are key players in promoting RE due to the technical and commercial impact on their operations. These power system actors are responsible for managing the integration of RE into the grid while maintaining system stability. They need to adopt suitable technical and regulatory guidelines to enable the deployment of RE systems that are distributed and variable in nature.

#### RE industry

Improve the robustness and efficiency of RE systems, create skilled local jobs, lower project costs, and develop sustainable business models and an efficient supply chain.

We have provided a roadmap below which details actions and milestones to aid policymakers, industry and power system actors (such as utilities) in their efforts to successfully deploy RE systems in an efficient manner to maximise their potential in Bangladesh.



Government	Utilities	Industry
Set or update long-term targets for RE deployment, including short-term milestones consistent with the national energy strategy and their contribution to the global climate mitigation effort.	Develop wide-area transmission plans that support interconnection, anticipating RE deployment and the linking of regional power markets to ensure security of supply.	Further improve efficiency, performance ratios and robustness of RE systems while lowering costs.
Ensure a stable, predictable financing environment by identifying and addressing key risks that create uncertainty.	Develop technical rules and guidelines for RE integration and grid management (voltage, frequency control).	Develop a thriving local value chain to ensure job creation and revenue growth for the local community.
Where market arrangements and cost competitiveness do not provide sufficient incentives for investors, the government should ensure that predictable, long-term support mechanisms exist, such as capital subsidy, viability gap funding (VGF), tax breaks or preferential tariffs such as FITs. The level of support can be progressively reduced as markets mature and RE system costs decrease.	Develop mitigation plans to compensate for additional cost incurred by RE projects such as grid upgrade and loss of revenue due to captive RE consumption by end users.	Develop partnerships with national and international investors to ensure access to sufficient capital.
Address existing or potential barriers to deployment, in particular from permitting and interconnecting procedures.	Exploit and maximise the existing power system flexibility to increase the value of RE systems.	Train the local resources for system designing and installation and project management.
Ensure that a combination of self-consumption and fair remuneration of injections of electricity into the grids allow for deployment of distributed PV generation, acknowledging the value of solar PV generation, and outreach to consumers about the options.	Develop methods to assess the need for additional power system flexibility; carry out grid studies to examine costs and benefits of high shares of RE power.	Develop innovative and sustainable business models and strategies to lower risks and maximise returns.
Mandate renewable energy generation (RGO) as an obligation for conventional power producers and utilities.	Improve RE output forecasting and include online data in control rooms of system operators.	Explore potential for local manufacturing of key components like solar PV modules to cater to domestic and international markets.
Enable greater international collaboration for access to low-cost financing and also to make best use of national competencies.	Anticipate further RE deployment through increased flexibility of the rest of the system when additional capacity investments are required.	
In mature RE markets, progressively modify the policy framework for new-built capacities, as greater market exposure favours better adaptation to the broader power system.	Carry out an integrated approach to power system planning, RE generation, grid integration, transmission, distribution and forecasting/scheduling.	
In mature RE markets, consider progressive modification of the rate structure for electricity customers to ensure full recovery of fixed grid costs while preserving incentives for the deployment of distributed RE generation, including time of use and locational pricing.		

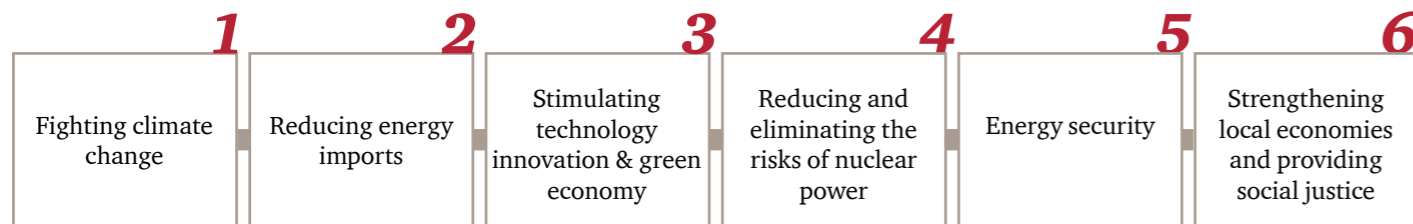
## Case study: Promotion of distributed solar using feed-in tariff (FIT) – Germany

PV has witnessed exponential growth from 2007 to 2017. During this period, PV has evolved from a niche market of small-scale applications to a mainstream electricity source. In the early years, the growth was mainly driven by Japan and Germany through programmes like FITs which incentivised large-scale adoption of solar PV. The FIT programme boosted Germany to the largest solar PV market in the world until 2015 with more than 45 GW installed capacity.

### Germany: The Energiewende (Transition to RE)

The Energiewende (German for ‘energy transition’) is the transition by Germany to a low-carbon, environmentally sound, reliable, and affordable energy supply. Germany aims to achieve greenhouse gas (GHG) reductions of 80–95% by 2050 (relative to 1990) and a RE target of 35% by 2020 and 60% by 2050. The legislative support for the initiative was passed in 2010 and a number of laws and programmes were implemented for the proposed energy transition.

### Goals of the Energiewende programme



A key programme under Energiewende that shall govern the promotion of RE to achieve its target of 60% clean energy by 2050 is the **Renewable Energy Act with feed-in tariffs and auctions (EEG)**. The EEG was passed as a legislation in 2009 and has subsequently undergone multiple revisions in 2012, 2014 and 2017. The EEG was a tremendous success in achieving its goals for RE penetration in the country. The law is the basis for Germany’s Energiewende and specifies two things: priority dispatch for renewable power and a floor price for that electricity. The resulting high level of investment security and lack of red tape are often cited as the main reasons why the EEG has brought down the cost of renewables significantly. Without the EEG, RE projects in Germany would have had to find a buyer for that electricity. Most utilities would have rejected the offer outright, arguing that these third-party investments conflict with their existing assets. The EEG thus opened up the power market to newcomers, who believed they could make solar and wind work. Under the EEG, Germany has achieved its target of 35% RE penetration three years in advance in 2018 from 2020.

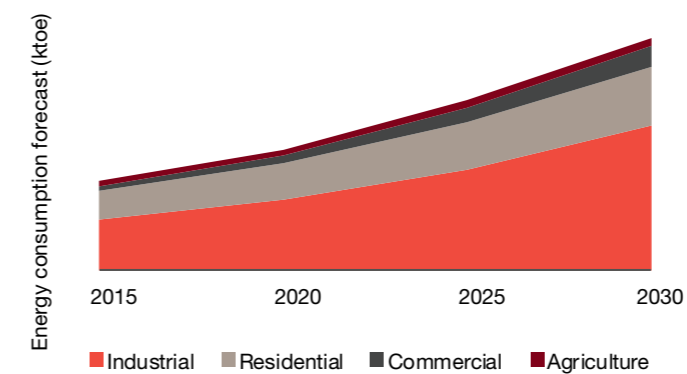
### FIT programme for solar PV projects

The FIT programme for solar rooftop and utility projects is the most important catalyst for making Germany one of the largest solar markets in the world. The rates were fixed by EEG 2009 and subsequently modified under EEG 2012, 2014 and 2017. Under EEG 2017, FIT for projects above 700 KW was replaced by an auction mechanism as proposed under EEG 2014. The FIT rates have fallen each year under the degression clause where the FIT rates are lowered based on the progress of the programme. The fall in FIT rates (from 49.2 Euro cent/ kWh in 2007 to 12.31 Euro cent/ kWh in 2017) has coincided with a fall in annual installed capacity since 2012 as the market moved from the growth to maturity phase.



### EEC measures

Industries and the residential sector are the two largest energy consumers in Bangladesh’s economy, followed by commercial and agricultural consumption. The share of energy consumption (in kilo tonnes of oil equivalent [ktoe]) by each of the key economy sectors and projections thereof are presented below.<sup>11</sup>



<sup>11</sup> Source: EEC Master Plan, SREDA

SREDA, the apex institution in Bangladesh responsible for EEC activities, has also identified sector-wise potential for EEC, which ranges from 30% for industry, 36% for residential and 30–40% for commercial sectors (as a percentage of EEC).

The EEC ecosystem comprises key groups of stakeholders (as shown alongside). Each of these stakeholder groups has a direct impact on the extent of adoption/penetration of EE technologies in industrial, commercial and other sectors. The roadmap to EEC needs to necessarily include relevant stakeholders' participation. One of the key driving factors for the smooth implementation of EEC activities is addressing the specific needs of each of the stakeholder groups.

While GoB has demonstrated initiatives to keep pace with the rising energy supply gap and is addressing the same with a host of policy instruments, including the ones on EEC, the policy scenario towards EEC in various sectors is still largely driven by a voluntary approach from the end-users. The existing policies and regulations by policymakers and regulators may be supplemented by promoting incentive-driven demand side management among various classes of consumers.



A roadmap for EEC by demand-side measures is presented below.

Legal, policy and institutional framework	Regulations	Financing mechanisms	Awareness and communication
Need more focus on EEC norms and standards.	Develop Minimum Energy Performance Standards (MEPS) and design labels for appliances under voluntary regime.	Set up 'National Energy Efficiency Services Company' to lead EEC investment-related actions.	Create awareness on significance of EE in national energy targets.
Promote utility-driven EEC programmes.	Set up adequate testing laboratories and strengthen the capacity for MEPS testing.	Design and test various energy service companies (ESCO) financing models through pilot projects in potential demand-side energy efficiency (DSEE) markets	Develop and implement a comprehensive communication strategy for all stakeholders – from policymakers to small consumers.
Enact target-based rules and regulations for promoting EEC activities in Bangladesh.	Include clauses of EEC in the Bangladesh National Building Code (BNBC) [Revised] version.	Replicate successful models by aggregating demand and promote large-scale ESCO financing.	Build capacity of programme managers of various EEC programmes on effectiveness of messaging and campaign design.
Build capacity and allocate sufficient resources to facilitate informed policymaking and scale up EEC investments in various demand-side sectors of the economy.	Notify large industrial consumers as designated consumers.	Leverage international cooperation in terms of lines of credit towards focused investment in EE technologies in various sectors.	Conduct detailed consumer research among various end-use sectors of the economy to understand consumer priorities and areas of concerns towards EEC activities.
Monitor, track and evaluate compliance and energy savings.	Notify public procurement rules with a qualified product list and EE specifications.	Aggregate demand and undertake bundled procurement of DSEE solutions.	Conduct impact assessment of various awareness and communication initiatives to gauge effectiveness, outreach, course correction, and optimisation of expenses.

### 3.3. Financing and investments

Traditionally, power projects in Bangladesh have been financed by a consortium of local banks, non-banking financial institutions (NBFIs), international financial institutions (debt or equity investments), export credit agencies (ECAs) and foreign investors. A brief overview of some of these is given below:

#### Infrastructure-focused NBFIs

Government-owned infrastructure-focused NBFIs, such as the Bangladesh Infrastructure Finance Fund Ltd. (BIFFL) and Investment Development Company Limited (IDCOL), provide low-cost debt financing. However, availability of these funds is limited compared to the investment requirement. Some examples of successful IDCOL financing are given alongside.



Borrower	Plant
Summit Meghnaghat Power Company Limited	305-335 MW dual fuel
Energypac Confidence Power Ventures Chittagong Limited	108 MW HFO
Quantum Power Systems Limited	105 MW HFO
Summit Power Limited Expansion project	33.75 MW
Lakdhanavi Bangla Power Limited (LBPL)	52.2 MW dual fuel
Regent Energy and Power Limited (REPL)	108 MW gas fired



## International financial institutions

International financial institutions such as Asian Development Bank (ADB), the World Bank and International Finance Corporation (IFC) have a significant presence in the Bangladesh power sector. The World Bank, in addition to debt financing public sector power projects, has also extended Multilateral Investment Guarantee Authority (MIGA) facility to private firms in order to help improve the financial attractiveness of their projects. Recently, the World Bank, through its Investment Promotion and Financing Facility (IPFF) programme, has financed multiple power projects at an approximately 5–6% interest rate (substantially lower than the predominant local market rates of 12–14%) and loan tenure of around 12 years.

IFC has provided both debt and equity financing to independent power producer (IPP) projects. One of the notable projects includes Bibiyana (a 341-MW combined-cycle gas-fired power plant set-up in 2015), developed in association with ADB and the Islamic Development Bank. IFC has also invested in Summit Group's power projects through their emerging Asia Fund and also extended debt facility to one of United Group's power projects in 2016. In addition to this, they are financing the Sirajganj dual fuel combined cycle 414 MW plant.

ADB has financed many public sector projects. However, they have a limited footprint in financing private sector projects. Their notable footprint in the private sector includes Summit's Bibiyana plant. They have also extended debt financing and partial risk guarantees for the development of a planned LNG-based power plant located in Meghnaghat and an LNG terminal near Kutubdia Island. Such initiatives are managed by ADB's Private Sector Operations Department (PSOD).

Challenges to financing	IFIs provide
Loan tenor mismatch	Longer-term loans
Lack of public financing	Both debt and equity to infrastructure projects
Lack of project-specific expertise	Specialised infrastructure expertise
High cost of financing	Lower costs of financing

## Export credit agencies

Export credit agencies (ECAs) are government-sponsored institutions established to support the export of capital goods and services from the country. The first ECA financing in the power sector of Bangladesh was in 2012 for Ashuganj Power Station Company Ltd., arranged by HSBC. Generally, the credit facility tenure is of 12–13 years, including a grace period of 2–3 years.

## Financing power sector projects – the current context

By 2041, it is envisaged that Bangladesh will require investment of about 35 billion USD in the power sector. However, Bangladesh may face challenges to fund such investment requirement due to the following key impediments:

### Lack of project finance

Globally, project finance is used as a means to finance large infrastructure projects involving a special purpose vehicle (SPV) structure. Usually, project finance is no recourse or limited course financing. This allows sponsors to protect their other assets. However, in Bangladesh, lenders sometimes demand corporate guarantees from sponsor shareholders as collateral besides project assets and, in some cases, assets of the sponsor shareholders outside of project assets. This tends to increase the cost of equity for sponsor shareholders.

### Inadequate domestic funding options

Bangladesh's bond market represents only 12% of its GDP<sup>12</sup>, with government bonds dominating the market. Historically, a few corporate bonds (non-power sector) that have been issued in Bangladesh have been privately placed, with only one listed on the Dhaka Stock Exchange. Most of the lending is for very short term periods. Further, the private equity industry (including venture capital) in Bangladesh is largely at a nascent stage.

As a result, the power companies typically fund the projects through accumulated earnings or long-term multilateral loans. However, accumulated earnings are often limited and long-term multilateral loans are bound by country and sector limits. Hence, companies often resort to financing long-term project with short-term financing, thereby causing asset liability mismatches.



<sup>12</sup> Assignment Point (n.d.). Development of bond market in Bangladesh. Retrieved from <http://www.assignmentpoint.com/business/finance/development-of-bond-market-in-bangladesh.html> (last accessed on 11 March 2018)

### Poor financial performance of the utilities

Some of the public power utilities in Bangladesh, including BPDB, which is the bulk power purchaser, have not been performing well financially over the last few years. This decreases the overall attractiveness and viability of the entire sector and makes it difficult for utilities to raise finance.

Public utility	Net profit after tax (in million USD equivalent)			
	2013-14	2014-15	2015-16	2016-17
Bangladesh Power Development Board	(821)	(878)	(467)	(534)
Power Grid Company of Bangladesh	(0.35)	5	15	24
Electricity Generation Company of Bangladesh	4.3	7.2	(2.2)	7.1
West Zone Power Distribution Company Limited	(4.9)	4.8	2.1	NA

Source: Annual reports of the respective utilities

### Bangladesh debt sustainability

Although GoB has been receiving funding from international development partners to finance public sector projects, it will not have headroom to borrow beyond a certain limit as governed by its fiscal responsibility. As a result, it may need to consider an appropriate mix of public and private sector power projects to avoid potential adverse impact on the country's debt sustainability.

### Alternative financing options

Given the scale of funding requirement over the coming years, Bangladesh may need to explore other sources of financing beyond the existing ones. The current global financial market provides an opportunity to consider many options for financing which can be explored in the context of Bangladesh.

#### Local currency denominated bonds in overseas market

Issue of such bonds in overseas bond markets to tap offshore capital markets can be a debt financing option. In this case, unlike external commercial borrowings (ECBs), where the issuer bears the risk of exchange rate fluctuations, the bond is issued in local currency in an attempt to shield issuers from currency risk and instead transfer the risk to investors buying these bonds. The coupon rate depends upon factors such as the issuing entity's country rating and currency stability. Examples of this type of bonds listed on LSE are provided alongside.

#### Bonds in London Stock Exchange (LSE)

Number of bonds listed	27 (11 active)
No of issuers	5 (3 active)
Capital raised	~23 billion USD
Active issuance maturities (from issue date)	10 y, 5 y, 3.5 y, 3 y, 2.4 y, 2 y, 1.5 y, 1 y
Average coupon across maturities (active bonds)	6.21%

Source: LSE website

#### Green funds

GoB has extended policy support for the proliferation of RE in Bangladesh, targeting 2,470 MW by 2021 and 3,864 MW by 2041 as per PSMP 2016. In such a scenario, various green funds can be explored as debt financing options for Bangladesh. Green funds are meant for financing activities in developing countries that target to reduce greenhouse gas emissions and support resilience to climate change. Generally, these funds are concessional and long term in nature.

#### Overseas listing

Listing of Bangladesh's profitable public power utilities in overseas markets can be explored as an equity financing option to unlock value. As it is difficult to raise equity through listing for new generation projects (because of the multiple risks involved), utilities with proven track records of stable cash flows and profitability can be listed to raise funding for the new projects (e.g. transmission). This will, however, require adherence to international accounting and governance standards. In addition to enlarging and diversifying the equity base of the companies, listing would also lead to good corporate governance practices and transparency because of the various disclosure requirements.

#### Strategic disinvestment

Strategic disinvestment of GoB's stake in the public power utilities can also be explored as an option to raise equity. However, the aspects of control and the overall benefit to the people of Bangladesh, among others, will need to be considered while exploring this option.

#### Creation of power sector focused financial institution

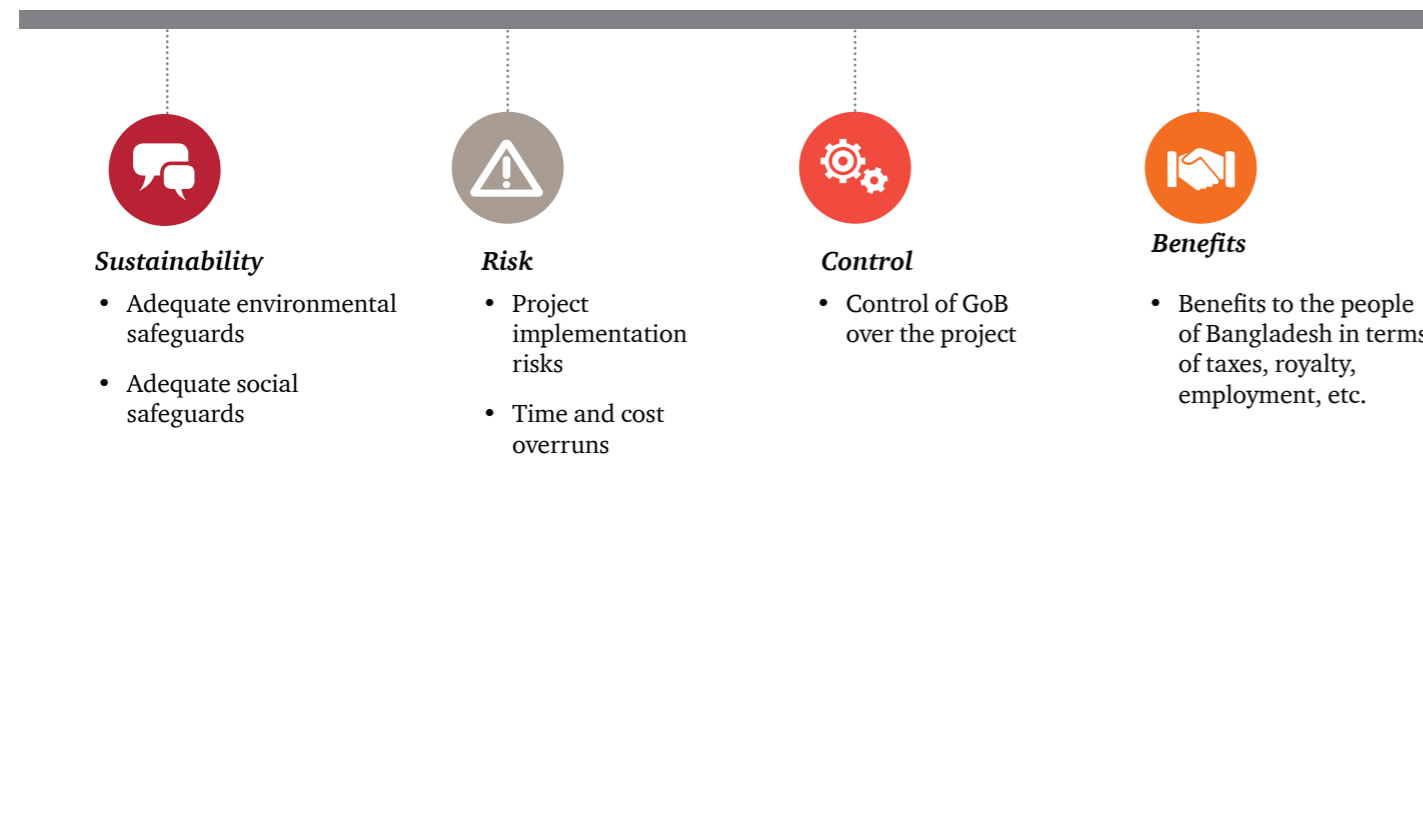
Formation of specialised financial institutions to cater to the power sector's specific need for competitive finance, with a robust mechanism, guidelines, adequate capacity, etc., can be explored. Such institutions can play a crucial role in the development of the power sector.

## Further incentivising private participation

Given the investment requirement, the role of private participation will be important in Bangladesh's power sector. This requires a clear framework and greater clarity for private investors. Also, private participation needs to be adequately incentivised. Some of the incentives for private investors to be considered are given alongside. Many of these incentives have been extended earlier and may need to be continued.

- Minimisation or avoidance of double taxation incidence
- Tax exemption on royalties
- Ease of repatriation of profits and dividends
- Tax exemption on capital gains from transfer of shares by the investing company
- Tax exemption on interest paid on foreign loans

Bangladesh can also explore various PPP models. The following is a broad framework for assessing the different PPP models for their suitability.



## Suggested regulatory actions from key stakeholders for facilitating investments

Some issues identified by investors with respect to the investment and regulatory climate for power sector investments in Bangladesh and suggested way forward are discussed below:

- Interest rates charged by foreign banks, including international financing institutions (IFIs), are capped at 500 bps inclusive of London Interbank Offered Rate (LIBOR) as per regulations/ guidelines issued by Bangladesh Investment Development Authority (BIDA) as well as Bangladesh's Foreign Exchange Regulation, 1947. As LIBOR is a market-driven variable rate, this often makes it difficult for international lenders to lend to infrastructure projects in Bangladesh, given the risk profile of the projects and availability of alternative competitive markets for lending. Thus, the government may consider capping such interest rate by allowing LIBOR + a margin as the ceiling for interest rates to be charged by foreign banks.
- There is a requirement for relaxation of BIDA's guidelines on remittance of fees to technical advisors (see the box alongside for details).
- Globally, the issue of preference shares is one of the key modes for financing infrastructure projects. However, BIDA considers subscription of preference shares by banks as part of capital market exposure, which restricts the amount of preference shares that banks are willing to subscribe to. The government may consider a review of these guidelines to facilitate investments through preference shares in power sector projects.
- BIDA requires a 70/30 debt to equity ratio for all foreign investments. To facilitate greater access to debt capital, especially for larger projects, the government may consider suitably relaxing this norm.
- Given Bangladesh's current credit rating and high risk profile, there is a need for the government to issue sovereign bonds so that there is an adequate assessment of sovereign risk. This will facilitate issuance of bonds by investors for financing power projects.
- The government may encourage development partners and IFIs to increase their presence in Bangladesh and continue to extend their support to facilitate financing of infrastructure sector projects. These institutions offer lower interest rates and prefer sustainable sources of power (e.g. RE and natural gas based projects) and the government should provide an enabling policy and regulatory environment to promote such sources of generation.

### Challenges faced in remittances of loyalty and technical fees

Project financing by lenders and investors often relies on third party advisors' due diligence reports in making their investment decision. These advisors are generally cross-border entities with expertise in the areas of law, environment, engineering and technical, insurance, etc., who are appointed by project companies in the early stages of project implementation and involve outward remittance of fees.

To make the remittance payment, project companies need to apply to BIDA for permission. BIDA's permission for such remittance is governed by Chapter 10, Para 25 of the Guidelines for Foreign Exchange Transactions Volume 1, which reads as under:

'No prior permission of the Bangladesh Bank or BOI is required by the enterprises for entering into agreement involving remittance of royalty, technical knowhow or technical assistance fees, operational services fees, marketing commission etc. if the total fees and other expenses connected with technology transfer do not exceed the following limits:

- for new projects, not exceeding 6% of the cost of imported machineries;
- for ongoing concerns, not exceeding 6% of the previous years' sales as declared in the income tax returns.'

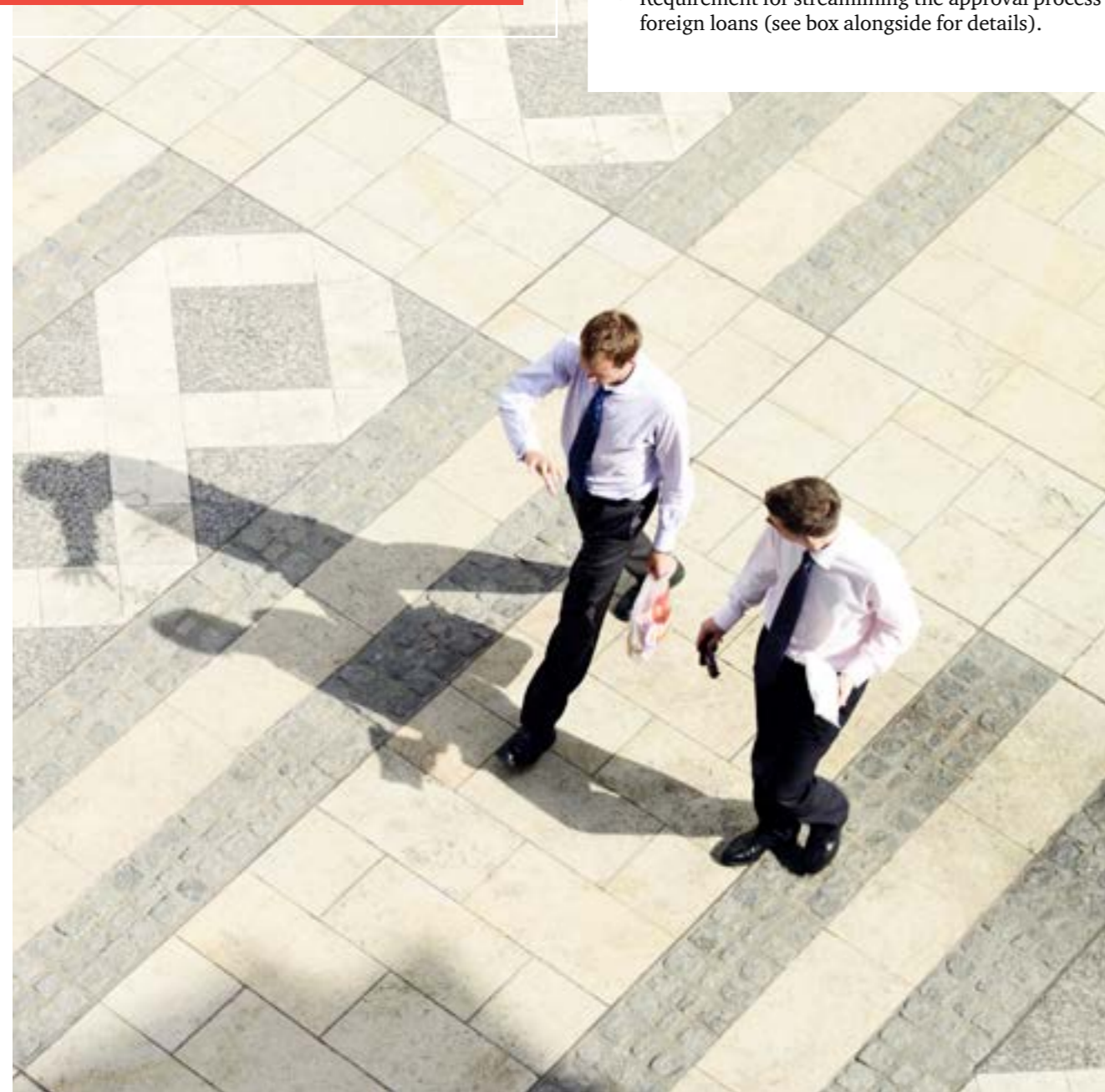
However, a project which is in the early stage of implementation fails to fulfill either of the conditions stipulated—(a) or (b) above. This creates significant challenges for investors and lenders as special permissions are required, resulting in delays and project cost escalations.



### Process of foreign loan approval

Foreign currency transactions are regulated in Bangladesh with capital account convertibility not yet approved by GoB. All foreign loans must be approved by the Hard Loan Scrutiny Committee (HLSC), administered by the Board of Investment and chaired by the Governor of the Central Bank. Before any loan is considered, an inspection is carried out by the Foreign Exchange Investment Department of Bangladesh Bank, and findings are forwarded to the HLSC for consideration. The typical time frame for this approval is about three (3) months.

- Presently, dividend is taxed in the hands of the shareholders multiple times in a multi-tier corporate hierarchy before reaching the ultimate investor which creates a complex cascading effect, deterring repatriation of funds and foreign investments in Bangladesh. This leads to challenges for large investors. To overcome this issue, the government may need to review the existing multi-layer dividend taxation system and provide relaxation, as appropriate.
- Local banks may increase their exposure towards lending for power sector projects with appropriate interventions by the government. For example, the government may consider making interest income from financing power projects tax free to incentivise local banks to increase their exposure. Similarly, it may also consider waiving of general provisions against loans (currently at 1% against letter of credit (LC) value) for local banks, which increases financing costs.
- Requirement for streamlining the approval process for foreign loans (see box alongside for details).



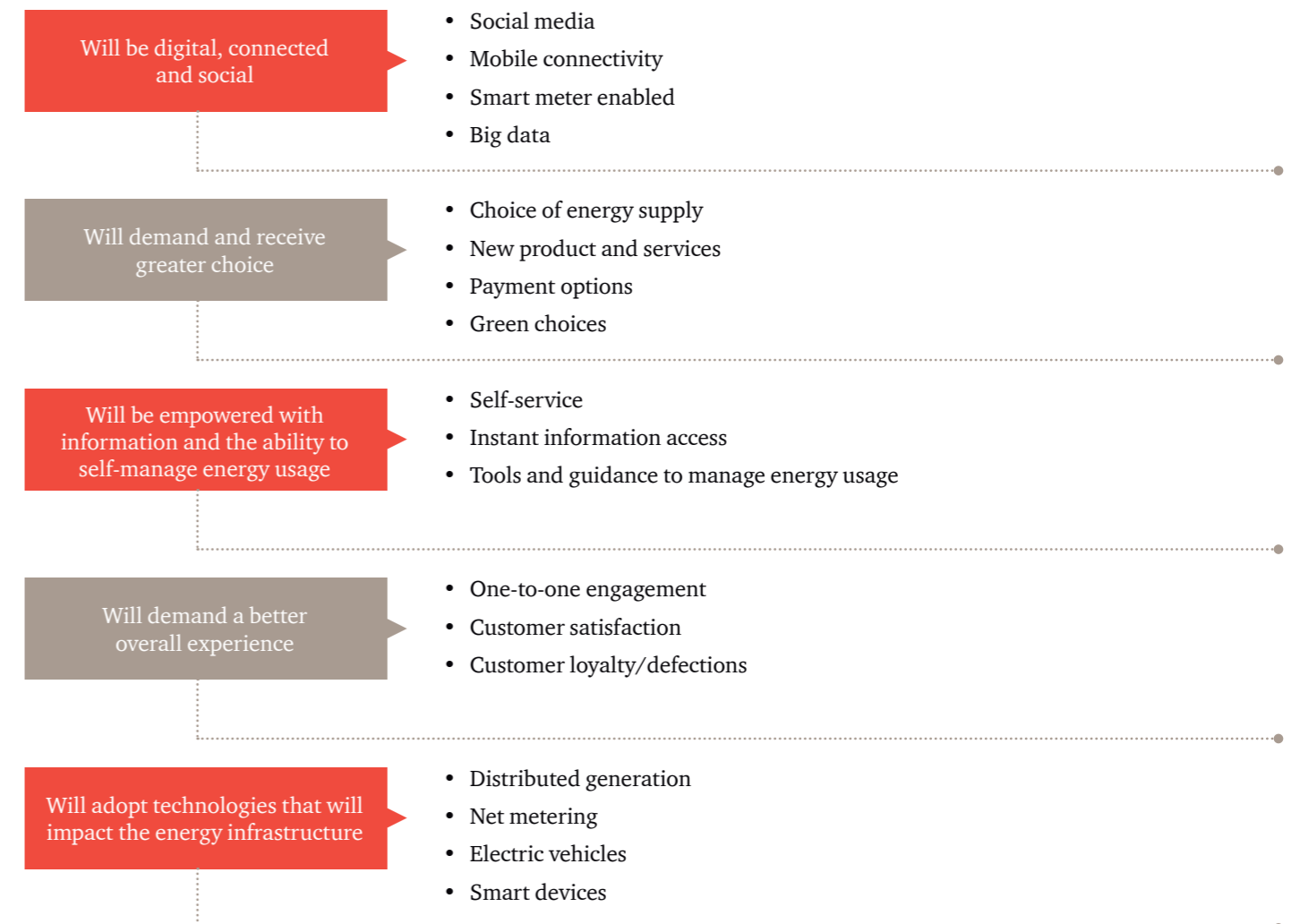
## 3.4. Technology and efficiency

Information technology (IT) solutions are key enablers for improving the efficiency of the power sector. Considering the requirements of Bangladesh, we foresee that information and operational technologies shall play a critical role in Bangladesh's power sector. With the ongoing plans for the implementation of enterprise resource planning (ERP) systems, geographical information system (GIS), metering-billing-collection (MBC) system, supervisory control and data acquisition (SCADA) system, underground substations, etc., the utilities in Bangladesh are well placed to keep pace with the global trends. A few such global trends along with key takeaways for Bangladesh are discussed below.

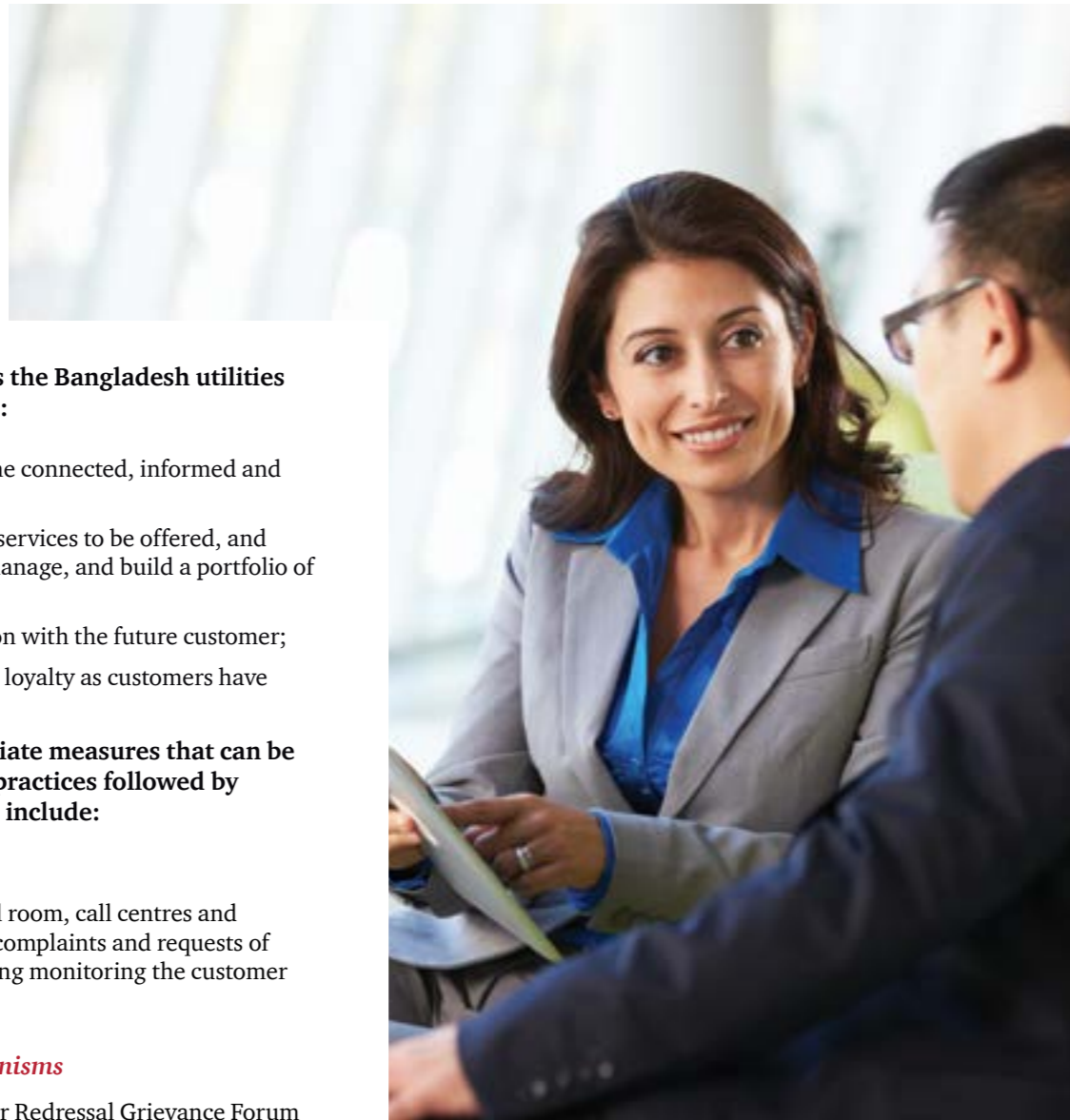
### Technology as an enabler for a customer-centric approach

We are already seeing a gradual erosion in the revenues of power utility companies as distributed energy is gaining a strong foothold. To prepare for the future, the focus, in the context of Bangladesh, should also shift to providing good consumer-centric services and not merely fulfilling demand requirements. This trend, i.e. a shift towards enhanced consumer services and resulting satisfaction, has been observed in several developing countries, and utilities in Bangladesh need to adopt similar measures. In terms of both regulatory and customer relations, utility companies in Bangladesh need to align their ambitions with those of their customers, ensuring their services are relevant to and cost effective for as many customer situations as possible.

Over the next 10 years, the utility customer will demonstrate the following traits:







Thus, the key issues the Bangladesh utilities need to address are:

- Preparedness for the connected, informed and mobile customer;
- New products and services to be offered, and how to innovate, manage, and build a portfolio of services;
- Modes of interaction with the future customer;
- Options for driving loyalty as customers have more alternatives.

Some of the immediate measures that can be adopted, based on practices followed by utilities worldwide, include:

#### Customer care

Having a 24x7 control room, call centres and support for handling complaints and requests of the consumer, including monitoring the customer care centres.

#### Institutional mechanisms

Setting up a Consumer Redressal Grievance Forum and Ombudsman independent of utility, regulator and government influence.

#### Enhancement of IT-enabled services

Providing services on the website as well on mobile-based applications for all technical and commercial processes. Many power utilities have implemented strong CRM software to handle consumer complaints.

#### Define standards for commercial services

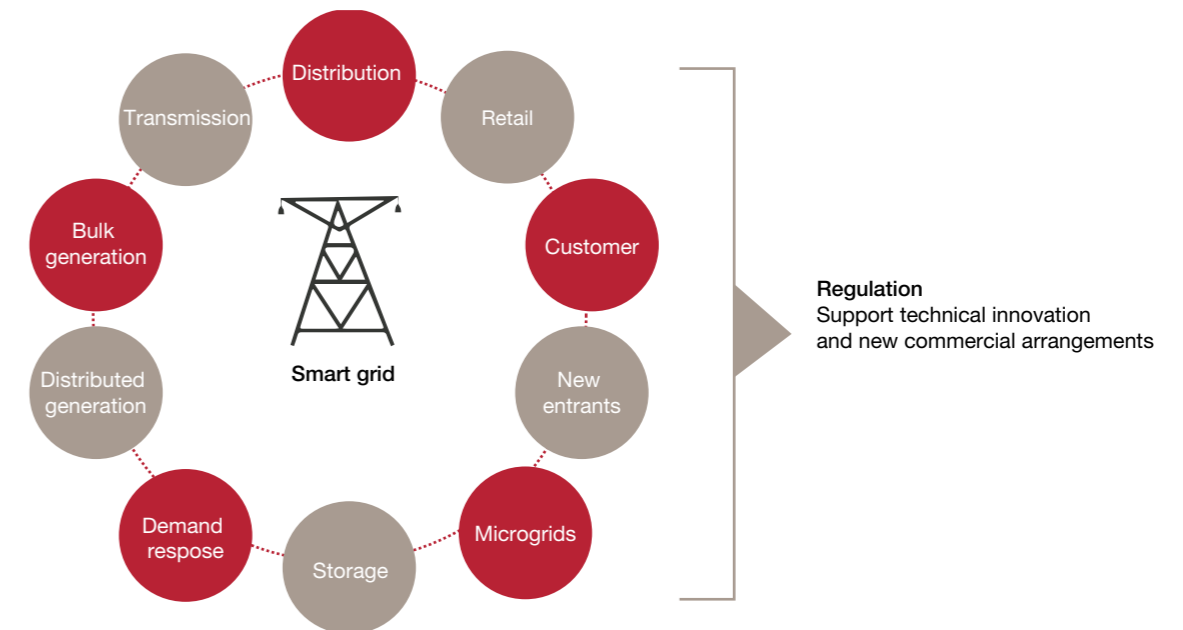
Defining codes/standards/regulations for protection of consumer interest, defining the timeline for completion of commercial services, complaint resolution, load extension, penalty provision, etc.

## Smart grids

The gradual adoption of smart grid technologies by Bangladesh utilities will result in a seismic transformation of the industry.<sup>13</sup>

Smart grid technologies are grids of tomorrow where the supply chain will become networked and non-linear both physically (with power flowing bidirectionally) and commercially (with new market participants and new commercial arrangements between participants). In this new world, the smart grid will play a key role in ensuring that demand and supply are balanced through smart systems that merge consideration of grid technical constraints with customer preference and activity while allowing industry participants to manage risk and make a fair return.

Thus, new technologies and ways of working will be required. New players will enter the industry and the industry's relationships with their customers will be changed. Smart grids will challenge the utilities to think outside the box and look for new solutions. The stable nature of the traditional utility business will become a thing of the past. Policymakers and utilities in Bangladesh need to ponder over the following points in working towards a consensus for a suitable strategy to be adopted for smart grids in Bangladesh.



#### How to develop a solid business case?

Costs and benefits for smart grid and smart meter projects are often not aligned. Costs can fall on one participant in the value chain with benefits falling to others. Understanding how benefits and costs aggregate to a societal level is important but so is understanding the individual case for each organisation. A rigorous evaluation is required to fully understand the cost and benefit impacts of smart grid projects across the value chain.

#### How to finance a smart grid transition?

Smart grid solutions work differently from the traditional grid, have a different lifecycle, involve different commercial arrangements and carry a different risk profile. They therefore require different financing and regulatory models that allow utilities to make a trade-off between operational and capital expenditure and take account of the different risk. Utilities, their investors and regulators need to be able to compare smart grid approaches against traditional grid reinforcement or construction.

<sup>13</sup> PwC's report on 'Get Smart with Smart Grids'. Retrieved from <https://www.pwc.com/gx/en/utilities/assets/pwc-smart-grids.pdf> (last retrieved on 11 March 2018)

### How to integrate new smart grid technologies?

Technology must be integrated not just between the traditionally separate realms of information and operational Technology but also between different organisations in the supply chain and also to customers themselves. The task is made harder by the reality that smart grid standards are emerging, overlapping and incomplete. The risk of integration and security problems occurring is high and requires careful control and management of vendors and the overall architecture.

### How to regulate for the smart grid?

Current regulation may not allow smart grid investments to be fairly weighed against traditional investments. Smart grid solutions may have a different risk profile and require different commercial arrangements that make their consideration as a traditional utility regulatory investment problematic. Regulators need to encourage innovation and allow trade-offs between OPEX and CAPEX, such as allowing the comparison of demand response against network reinforcement. Regulators need to make sure they encourage innovation while still protecting the consumer.



### How to turn pilots into reality?

Many utility companies have successfully executed smart grid and smart meter pilots. However, fewer companies have fully translated their pilots into full-scale roll-outs. We believe that this is because many pilots are constructed as technical trials whereas a full deployment requires a complete business transformation. It is important therefore that smart grid and smart metering pilots are, from their inception, considered as business transformation pilots. This means focusing on proving the business outcomes that the technology will enable rather than just that the technology works.

### How to make sense of all the data?

Smart grid technology has the potential to generate large volumes of data. Utilities must be able to exchange data with each other, process the data and obtain insights from it. Exchanging data securely may require new functions such as data hubs to be created. Gaining operational efficiencies and insights will require new approaches to analysing big data in order to yield insight that will improve operating efficiencies or deliver a competitive advantage.

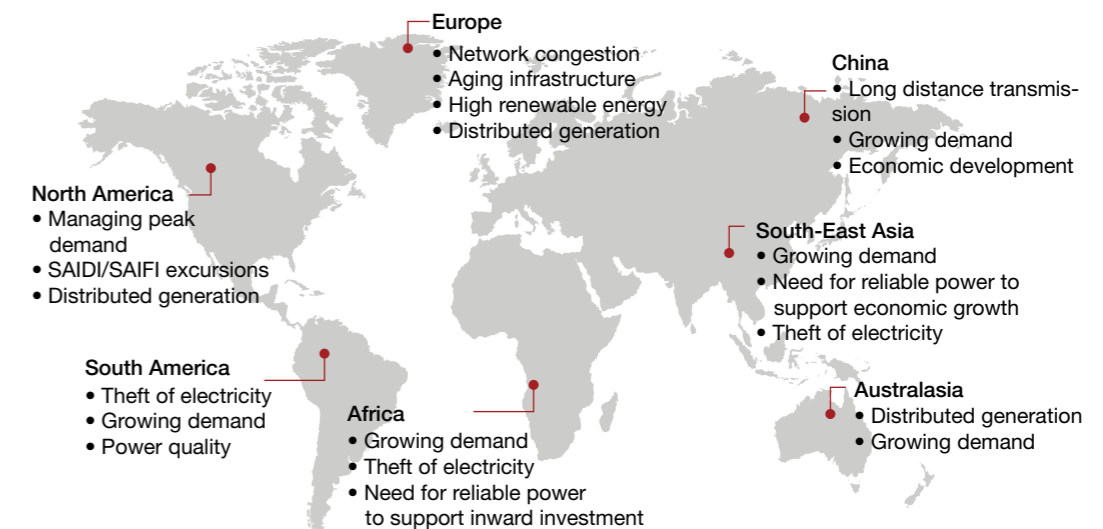
### How to manage risks?

Smart grids and metering pose risks to the ongoing operation of the electricity system and to the business operations of utility companies. Because of the interconnections between participants in the new smart world, there are new risks to be considered around interactions between participants.



## Advanced technologies

Advanced technologies are being adopted in the power sector around the world, though the drivers and needs may differ from region to region.



Below, we have discussed a few key trends in advanced technology deployment for improving the sector efficiency which is gaining traction globally. The day is not far off when Bangladesh utilities would also need to think about utilising these disruptive technologies to provide improved customer service experience, operate with higher efficiency, and transform their business and revenue model.

Digital asset management technologies have been helping power utilities improve quality of supply and reduce operational expenditures.



### Key factors contributing to increased focus on asset management

- Ageing infrastructure (developed countries)
- Major investment in new infrastructure
- Do more with less (OPEX and CAPEX)
- Energy transformation



### Digital asset management opportunities

- Internet of things (IoT)
- Low-cost cloud storage
- Ongoing advancements and miniaturisation of sensors and communications
- Improved and cheaper analytics technology, artificial intelligence, machine learning, etc.
- Investments from major players
- Evolution of guidelines and standards

### Select applications:

#### Condition-based/predictive maintenance

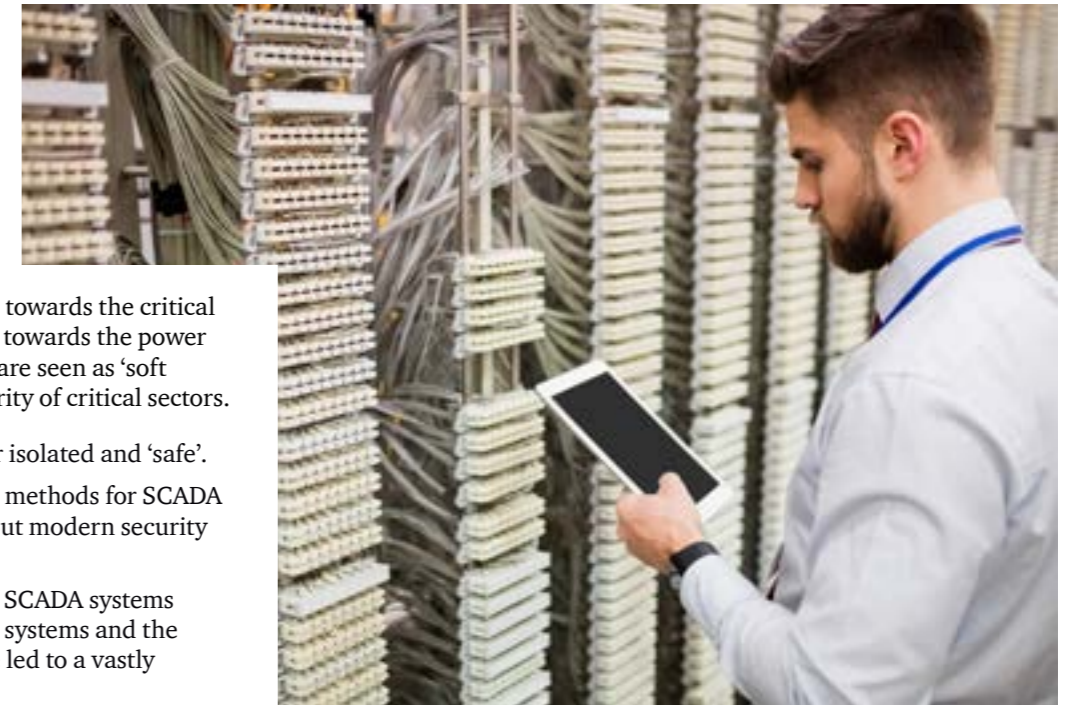
- Real-time view of condition indicators (direct or multivariate algorithms)
- Asset reliability and life maximisation
- Work management efficiency

#### Asset health modelling

- Real-time view of asset health
- Asset life-cycle optimisation
- Risk-informed decision making for capital planning and allocation
- Quantitative motivation for capital spending

#### Operational optimisation

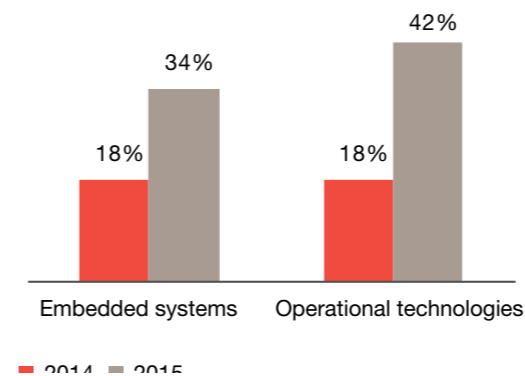
- Generation dashboards
- Transmission and distribution network management



Cyber security focus is shifting towards the critical national sectors and specifically towards the power sector. SCADA and ICS systems are seen as 'soft targets' to compromise the security of critical sectors.

- SCADA systems are no longer isolated and 'safe'.
- Traditional risk management methods for SCADA systems were designed without modern security requirements in mind.
- The increasing integration of SCADA systems with enterprise management systems and the evolution of smart grids have led to a vastly interconnected network.

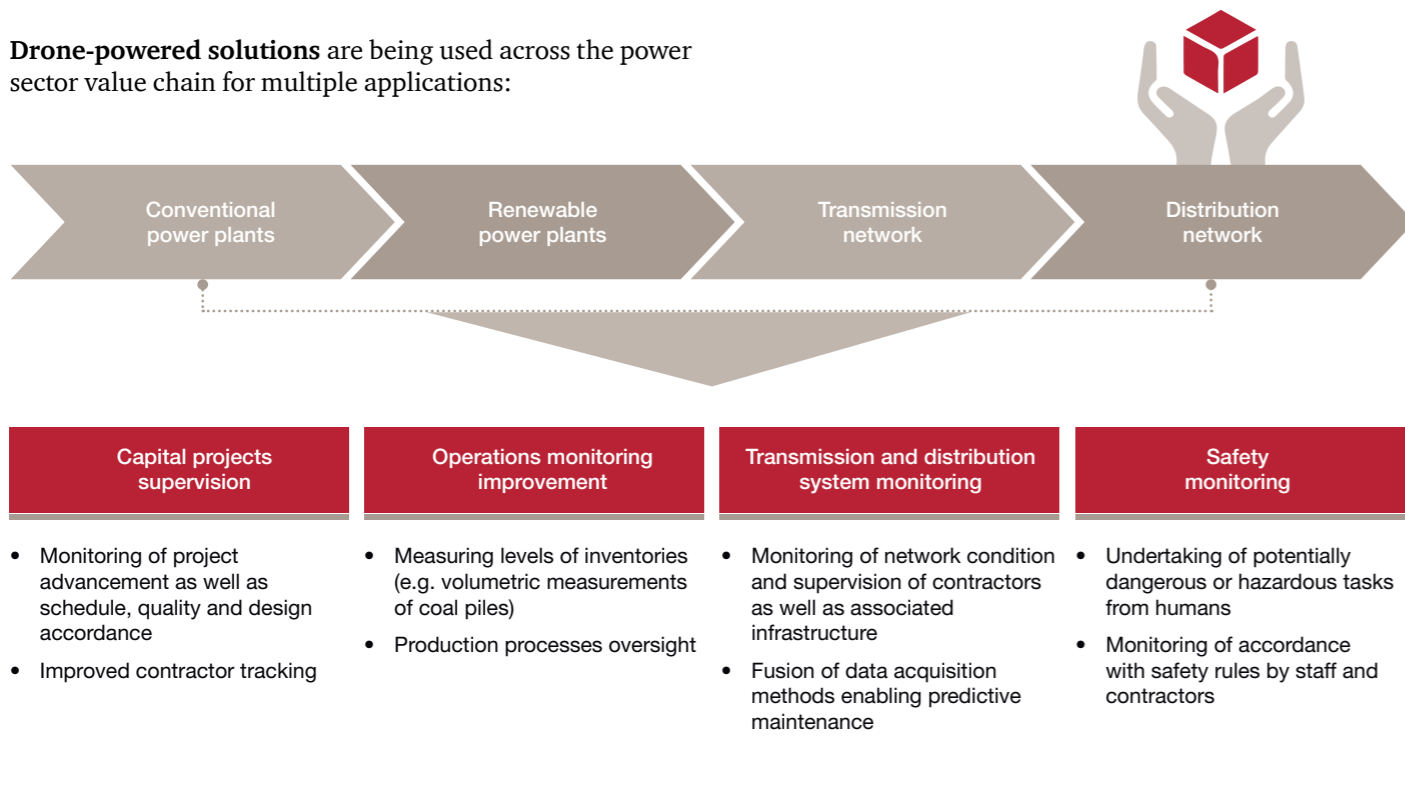
Security incidents caused through embedded systems and operational technology



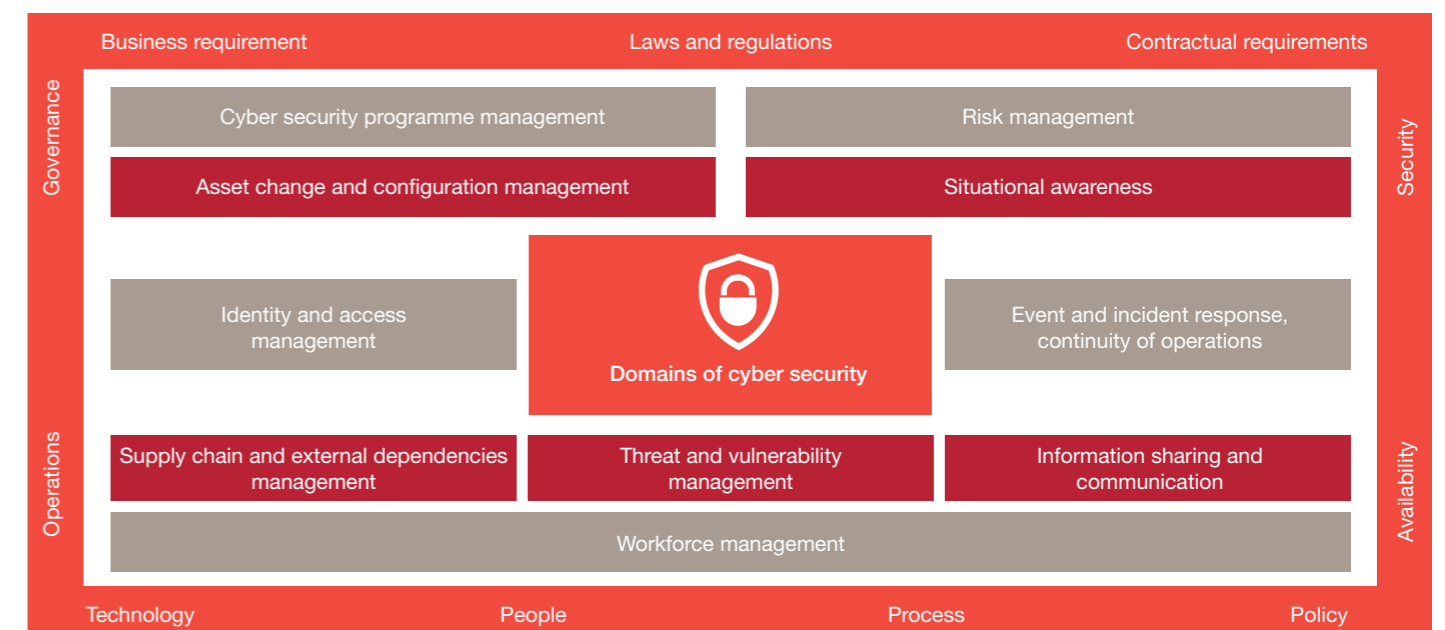
- SCADA systems and ICS technologies are targeted more frequently by threat actors, whose motivation ranges from economic advantage to espionage (spying) to disruption and destruction.
- One of the reasons for more incidents can be the convergence of IT, operational technology and consumer technology.

Source: PwC Global State of Information Security Survey

Drone-powered solutions are being used across the power sector value chain for multiple applications:



Power utilities in Bangladesh should follow a structured approach to assess and enhance their cyber security. A structured framework comprising people, process and technology has to be put in place to enhance security across the organisations, and also to comply with international standards and guidelines.



### 3.5. Capacity building for the new age workforce

A team from PwC UK and the James Martin Institute for Science and Civilisation at the Saïd Business School of the University of Oxford conducted research that begun in 2007, which comprised a specially commissioned survey of 10,000 people from China, India, Germany, the UK and the US. The survey report provided insights into how people think the workplace will evolve, the megatrends and how this evolution will affect their employment prospects and future working lives.

**Together, the megatrends and their impact on the workforce, in the context of developing countries like Bangladesh, indicate the following:**

- Pressure on industries facing higher than average employee retirement, such as utilities, will intensify. This is happening at a time when disruptive technologies require an expanding array of skills more than ever before. **Clearly, investing in a workforce that can harness and exploit technologies as they evolve has become a strategic imperative.**
- Utilities' existing workforces can benefit from the **wider use of mobile and digital technology for greater efficiencies, real-time situational awareness and improved safety.**
- Going forward, field workers can benefit through the **use of emerging technologies such as augmented reality (smart glasses or smart helmets)**, which can aid maintenance and repair and improve the safety of workers by accessing data instantly. Virtual reality can also be adopted for training and worker-safety applications; currently, it is being adopted for training workers in dangerous workplace situations, such as chemicals plants and oil rigs.
- Beyond empowering their existing workforce with digital and mobile tools, utilities are in a race to lure new talent—not only traditional roles such as engineers and technicians but also, more importantly, altogether **new talent such as data scientists, app developers, virtual and augmented reality experts, social media specialists**, and home automation, and IoT specialists. Going forward, utilities will need to adjust to the mindset of millennials.

- As power and utility business models expand into other areas such as EE products and services, energy storage and distributed power, they will need talent to drive their new business endeavours. Hiring this new breed of workforce is not the only avenue to capture new skill sets. **Joint ventures, acquisitions and alliances too are paths utilities could pursue to narrow the talent gap.**

- Others are forging relationships with colleges and technical schools to develop curricula; some are also tapping ex-military talent.
- Power and utility companies are finding new ways to tackle knowledge transfer of their aging employees—a perennial and urgent issue for the industry. Companies should view knowledge transfer efforts not as a cost but as an investment. The leadership, particularly in operations, may find the need to double efforts around workforce planning as the waves of retirement continue. However, it is not just about scrambling for new hires; they can **get more out of their existing workforce by efficiently allocating talent to the right places in the organisation.** Importantly, better workforce management means quick and accurate monitoring of talent shortfalls and finding ways, including turning to third parties, to fill those talent deficits.

*Given the shift in generation mix and advancement in technological interventions that the Bangladesh power sector is witnessing, significant skill upgrade and capacity building of the workforce are required to enable successful transformation. The interventions need to be planned, designed and implemented by factoring in process, technology, information requirements, organisation structure, people capabilities, and customer requirements.*



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## About BIPPA

- The journey of Bangladesh Independent Power Producers' Association (BIPPA) is started on 29-06-2014 satisfying all the requirements as per Law of the Government under the dynamic leadership and proper guidance of the First Convener and founder president, late Mr. Annisul Huq, Honourable Mayor of DNCC, to protect, promote, represent and safeguard the occupation, trade and the business of Independent Power Producers who are engaged in commercial power production in Bangladesh.
- One of the main objectives of BIPPA is to promulgate a Combined platform so as to enable major stakeholders including government, a single point instead of conducting one to one discussion programs. Successful implementation of Power System Master Plan is simultaneous vision of the Government of Bangladesh as well as private sector. The recent circular of the Ministry of Commerce regarding the decision of the Government that as per Section 13(1) of Trade Organization Ordinance-1961 Independent Power Producer Companies must (compulsory) be the members of Bangladesh Independent Power Producers' Association (BIPPA) will strengthen our Combined platform.
- The Board of Directors of Bangladesh Independent Power Producers' Association (BIPPA) is consisting of 11 members.
- Bangladesh Independent Power Producers' Association (BIPPA) is now a organization of 45 active member companies of Private Sector Power Generation running under the dynamic leadership of our present president Mr. Mohammad Latif Khan, Vice-Chairman of Summit Corporation

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