Study on Feed in Tariff (FiT) Policy for Bangladesh- A Regulatory Framework for Renewable Energy

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FiT	Feed in Tariff

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Abstract

The phrase "*feed-in tariff*" has recently entered the daily dialogue of not only renewable energy advocates, but policy makers as well. A feed-in tariffs is a policy mechanism that provides a renewable energy facility with a guarantee of interconnection to the electrical grid and a set price paid for that renewable energy. Feed-in tariffs are proven to be the most successful policy for the rapid development of significant amounts of renewable energy world-wide, and have experienced increasing attention in North America over last few years. Feed-in tariffs work because they are more equitable than other policies. They enable everyone - including homeowners, farmers, cooperatives, and businesses large and small - to profit from renewable energy.

Chapter 1

Introduction

1 Introduction

1.1 What is Feed in Tariff (FiT)?

A **feed-in tariff** (FiT) is a special rate paid for electricity fed back into the electricity grid from a particular renewable electricity generation source. a net FiT - whereby only unused or surplus electricity is purchased from the service provider.

This policy instrument has become so successful and popular that policy makers sometimes claim to have established a feed-in tariff even though this is not the case.

Other than classical tax and investment incentives, the most frequently used support mechanisms for renewable electricity are feed-in tariffs, net metering, preferential tariffs, quota based mechanisms (based on certificate trading) and tender systems. These mechanisms can be grouped into price-based and quantity-based support. Tender mechanisms and quota obligations – also called Renewable Portfolio Standards or Tradable Green Certificate schemes – are quantity-based mechanisms because the legislator fixes a certain quantity that has to be provided by certain market actors.

Feed-in tariffs, net metering and so-called preferential tariffs are all price-based support instruments. In order to qualify for being labelled a feed-in tariff, the support instrument in place should consist of at least the following design options: a purchase obligation, and a stable tariff payment which is guaranteed over a long period of time. First, the purchase obligation obliges the nearest grid operator to buy all renewable electricity – independent of electricity demand. Second, the renewable power producer is guaranteed a certain amount of money per unit of electricity that is produced. Third, this payment is guaranteed over a long period of time (usually 15 to 20 years), which increases investment security and allows for cost recovery.

Feed-in tariffs should not be confused with net-metering mechanisms, another price-based support instrument. Net metering is a concept mostly applied for the promotion of decentralised solar electricity in many regions of the USA and other parts of the world. Under this support scheme, independent power producers have the right to get connected to the grid and the local utility is obliged to purchase all excess electricity – that means all electricity that is not needed for local consumption.

The name of the support instrument refers to the meter measuring the electricity consumption. In the case of most net metering schemes, the meter starts turning 'backwards' once excess electricity is fed into the grid. In other words, for each unit of electricity delivered to the grid the renewable power producer 'receives' the equivalent of the retail electricity price. However, this electricity price for final consumers is not fixed and not guaranteed over a long period of time. Therefore, a net metering mechanism lacks two important components of a feed-in tariff and therefore offers a lower degree of investment security.

Feed-in tariffs should also not be mistaken with so-called preferential tariffs, as they are paid in some Indian provinces and other parts of the world. In the case of a preferential tariff, the remuneration level is fixed by the legislator. However, in contrast to a feed-in tariff mechanism, the tariff level is not guaranteed for a long period of time. Instead, the legislator can change the remuneration level on an annual basis. Therefore, one of the essential components of a feed-in tariff is missing.

Today, feed-in tariffs – as defined above – are applied in a large number of countries, regions, or provinces, including Africa, the Americas, Asia, Australasia and Europe.

1.2 The impact of FiT

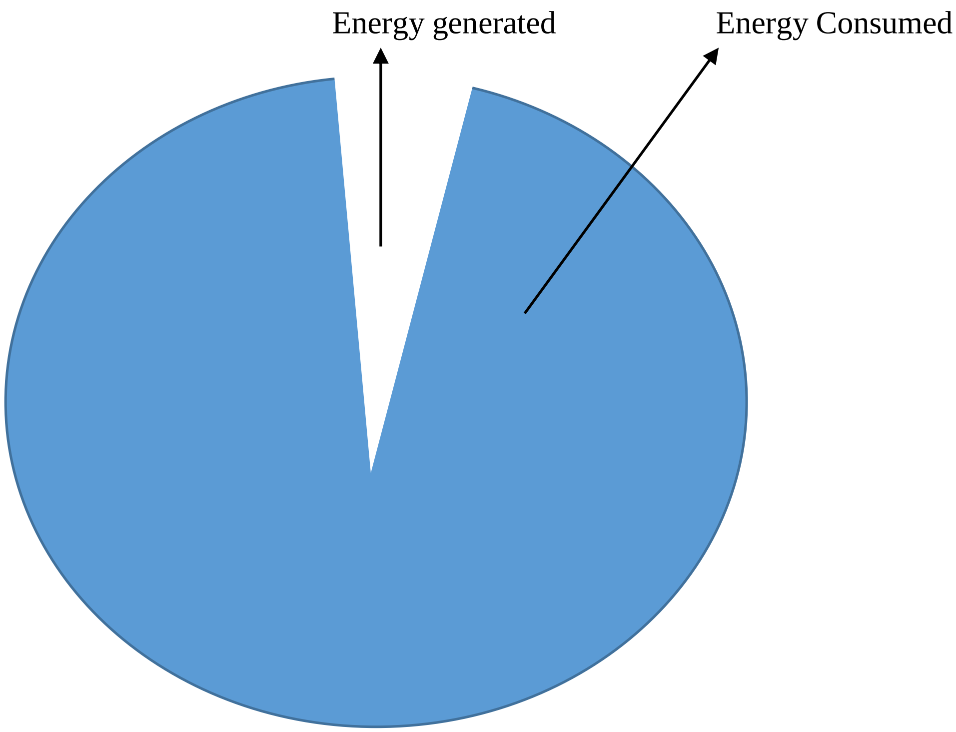

Figure 1:1 Impact of FiT

Customer Consumes the complete blue part from figure 1:1, the net production from consumer side is the white part. So, customer will be paid attractive price for white part. If it produces more than blue part, the supply company will be benefited more.

People fulfilling there requirements by themselves is a huge relieve for government. As we are running out of fuels, we have to start thinking alternatives.

Solar, Biomass, Biogas, Wind can be huge boost for meeting energy demand. In upcoming years we have to generate more and more energy so letting people drag into it is a marketing for renewable energy itself.

Chapter 2

Literature Review

2 Literature Review

This chapter summarizes some of the significant studies on the states of feed-in tariff policies of some of the successful countries as well as neighboring countries of Bangladesh. Lastly the current state and possible outcome of Bangladesh are briefly discussed.

2.1 Feed-in tariffs in Germany

Feed-in tariffs have become a term of art to refer to the style of incentives adopted (most notably) by Germany to increase the adoption of renewable energy resources. Under the German feed-in tariff legislation, renewable energy technologies are guaranteed interconnection with the electricity grid, and are paid a premium rate that is designed to generate a reasonable profit for investors over a 20-year term. The rates are differentiated by technology such that each renewable resource type (e.g. solar, wind, biomass, etc.) can profitably be developed. This approach stands in contrast to the Public Utilities Regulatory Act (PURPA) in the US, under which long-term contracts are based on the avoided cost of conventional fuels. German feed-in tariff rates decrease each year, such that a generator locking into a feed-in rate in 2008 would get a slightly lower rate than a generator locking into a rate in 2007.

The German feed-in tariff has caused explosive renewable energy market growth during the past
decade, and Germany is now the world's largest market for photovoltaic systems and wind energy. Germany more than doubled its national supply of renewable electricity between 2000 and 2007, and et its 2010 target of 12.5% renewable electricity three years ahead of schedule. [1]

The majority of European Union countries have adopted a feed-in tariff, and the policy is diffusing to other countries around the world [2]. In 2006, Ontario became the first government in North America to establish a set of European-style feed-in tariffs, called the Standard Offer Contract [3]. There has been vigorous debate in Europe as to whether feed-in tariffs or policies based on tradable renewable energy credits (RECs) are more efficient for promoting renewable energy [4]. The European Commission (2005) determined that feed-in tariffs were both more effective and efficient than tradable renewable energy credit systems, largely because feed-in tariffs provide greater investor security. European REC systems are viewed as direct descendents of US renewable portfolio standard (RPS) policies [5]. As a result, it has been assumed that US states would not adopt feed-in tariffs, given the conflict between feed-in tariffs and tradable credit policies in Europe. The past two years have seen a remarkable shift in the US policy landscape, however, as numerous states have introduced feed-in tariff legislation to supplement RPS policies, and proposals for a federal feed-in tariff have been developed. This paper provides an overview of state and federal feed-in tariff proposals, and discusses potential future directions for US energy policy.

2.2 Feed-in tariff in USA

By mid-2006, several US states had established limited policies that shared some feed-in tariff
design features, but no state had yet introduced feed-in legislation .Two years later, six states have introduced feed-in tariff bills, and another eight states have considered, or are considering, similar legislation.

California has played a leading role in developing feed-in tariffs in the US. California Assembly Bill (AB) 1969 of 2006 established a feed-in tariff for systems with a capacity of 1.5 MW and below, capped at 250 MW total statewide. Generators can choose 10-, 15-, or 20-year contracts, and can opt to sell either 100% of their power, or offset their retail load and sell only their excess electricity. Unlike in the German law, California's tariff rates are based on time-of-delivery, rather than the generation cost of individual technologies. This means that all technologies are offered the same price, but that this price varies depending on whether the electricity is generated during peak or off-peak times. In Southern California Edison territory, peak payments can be up to $0.31/kWh in the summer [6]. The original program was limited to facilities sited at wastewater and water treatment facilities, but the California Public Utilities
Commission (CPUC) extended the program to all customer-types, and expanded the cap to 478.4 MW in 2007. Subsequent bills have sought to expand both the overall program cap and the individual project cap4, and a recent bill (AB 1807 of 2008) is

seeking to increase the system capacity limit to 20 MW, and shift to a more European-style structure based on technology-specific payments.

In addition to the state-level feed-in tariff bills, there is a significant effort to move feed-in tariff legislation forward at the federal level. In May, 2008, Congressman Jay Inslee (WA-1st-D) introduced a national feed-in tariff bill, which he refers to as a renewable energy payment (REP). The bill includes three main design elements that are modeled on the most successful national policies in Europe: 1) guaranteed interconnection through uniform minimum standards, 2) a mandatory purchase requirement through fixed-rate 20-year contracts and 3) rate recovery through a regionally partitioned national system benefits charge.

1) Under the proposed law, the Federal Energy Regulatory Commission (FERC) would set standards for the priority interconnection and transmission of power from new "renewable energy
facilities", which include renewable energy facilities 20 MW or less. The FERC and the states
would then be required to implement these standards within their own respective areas of jurisdiction when renewable energy facility owners request interconnection.

2) The bill would then require all electric utilities in the US to enter into fixed-rate, 20-year power purchase agreements at the request of any new renewable energy facility owner. The FERC would set minimum national REP rates at levels designed to provide for full cost recovery, plus a 10% internal rate of return on investment, for commercialized technologies under good resource conditions. REP rates would be differentiated on the basis of energy technology, the size of the system, and the year that the system was placed in service. Utilities would earn any associated RECs in order to help meet RPS requirements. As with interconnection, the FERC and the states would each implement the rules of the Inslee bill for all renewable energy facilities that fall within their respective regulatory jurisdictions.

3) The bill would facilitate cost recovery through a private renewable energy utility organization that would be independent, yet subject to FERC oversight. Utilities would be reimbursed by RenewCorps for the additional cost of their power purchases, plus all costs associated with interconnection and network upgrades needed to accommodate these new facilities. To reimburse utilities, RenewCorps would raise revenues through a regionally partitioned national system benefits charge on every electric customer in the US14.

Given its success in Europe, there are multiple reasons for introducing a national feed-in tariff bill in the US, but Inslee’s primary motivation is to create long-term investment security for the rapid deployment of renewable energy technologies [7]. Furthermore, with renewable energy tax credits on track to expire again at the end of 2008, there is a growing interest in establishing a more stable policy support mechanism for the US renewable energy industry.

2.3 Feed-in tariff in China

In order to adjust and optimize China's energy structure, “Renewable Energy in 12th Five-Year Plan” was issued by the National Energy Board, clearly pointed out that the renewable energy generation will rise to be an important power in the electricity system in the future and some specific development indicators will be put forward [8]. Furthermore, the planning also brings forward installed capacity target of hydropower, wind power, solar energy and biomass power. In the 12th Five-Year Plan, policy makers called for non-fossil fuel energy production to reach and stay above 11% of total energy production by 2015. If all renewable energy targets are met, the annual consumption of renewable energy will contributed to emission reduction of 1 billion t of carbon dioxide, 7 million t of sulfur dioxide, 3 million t of nitrogen oxides and 4 million t of dust, and a saving of 2.5 billion m^3 of water by 2015. [9]

Tariffs of wind power in China have experienced four stages in four different periods: approval tariff stage, coexistence of bidding price and approved tariffs stage, bidding plus consenting stage and fixed tariffs stage, as shown in the below table:

About 1998-2003	2003-2005	2006-2009	2009-present

The feed-in tariff approved by the local price departments should be reported to the central government for record. The lowest feed-in tariff 0.2-0.4 RMB/kWh, is equivalent to that of coal-fired power plants, while the highest feed-in tariff is over 1RMB/kWh	The feed-in tariff approved by the local price departments should be reported to the central government for record. The lowest feed-in tariff 0.2-0.4 RMB/kWh, is equivalent to that of coal-fired power plants, while the highest feed-in tariff is over 1RMB/kWh	"Interim Measures on Renewable Energy Electricity prices and Cost Sharing Management" formulated that the tariff of wind power was executed by the way of bidding plus consenting during this stage. The price of wind power is generated through tendering and the electricity price standard is determined according to the results of the tender price.	"The Improving Policies on the Feed-in Tariff of Wind Power" issued by NDRC in 2009 introduced benchmark wind power tariffs for four different regions in China: RMB 0.51, 0.54, 0.58 or 0.61 per kWh. Different costs reflect different wind resources in each region. Power costs above the cost of coal-fired generation to be split between provincial grid operators and the central government.

Table 2-1 Tariffs of wind power in China

The specific implementation of wind power feed-in tariff is as follows: before 2003, the lowest feed-in tariff of wind power was 0.38 RMB/kWh, while the highest was more than 1 RMB/kWh [10]. After 2003, the NDRC organized a few of wind power concession projects, for which investors were selected via public tendering. However, the prices formed through concession bidding were generally low, about 0.38–0.5 RMB/kWh, while the prices without concession bidding approved by the local government were generally high, at 0.5–0.8 RMB/kWh. In July, 2008, the price level of 48 wind power projects approved by the NDRC was between 0.51 and 0.61 RMB/kWh. The "Improving Policies on the Feed-in Tariff of Wind Power" promulgated by NDRC in August 2009, enacted a fixed feed-in tariff. The whole country is divided into four classes of wind energy resource regions with the benchmark feed-in tariffs were 0.51, 0.54, 0.58 and 0.61 RMB/kWh [11].

Tariffs of solar photovoltaic power in China have gone through the approval tariff stage, bidding price stage and fixed price stage, as shown in below figure.

Before 2009	2009-2011	2011-present
The "Interim Measures on Renewable Energy Electricity Prices and Cost Sharing Management" stipulated that the feed-in tariff of solar power shall be decided by the government and its specific tariff standard should be set by the pricing department of the State Council based on a reasonable costs plus a reasonable profit.	The National Energy Board organized two groups of PV power plant concession projects in 2009 and 2010. Investment enterprises with a lower feed-in tariff were selected through an open bidding process. Projects which were selected should be constructed and managed by the way of concession. The concession period of the projects is 25years.	The "Improving Policies on the Feed-in Tariff of Solar Photovoltaic Power" issued in 2011 stipulated that based on the cost of social average investment and operation and in light of the bidding price of solar photovoltaic power plants and the conditions of China's solar resources, the nationally uniform feed-in price is applied to non-bidding solar photovoltaic power generation projects.

Table 2-2 Tariffs of solar photovoltaic power in China

The specific implementation of solar photovoltaic feed-in tariff is as follows: in 2007, the solar power price of Inner Mongolia, Shanghai and Chongming approved by NDRC was 4 RMB/kWh. In 2009, the feed-in tariff for the first batch of concession projects was 1.09 RMB/kWh, while the temporary feed-in tariff for solar photovoltaic power plant project in Ningxia was 1.15 RMB/kWh in April, 2010. In October, 2010, the lowest feed-in tariff for the second batch of concession projects was 0.73 RMB/kWh, while the highest was 0.99 RMB/kWh; in July, 2011, China's energy regulator announced a new circular on the feed-in tariff for solar photovoltaic power. The "Improving Policies on the Feed-in Tariff of Solar Photovoltaic Power" issued in 2011, introduced a unified feed-in tariff for solar photovoltaic power projects. The national feed-in tariff is RMB 1.15/kWh for projects completed by December 31, 2011, and RMB 1.0/kWh for projects approved by July, 2011, but not completed before the end of the year. The NDRC will from time to time adjust the price according to certain factors such as investment cost changes and technical advances [12].

Chinese renewable energy has been gained rapid development since the Renewable Energy Law", "Interim Measures on Renewable Energy Electricity Prices and Cost Sharing Management", etc. were enacted. In recently years, China has made a significant progress in the exploitation and use of renewable resources. With continuous optimization of the energy structure, the proportion of the coal consumption drops from 95% in 1952 to 68.6% in 2010 and the proportion of the renewable energy increased step by step.

2.4 Feed-in tariff in India

India inaugurated its latest solar power program to date on 9 January 2010. The Jawaharlal Nehru National Solar Mission (JNNSM) was officially announced by Prime Minister of India on 12 January 2010. This program aimed to install 20 GW of solar power by 2022. The first phase of this program targeted 1000 MW, by paying a tariff fixed by the Central Electricity Regulatory Commission (CERC) of India. While in spirit this is a feed in tariff, several conditions affect project size and commissioning date. The tariff for solar PV projects is fixed at Rs. 17.90 (USD 0.397)/kWh. Tariff for solar thermal projects is fixed Rs. 15.40 (USD 0.342/kWh). Tariff will be reviewed periodically by the CERC.

The CERC issued regulations in September 2009 providing guidelines on how feed-in tariff rates for renewable energy projects are to be calculated, for projects that the Commission would set tariffs for. The regulations cover all renewable energy technologies, and are to be reviewed every three years, though the first review will take place in March 2010, while benchmark capital costs for solar PV and solar thermal projects are to be reviewed every year. The tariff will be determined by taking into account the following fixed-cost components: a) return on equity; b) interest on loan capital; c) depreciation; d) interest on working capital; e) operation and maintenance expenses

The regulations specify the financial principles or assumptions of each component, some of which are technology specific (e.g. capital costs, interest on working capital). They also allow for project-specific tariffs to be determined for certain types of projects (e.g. municipal solid waste, hybrid solar thermal, certain solar PV and solar thermal), with relevant guidelines. The discount rate used in determining the tariff will be the average weighted cost of capital**.** The tariffs are defined as the levelised cost of energy and are derived from the specific useful life of each technology. The feed-in tariff period for most renewable energy technologies is 13 years, extended to 35 years in the case of small hydro (below 5MW) and 25 years for solar PV and solar thermal. The regulations specify the capital and operation and maintenance costs per MWh for several technologies: wind, small hydro, solar PV, solar thermal, non-fossil fuel based cogeneration, and biomass-based power projects. Capital costs are adjusted yearly through an indexation mechanism. For wind power, the tariff will also vary based on resource intensity. [13].

2.5 Feed-in tariff in Pakistan

Perhaps motivated by the massive crash in the solar power tariff bids across the world, Pakistan is set to shift from feed-in tariff mechanism to competitive auctions in the solar power sector.

Pakistan's National Electric Power Regulatory Authority (NEPRA) is reported to have approved the implementation of competitive auctions for solar power projects. The move could bring solar power tariffs in the country crashing, as has been the case all across the world.

Even with a 25% reduction in feed-in tariff in late 2015 the solar power prices in Pakistan remain significantly higher than those in developing markets. Beginning January 1, 2016, NEPRA had reduced feed-in tariffs from 14.15-15.02¢/kWh to 11.35-11.53¢/kWh in the northern part of the country and 10.72-10.89¢/kWh in the southern part of the country [14]

Several project developers had expressed concerns regarding this correction in tariffs claiming that the move would hamper future investments in the country's renewable energy sector. The latest move has seen a similar response from project developers. In their comments submitted to NEPRA's proposal, developers claimed that the market is not ready to make the transition to competitive auctions.

Pakistan does not have to look very far to see the benefits of competitive auctions over feed-in tariff mechanism. The lowest solar power tariff bids in neighboring India currently stand at around 5.00¢/kWh. A project currently under construction in the Indian side of Thar Desert, an arid region shared by the two countries, was secured at a tariff bid of 6.50¢/kWh. The lowest solar tariff bid in the world stands at 2.42¢/kWh.

Solar power has immense potential and a major role to play in Pakistan's power market. Pakistan currently faces a shortfall of around 6,000 megawatts. It has been forced to import electricity from neighboring Iran. The volume of import from Iran stands at 100 megawatts, but Pakistan plans to increase it to 3,000 megawatts.

2.6 Current State of Bangladesh

Bangladesh has been experiencing a huge gap between supply and demand of electricity; 40% of the population is yet to have access to electricity. The majority of rural population has been relying on biomass fuel broadly. Electricity is the key to economic growth and development. Bangladesh is an energy starved country with only 321KWH/capita/year electricity use. The per capita energy use of us is much lower compared to neighboring India and that of Pakistan as well.

Bangladesh has been making significant progress within the promotion of its electricity generation in recent years comparing to the recent past. There has been a paradigm shift, from a traditional centralized approach of electricity generation towards a public private sector energy development through where Independent Power Producers (IPP) has been playing the key role. The mechanism has resulted into a generation of almost 4700 MW of electricity. Likewise, the country has made an essential basis for the advancement of renewable energy fitting to the development where the main means of power has been biomass. The good news is this – efforts of renewable development to electrify rural homes through multilateral development funding have resulted into development of 135 MW energy from solar power alone. Since energy is the real currency for development we are in a serious need to develop our electricity and other form of commercial energy. As of September 2015, Bangladesh Power Development Board (BPDP) has managed to supply 11,088 MW of Electricity including its imported 500MW.

The government has a commitment to develop 5% share of energy through development of renewable energy sources by this year; and 10% by 2020. Solar energy development has been a great success story in rural development. However, the challenge is to reach up to the target of renewable on the mentioned time frame. In order to reach the target, there is a need of development programs in cities where development of solar energy needs a big push from government, financial institutions, donor aided funding. The policy tool feed-in-tariff (FITs) is yet to come into force although the draft document has been done so far. Since it was supposed to come into force this June hope still remains that we will see the gazette notification soon.

Feed-in-tariff (FITs) has been a proven policy tool to develop renewable energy both in developed and developing countries. FITs is indeed a policy mechanism, which is specifically designed to accelerate investment in renewable energy technologies by providing them a fee or tariff above the retail rate of electricity. It helps to encourage the use of new renewable energy technologies often from low carbon sources: such as wind power, biomass, hydro-power, geothermal power, tidal power and solar photo voltaic. Also, highlighting that technology such as wind power, for instance, are awarded a lower KHW price, while solar and tidal power are offered a higher price. Thus FIT helps by offering a higher price rather than paying equal amount in market rate reflecting the cost higher at the moment. It also provides an offer for long term contracts to green renewable energy producers typically based on the cost of each technology. The contract for majority of sources is usually 20 years, while for solar, it is 25 years. Therefore, the goal of FIT is to allow reasonable tariff for different sources of green renewable at different levels of operations. Although generally speaking without considering sustainability for economy and environment these sources are costlier than that of the traditional carbon based or other risky nuclear sources; nonetheless this green technology builds up economy increasing small entrepreneurs and employment, increasing electricity, helps environment and helps to offset carbon thus helps in climate change challenges mitigation.

In Bangladesh there is a limited chance to boost renewable energy other than solar at the moment. Hydro has got some prospect for 5-10 MW small projects identified; while Sangu 140 MW and Matamuhari 75 MW having potential respectively. Biogas has some limited prospect. Prospect of Wind energy and its growth still depending upon the hard data which is expected to come out briefly; while only operational wind turbines are in Feni and Kutubdia. Therefore, government commitment of the targeted growth for renewable will be largely be based on solar energy. The possible avenues been targeted such as off grid home systems in rural Bangladesh (successfully being implemented with IDCOl). Solar Irrigation largest growth area since half a million pumps targeted to be brought under solar PV generation. Another growth area in solar will be small and medium solar parks, solar street lighting and introducing rooftops solar PV in cities in-grid system that will help the entrepreneur to relief themselves from load shedding and help in adding and reduce dependency respectively on national grid in some scales. Moreover, it will help to add good amount of electricity supply on grid through FITs if policy allows that. Solar parks might be successful even with a permanent 25-year contract. In reality, there is a huge need to accommodate them since lots of small and medium solvent home owners, real state owners may come up. Hence proper compensation packages for development of rooftop solar PV in cities need to develop in line with FITs, Irrigation (solar pumping) project and small scale government and private solar power parks 1 to 5 MW with 25 years contractual agreement will help in reaching 10% of targeted renewable in Bangladesh. Similarly, medium scale solar parks might be also useful for the growth of renewable. The next paragraph will explain the basic mechanisms of FITs.

Installing an electricity-generating technology from a renewable or low-carbon source such as solar PV or wind turbine, Government's Feed-in Tariffs scheme (FITs) in countries (adopted FITs) could mean that you get money from your energy supplier. You can be paid for the electricity you generate, even if you use it yourself, and for any surplus electricity you export to the grid. And of course you will also save money on your electricity bill, because you will be using your own electricity. In Europe, for example, in the UK the energy market is open and retail being managed by couple of private companies while the infrastructure and legal controls maintained by government. The UK Government's Department for Energy and Climate Change (DECC) makes the key decisions on FITs in terms of government policy. The energy regulator Ofgem administers the scheme. Feed-in Tariff grants as the main financial incentive to encourage uptake of renewable electricity-generating technologies. Most domestic technologies qualify for the scheme, including: solar electricity (PV) (roof mounted or standalone), wind turbines (building mounted or free standing,) hydroelectricity, digester, micro combined heat and power (CHP). In many countries of Europe and Asia solar rooftops has been the potential growth area followed by solar parks. Bangladesh through its rural rooftops systems has been a proof of that but the potential growth area in rooftops of cities are yet to be initiated by proper FITs. In Bangladesh energy supplier (basically Government Departments) will make the FITs payments to you once it is approved. Eligibility to receive FITs benefit in three ways are given for highly potential rooftops in cities.

Chapter 3

Current Situation in Bangladesh

3 Current Situation in Bangladesh

3.1 Overview

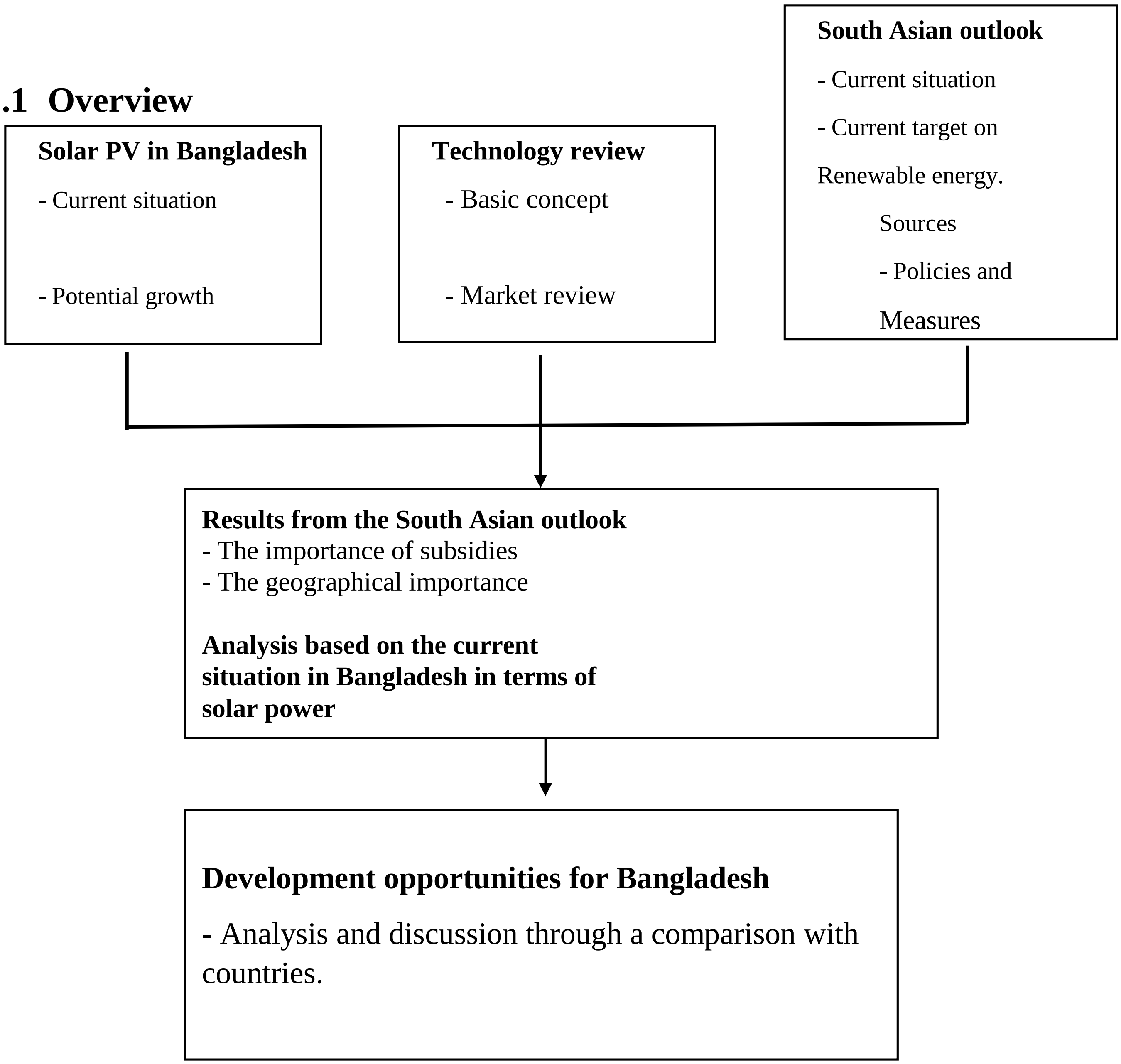

Figure 3-0:1 Overview of the report

3.2 Basic idea on Feed-in tariff

Feed-in tariff is a policy mechanism that is designed to attract investment in renewable energy

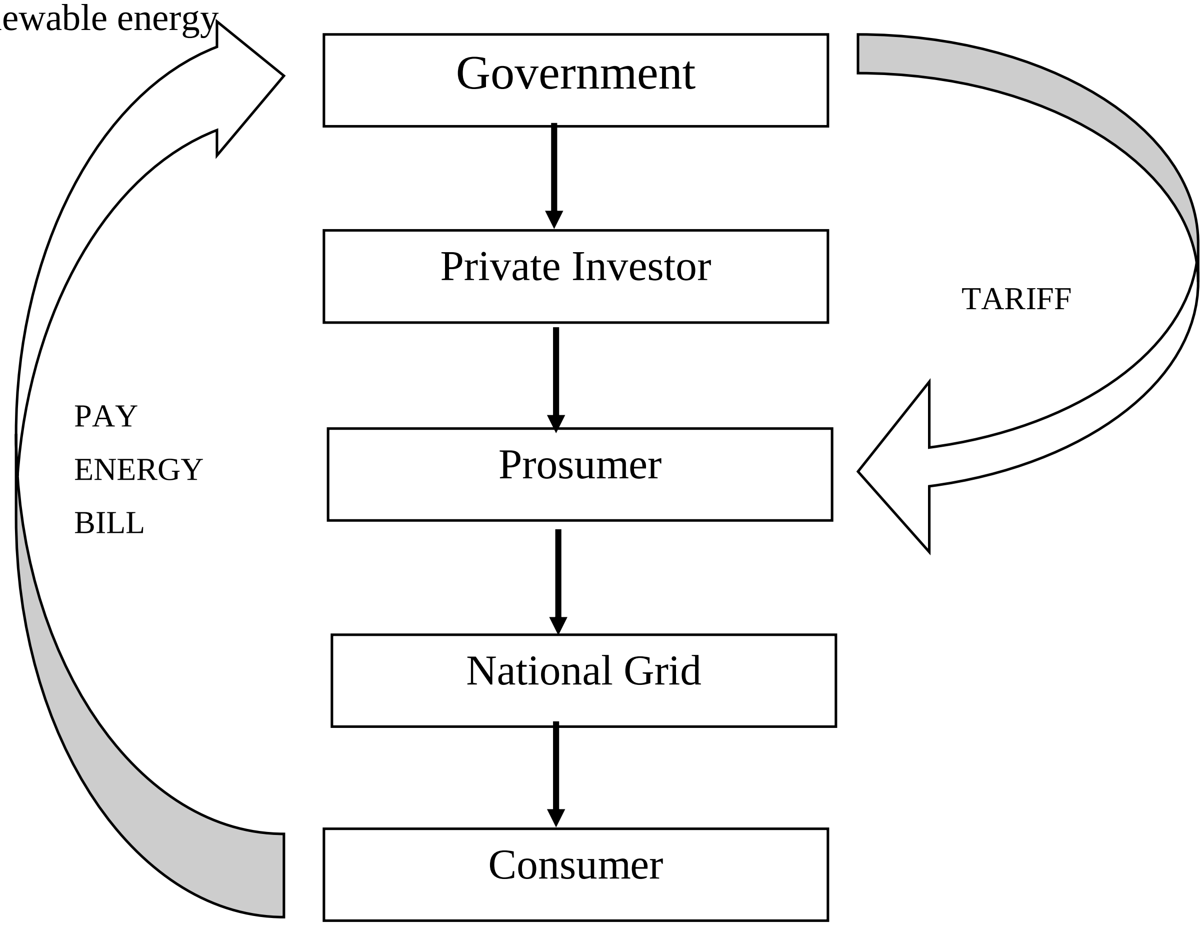

Figure 3:0:2Feed-in Tariff Diagram

technology to promote energy generation via renewable energy. It achieves this by offering long term contracts to renewable energy producers, mainly based on the cost of generation of each technology. Rather than pay an equal amount for energy, however generated, technologies such as wind power and solar PV, for instance, are awarded a lower per-kWh price, while technologies such as tidal power are offered a higher price, reflecting costs that are higher at the moment. In addition, feed-in tariffs often include "tariff digression", a mechanism according to which the price (or tariff) ratchets down over time. This is done in order to track and encourage technological cost reductions. The goal of feed-in tariffs is to offer cost-based compensation to renewable energy producers, providing price certainty and long-term contracts that help finance renewable energy investments.

The feed-in tariff basically works in following way-

- Govt. offers a policy that describes the tariff that is to be followed during the contract placed between the private investors and electricity producers.
- Private investors set up a long term contract with the prosumers i.e. generating and consuming electricity at the same time (producers + consumer= prosumer).
- Investors pay an initial setup money to the prosumer to start the generation process and continues to pay an annual cost to keep the process running. This is called control period.
- Prosumers starts getting paid after production starts. They get paid in two different tariffs- one for the electricity they supply to the main grid, another for the electricity they consume on their own.
- Investors get paid on the accordance to the contract they made with the prosumers after the control period is over.
- The lump sum that is paid to the investor and prosumer is earned by the collection of the energy bill which is paid by the consumers.
- Our goal is to find a FiT policy to find a tariff that is found to be attractive for both investors and prosumers on the current circumstances of Bangladesh.

3.3 Solar PV in Bangladesh

3.3.1 Current situation

Renewable Energy Sources are: Wind, biomass, solar, hydroelectric, geothermal, wave and tidal. Among all of them wind is the most expanding worldwide. But due to the geological condition of Bangladesh solar is most suitable renewable energy source.

Solar PV installation rates in Bangladesh are increasing rapidly. By July 2009, 25 MW [15] of solar PV had been installed in the forms of Solar Home Systems, Centralized (AC) Systems, Centralized (AC) market electrification and roof top PV mini-grid system to pump water, for railway signaling, to power refrigerators, etc. Much of this is being driven by investment through donor agencies or international aid agencies. The current aim is that by 2012 one million households will be powered form solar PV panel, producing 50 MW of power [16]. However, the World Bank notes that the market for SHS may become saturated before the 1 million target is reached due to their relative upfront expense, and the risk that consumer confidence in the technology may fall as current SHS equipment wears out, and requires greater maintenance [17].

Table 3-1 SHSs in Bangladesh

Grameen Shakti	One of the largest and fastest growing rural based renewable energy companies in the world; Installed about 250,000 SHSs.
	Demonstrates diversified applications of renewable energy technologies and contributes in capacity building; Installed 600 SHSs.
REB	Installed 806 SHSs in 1996-97 two riverine islands, generating 62 kWp powers; Installed about 12,000 SHSs in remote rural areas.
BPDB	Implemented projects of wind, solar and small hydro at remote locations where grid electricity could not be reached; Installed solar household system of total 54 kWp in off grid rural area.

Typically systems are sold in the range of 20-150 Wp and are coupled with an energy storage system consisting of batteries. Prices range from 15k to 79k Taka respectively. Main players are the Infrastructure Development Company Ltd which had installed more than 400,000 systems by October 2009, Grameen Shakti which had installed more than 283,000 systems by October 2009 and Bangladesh Rural Advancement Committee. Grameen Shakti aims to install more than 1 million systems by 2015, and a further 1 million biogas plants, and 10 million improved cooking stoves.

Manufacturers typically provide the peak power of their solar panels which is calculated under Standard Testing Conditions (STC) which is equivalent to 1000 W/m^2 at 25 degree Celsius and is primarily a function of the efficiency of the solar cells.

3.3.2 Potential Growth

Table 3-2 PROJECTION FOR FUTURE ENERGY DEMAND, ECONOMIC & POPULATION GROWTH

Year	**KWH / person**	**Population millions**	**Total energy / TWh**	**Electricity Demand / TWh (GW)**	**Percent electricity**	**$ / capita**
Yearly growth	6%	0.56%	6.6%	10%	n/a	6%
2010	2,150	160	344	28 (3.2 GW)	8.1%	$600
2020	3,850	169	651	73 (8.3 GW)	11.1%	$1,075
2030	6,895	179	1,234	188 (21.5 GW)	15.3%	$1,924
2040	12,349	189	2,336	489 (56 GW)	20.9%	$3,446
2050	22,114	200	4,424	1,267 (145 GW)	28.6%	$6,171

For calculations of solar resource arbitrary efficiencies of 10% are normally assumed [4].The global supply chain in Solar-PV is far larger than in Bangladesh, with installation rates in 2008 of 5.6 GW and an annual growth rate approaching 40%, as shown in table-III [18].

By 2030 the installation rate would have reached almost 1 GWp a year, which is highly plausible considering the European Photovoltaic Industry Association [19] predict that the solar-PV supply chain is expected to deliver and sustain production to support a market between 80 GW and 160 GW a year worldwide by 2030. Bangladesh would therefore represent approximately 1% of the global market under this scenario.

Table 3-3 THE STATUS OF SOLAR-PV IN THE WORLD

Year	**Installed capacity (GWp)**	**Annual growth rate**	**Installation rate (GWp)**
2004	3.8	38%	1.1
2005	5.2	34%	1.3
2006	6.8	31%	1.6
2007	9.2	35%	2.4
2008	14.7	61%	5.6

More than 500 potential consumers have been trained on the operation and maintenance of the entire PV system. This was conducted by BCAS and CMES experts. AEC initiated solar PV program (SPV) in 1985. The systems installed over the period 1985-1994 are 9790 watt peak. Most of the systems are not functional at present because of the lack of fund for spare parts, maintenance and back-up service.

Table 3-4 PROGRESS OF SOLAR PV INSTALLATION

System type	No. Of units supplied	Watt Peak
I	Nil	Nil
Ii	233	Charging station
Iii	27	Charging station
Iv	113	5,198
V	115	10,588
Total of Household systems	188	
Charging station	3	29,440
Health clinic	1	828
		46,054

It has been made clear from the previous paragraphs that Bangladesh is already strongly dependent upon traditional renewable energy technologies and notable initiatives have been taken to popularize modern RETs by different agencies. Even a densely populated (1355 inhabitants/km^2) country can live rather well with a solar energy input 80% with all the amenities that modern technologies can provide. The poor countries like Bangladesh in the tropical regions mobilize their resources to develop technology for the utilization of solar energy.

Chapter 4

Technology Review

4 Technology Review

4.1 Basic Concept

The most common types of solar PV systems are: monocrystalline, polycrystalline and thin-film, and these three types are the ones that are studied in this rapport. The two first types, monocrystalline and polycrystalline are so-called traditional solar cells. The third one, thin-film, can be categorized as second-generation solar cells (Euro-CASE, 2014, p.16). Second generation solar cells are based on amorphous silicon, which means that the solar PV system can be flexible to a surface with more than one degree as seen in the right picture below [20].There is also a third generation solar cells that are created from a variety of new materials such as plastic lenses or mirrors to concentrate sunlight onto a very small piece of high efficiency PV material [21] .This type of solar cell is not studied in this report.

Monocrystalline solar cells are made out of silicon ingots, which are cylindrical in shape. To optimize performance and lower costs of a single monocrystalline solar cell, four sides are cut out of the cylindrical ingots to make silicon wafers. This is what gives monocrystalline solar panels their characteristic look as seen in the left picture below. A good way to separate mono- and polycrystalline solar panels is that polycrystalline solar cells look perfectly rectangular with no

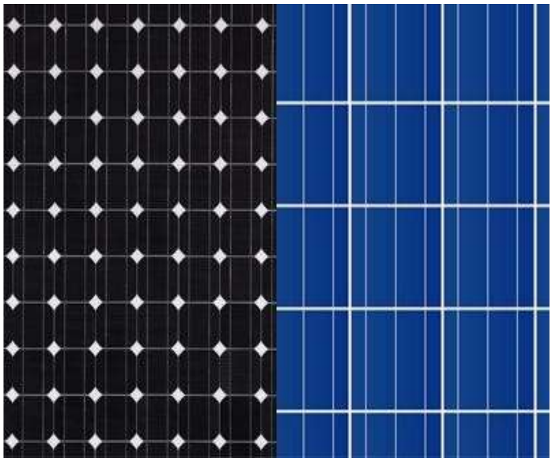
Figure 4:1Mono- and Polycrystalline solar panels

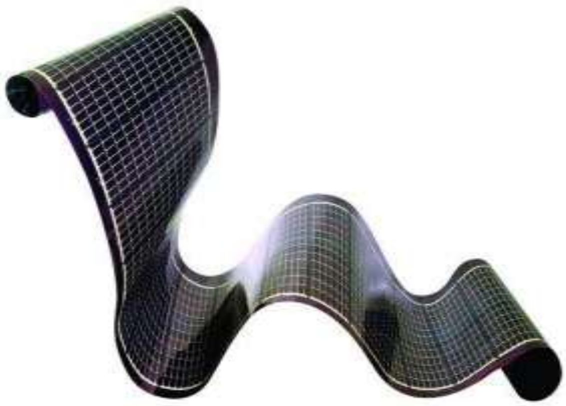

Figure 4:2 Thin-film

rounded edges, as seen on the picture in the middle. To produce polycrystalline, raw silicon is melted and poured into a square mold, which is cooled and cut into perfectly square wafers (Energy informative, 2013).

In the table below advantages and disadvantages for monocrystalline, polycrystalline and thin-film solar PV systems are identified.

Table 4-1 Advantages and disadvantages for the three different types of solar PV systems

	Advantages	**Disadvantages**
Monocrystalline	• Highest efficiency rates. • Space-efficient. • Live the longest	• Most expensive. • If it's covered with shade, dirt or snow, the entire circuit can break down. • A significant amount of the original silicon ends up as waste. • More efficient in warm weather.
Polycrystalline	• Simpler process to make the solar panels and less expensive. • Slightly lower heat tolerance,	• Lower efficiency (13-16%) • Lower space-efficiency.
Thin-film	• Flexible • Reduced production Costs	• Large energy consumption associated with the production • Based on scarce elements

4.2 Technology of Solar PV systems

At KTH, Associate Professor Staffan Norrga at the school of electrical engineering has ensured that solar PV panels have been installed on a roof of one of the KTH buildings.

Solar cells produce electricity by direct conversion of the energy from solar radiation [22]. A solar cell works as follows. When the sun is absorbed by the solar cell, photons hit the semiconductor material of the solar panel, a voltage between the front and the back of the cell occurs. It is causing outer electrons to break free of their atomic bonds. Because of the structure of the semiconductor, the electrons are forced in a direction, which creates a flow of the electrons, which will create electricity. The front side of the solar cell is a metallic mesh that collects the electricity. On the back of the cell, which is not illuminated, the entire surface is covered with a conductive metal layer. The electricity is transported from the cell with wires that are connected to both the front and the back of the cell [23]. It is this electricity that we can extract [24].

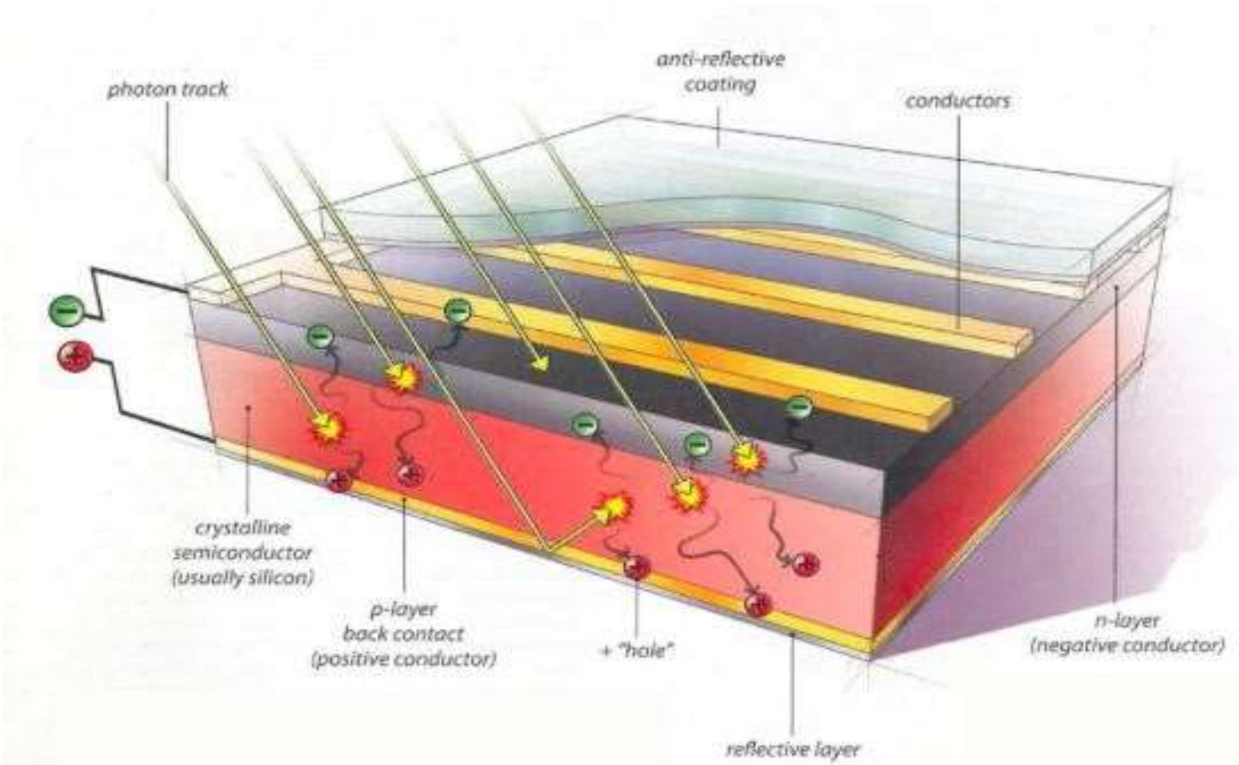

Figure 4:3 A Typical Solar Cell

Several solar cells together create a module. The solar cells are connected in series to increase the voltage. The result is a module. It is the modules that create a solar system. Therefore the module is the most important building block of a PV system [23]. The solar panels at KTH are of the most common technology and they deals with DC. Therefore is it required an inverter to get AC voltage in the power grid. Figure 7 shows how the system works.

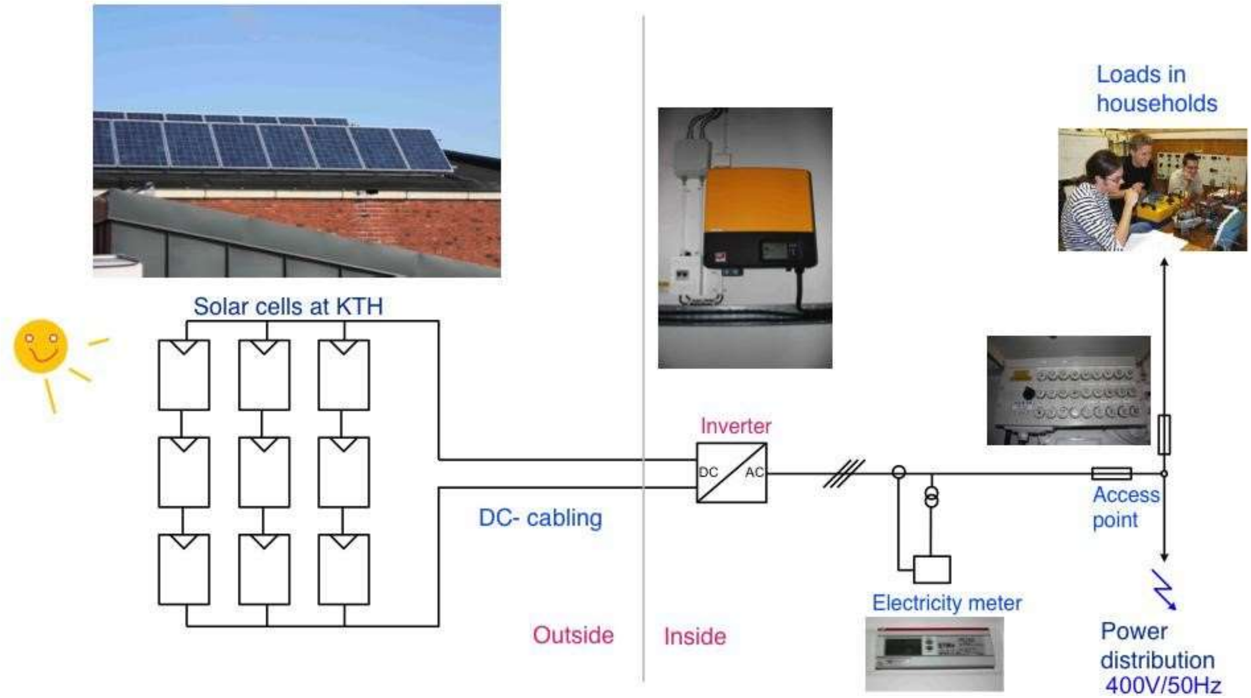

Figure 4:4 Overview of solar panels and the solar power system

What can be seen in the picture above, on the left side, is how the solar panels are connected to each other on the rooftop. The electricity produced in the cells is then passing through DC leaders and led indoors to an inverter that changes the power to AC so it then can be led out into the public power grid.

According to professor Staffan Norrga it is important to find ways to manage the variation in the climate, for example by finding good solutions to store the energy that are being produced. This should be revolutionary and the growth of solar PV systems should probably increase in the future.

4.3 Market review

4.3.1 Revenues and expenses

The costs of installing solar power constantly decrease while the electricity price remains high. This indicates an opportunity for the solar power to become commercial competitive in the energy sector [25] .

Solar PV systems are constantly under development. As a result of that the technology has become more and more developed and the efficiency is improved. The effect of this is for example a reduced investment cost. Another factor to why prices have dropped drastically is because most of the production has been moved to countries with low labour costs such as China for example.

A intermittent problem with solar PV systems is that the energy source has a huge variation because of the unpredictable solar radiation. Countries far away from the region of the equator may have difficulties, in some parts nearly impossible, to predict when the sun will shine or not. In Europe, the seasonal variations is an obstacle for implementation, while in Africa, this is not a problem.

One of the positive aspects about solar PV systems according to professor Staffan Norrga is that the solar power “fuel” is free and the maintenance as well as the maintenance costs is generally negligible here in Sweden. For example in Spain, where some periods of the year are very dusty, some maintenance needs to be done to keep the cells clean from dust. Here in Bangladesh, the rain makes sure the solar PV systems are clean enough. The only cost is the purchase cost that is drastically reduced to around 70k for a 120 Wp solar panel which is about half the cost that was around 10years ago.

4.4 South Asian Outlook

4.4.1 Current situation on renewable energy

Tender and auction schemes may be winning.

When policymakers look into the future of solar photovoltaic (PV) development in Asia, the role of feed-in tariffs (FITs) is slowly but surely becoming fuzzy as tender and auction schemes provide an attractive alternative. Benjamin Attia, global solar markets analyst at GTM Research says there were 49 national markets where tendering or auction schemes are in place in May 2017, up from 32 in the second half of 2016. During the first five months of the year, 29 reverse auction or tender procurement programs were launched or planned. [26]

Citing the recent spate of record-breaking bid auctions such as a Chinese-Japanese consortium's bid to build a solar panel farm in Abu Dhabi for $0.0242 per KW/h and the fact that most Asian countries now have a tendering or auction scheme in place, Attia reckons these trends "demonstrate that, globally, unsubsidized grid parity has arrived or is fast approaching in many of these markets, which calls the long-term sustainability of FIT into question." [27]

4.4.2 Designing auctions

Whilst solar PV and other renewable energy auctions have encountered implementation hurdles in the past, they have recently become a popular policy tool mainly because of their potential to achieve deployment in a cost-efficient and regulated manner, says the International Renewable Energy Agency (IRENA) in a report.

“Auction schemes have benefited from the rapidly decreasing costs of renewable energy technologies, the increased number of project developers, their international exposure and know-how, and the considerable policy-design experience acquired over the last decade. When well designed, the price competition inherent to the auction scheme increases cost efficiency and allows price discovery of renewable energy-based electricity, avoiding potential windfall profits and underpayments," says IRENA.

The agency says that policymakers must take great care when designing auctions, making sure that there are stringent bidding requirements and strong compliance rules in the form of guarantees and penalties to reduce the risk of underbidding, project delays and project failure.

IRENA's study reveals, for example, that sealed-bid auctions are easier to implement and fosters greater competition, while descending clock auctions can be more difficult to implement but allows for a fast price discovery and greater transparency. Ceiling prices should also be kept from bidders.

4.4.3 Project Bankability

As tender and auction schemes become more popular in Asia, project bankability is also bound to become more important. A solar PV project's bankability include having a stable and predictable cash flow, satisfactory coverage ratios, guarantees, and mitigation strategies for risks. This also includes technology and strong knowhow, past experience, regulatory considerations, financing mechanisms, and regional specificities.

Before even a single hole is dug or a component produced, it is crucial to conduct extensive environmental and social impact studies, which will then help guide risk mitigation measures. To avoid technical difficulties and cost overruns, which drastically lower the bankability of a solar PV project, there is a need to conduct peer-reviewed feasibility studies and rigorous selection of engineering, procurement and construction partners.

4.4.4 Strong renewable ambitions

Analysts reckon that designing auctions and raising project bankability will enable Asia to pursue its strong renewable ambitions. Although there will be a forecasted decline in East Asia next year, roughly 60% of global demand will still come from Asian markets.

The region is looking to install 900 GW by 2030 in order to give electricity access to 500 million people -- a target that will require roughly US$147b per year in investments.

Given the large amount of investments required to fuel Asia's renewable goals, he reckons the region faces two key challenges: **Access to financing solutions remains difficult to small or mid-size projects, and a lack of local experience in renewable deals structuring.**

In the case of Pakistan and Malaysia, Islamic financing has risen as an attractive option to bankroll their renewable and solar PV projects. Pakistan's US$955m hydropower plant has been financed through the issuance of Islamic bonds, an infrastructure deal that was notably one of the largest in the country's history. The Malaysian government likewise encourages Sharia'-complaint financing.

Table 4-2 Pors and Cons in Germany

Germany	
Pros	**Cons**
Strong political decisions addressed to solar power.	The end-users are the ones that pay for the renewable energy in the end. The consequences are a high cost for the electricity consumers.
Producers are always guaranteed a minimum price for the generated electricity.	Difficult to predict the amount of solar radiation (same conditions as Sweden).
The feed-in tariff during a long period	Despite much installed capacity a relatively little amount of energy is generated.
Investing in solar energy both for households, industries and solar power plants.	
The feed-in tariff is different for different forms of renewable energy. That's positive for solar PV power because they have the highest one.	

Generous FIT compared to the other countries	

Table 4-3 Pors and Cons in United Kingdom

United Kingdom	
Pors	**cons**
The reduction of their national fossil fuel reserves has led to that solar PV power has become more important. It is clear that the UK government believes that solar PV has the potential to form a significant part of the energy mix.	Difficult to predict the amount of solar radiation.
They have created two different financial, one for large scale and one for small-scale solar PV power. This is to make the best for both groups.	
Constant growth the beginning in 2010 and they have not had any financial problems.	

Table 4-4 Pors and Cons in Italy

Italy	
pors	**cons**
Are able to generate a relatively large amount of solar energy compared to the installed capacity.	Had to reduce their FIT to avoid a financial burden.
Good opportunities for solar radiation.	Are not using the potential of the great solar radiation that the country has.

The Italian parliament is positive to increase solar PV power and therefor do their best to encourage investors and households to continue to install.	The end-users are the ones that pay for the renewable energy in the end. The consequences are a high cost for the electricity consumers
The high cost of the electricity bill is an important factor for solar PV to approaching competitiveness.	An obstacle for the future development of solar PV in some southern parts is the inadequacy of the grid.

4.5 The importance of subsidies

Distinct and stable political decisions have a great importance for the growth of solar power. Guidelines from the government are required to make people and companies interested in invest in the solar PV technology. This is components that both Germany and United Kingdom have been able to handle. Even these countries have done some changes in the political decisions during the `years and that has, as for all countries in this study, affected their market. The difference between these countries to the other European countries in this study is that they have been able to continue the same guidelines with only a few small adjustments. In Italy, Spain, and Greece huge changes in the political decisions has been made. In Italy the previous favorable FIT has been reduced and in Spain and Greece the FIT has been completely excluded. This has led to a major reduce of the growth of solar power in these countries.

In order to enhance the growth of solar power it requires that investors feel an economical security and support from the government/ state. That is one of the benefits with the FIT. The producers are guaranteed a minimum price regardless how low the electricity price will be. In Germany, this has been a big part of their success. Thanks to a law called EEG (Erneuerbare Energien Gesetz) the producers of renewable energy are guaranteed a fixed price for the renewable electricity they produce and gives it precedence in the grid, for example before coal and nuclear power. With EEG, it has also been easier for households in Germany to take a loan from the bank to invest in solar panels to the roof. Perhaps the German system is in progress to redraw the traditional ownership structure in the energy market? (Riksdagen, 2012).

To increase solar power the political decisions need to be long-term decisions. It is therefore not enough to make short-term guidelines because these will not create any security for the investors. It is thereby preferable that the decisions on subsidies is determined for a longer period and are not changed if, for example, a new government would take office. To increase the growth of solar power in countries where the total installed capacity is low, as for example in Romania, the government must address the issue and add it to the everyday politics. It is necessary to raise awareness for solar PV systems and demonstrate the benefits they generate.

One of the most important factors is the attitude towards solar energy, both from the population and the state. That has both Germany and United Kingdom proved through the success in solar power installations, although they have weather conditions that are unpredictable and the solar radiation is very low during periods of the year.

4.5.1 The geographical importance

The geographical aspect

Naturally the geographical location is significant when it comes to solar energy. Countries closer to the equator generally have more hours of sunshine than countries in the northern or southern hemisphere. However, this has not stopped countries such as Germany and the United Kingdom. These two countries have basically the same weather conditions, which is unpredictable and the seasons has a high variation of solar radiation. Despite that, both of them has a successful growth of solar power.

The fewer hours of sunshine a country has, the more installed capacity is needed to reach a certain volume of solar power. This leads to a higher cost for the producers because of the high investment cost for solar power and it makes it more difficult to get a pay back on the investment. This is clearly seen if we compare Germany with Italy. Germany is the country with most installed solar power in the world with 36 MW of installed capacity, which gives an average production of 30 TWh. While Italy only has 17.6 MW of installed capacity but still gets an average production of 22 TWh. To see these in relation to each other gives a perspective in how much energy that could be extract from countries with a lot of solar radiation.

Another aspect to consider when it comes to geographical importance is the area of the country. A large land area could lead to a higher installation of large solar PV parks, which in turn can lead to less production costs. Another aspect is a country's population. If a country is densely populated it can be difficult to find good land surface, which by the population is acceptable to install on [28].

4.6 Analysis based on the current situation in Bangladesh in terms of solar power:

In Bangladesh there is a limited chance to boost renewable energy other than solar at the moment. Hydro has got some prospect for 5-10 MW small projects identified; while Sangu 140 MW and Matamuhari 75 MW having potential respectively.

Biogas has some limited prospect. Prospect of Wind energy and its growth still depending upon the hard data which is expected to come out briefly; while only operational wind turbines are in Feni and Kutubdia.

Therefore, government commitment of the targeted growth for renewable will be largely be based on solar energy. The possible avenues been targeted such as off grid home systems in rural Bangladesh (successfully being implemented with IDCOl).

Solar Irrigation is the largest growth area since half a million pumps targeted to be brought under solar PV generation.

Another growth area in solar will be small and medium solar parks, solar street lighting and introducing rooftops solar PV in cities in-grid system that will help the entrepreneur to relief themselves from load shedding and help in adding and reduce dependency respectively on national grid in some scales. Moreover, it will help to add good amount of electricity supply on grid through FITs if policy allows that. Solar parks might be successful even with a permanent 25-year contract. In reality, there is a huge need to accommodate them since lots of small and medium solvent home owners, real state owner smay come up. Hence proper compensation packages for development of rooftop solar PV in cities need to develop in line with FITs, Irrigation (solar pumping) project and small scale government and private solar power parks 1 to 5 MW with 25 years contractual agreement will help in reaching 10% of targeted renewable in Bangladesh. Similarly, medium scale solar parks might be also useful for the growth of renewable energy in Bangladesh.

Identified problems in Bangladesh for the growth of solar power

Problems with the financial incentives that have been identified is-

- No significant policies and prospects that are stable for solar power.
- Bangladesh has distinct seasons with a diverse amount of solar radiation, which makes it difficult to predict the solar radiation.
- A development of the power grid is needed.

4.6.1 Development opportunities for Bangladesh

Analysis and discussion through a comparison with countries

The first problem that Sweden has to deal with is that they do not have any significant policies and prospects for solar power. It is also important that the decisions from the government are not irregular and unexpected which makes the solar PV market more unpredictable. What can be seen in the outlook on the other

European countries is that clear long-term targets and provisions are the winning concept. Both United Kingdom and Germany have designed the financial incentives for solar power in a way that really promote investments in solar energy. By stable decisions and no drastically change, both of them have reached a high level of installed solar PV capacity. Even when these two countries have done a small change it reflect the market.

Chapter 5

Results-Our Proposed Policy

5 Results-Our Proposed Policy

5.1 Eligible Entities

Solar Rooftop PV Projects: Solar Rooftop PV projects to be commissioned shall comprise grid connected PV systems with installed capacity from 50 kW to 5 MW (AC **capacity with a flexibility of 10%**)) and shall be based on **proven** PV technologies such as crystalline silicon or thin film, as the case may be approved by SREDA and all new solar rooftop PV projects as may be approved by SREDA shall be eligible for availing Feed-in Tariff to be determined as per these Regulations.

"Solar rooftop PV" means the Solar rooftop or other small solar Photovoltaic power projects that uses Photo Voltaic technology for generation of electricity, which are mounted on rooftop of buildings or ground mounted installations, and satisfying any other eligibility criteria as may be specified by BERC from time to time:

Provided that, the ground mounted installations shall not exceed 50% of total installation capacity where rest of the installations must be at rooftop:

Provided further that, in order to be eligible rooftop, it must be capable to withstand the solar panel, frame and associated accessories.

5.2 Prosumer Category

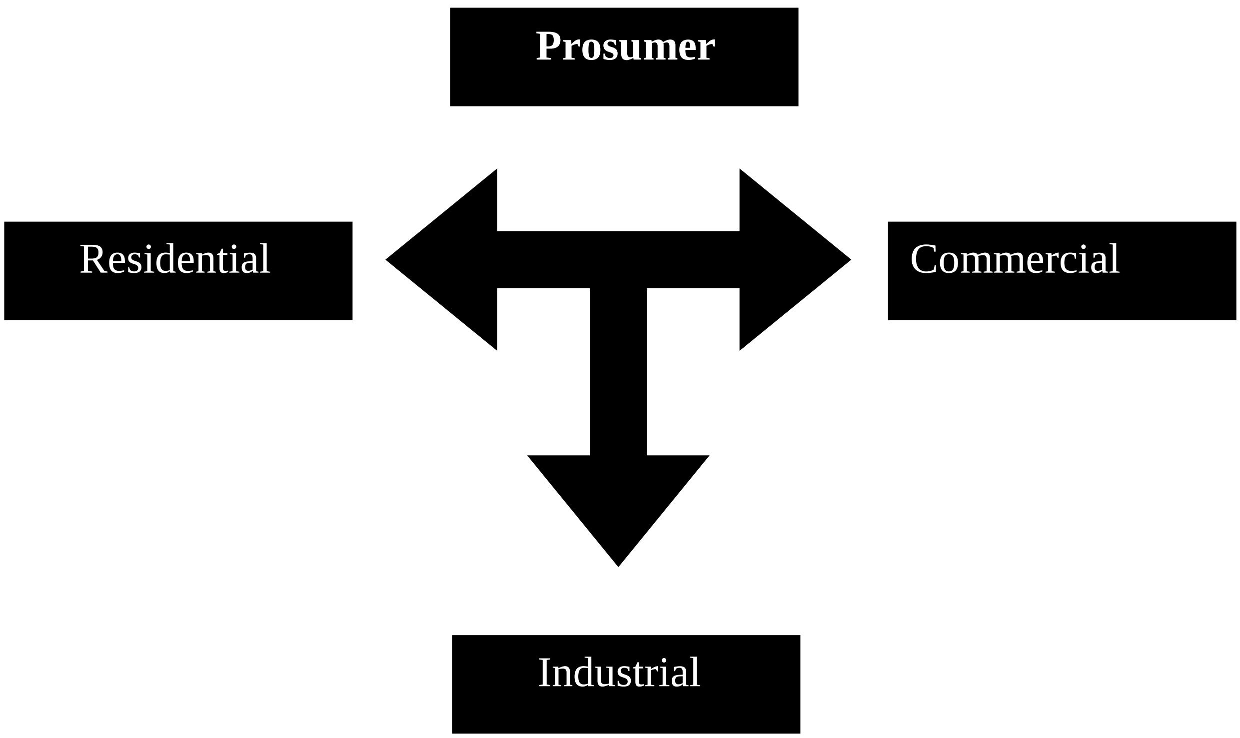

Table 5-1 Prosumer Benefits

Residential	Commercial	Industrial
• Reduced Tax • Provide Tariff benefits	• Extend Trade License date • Effect on tax	• Ensure low load shedding • Easier access to electricity

5.3 Procedure for determination of Generic Feed-in Tariff

The Commission shall notify the generic preferential tariff on two-part basis pursuant to approval of the capital cost norm by Bangladesh Energy Regulatory Commission at the beginning of each year of the Control Period for renewable energy technologies for which norms have been specified under the Regulations.

5.3.1 Tariff Structure and key components

The tariff for RE technologies shall be structured in the two part tariff model-

$$\text{Two part tariff} = \text{lump sum fee} + \text{per unit charge. These two part tariff will}$$

consist of the following components-

- Return on equity;
- Interest on loan capital;
- Depreciation;
- Interest on working capital;
- Operation and maintenance expenses

Conclusions

Chapter 6

6 Conclusions

6.1 Why is feed-in tariffs so fabulous?

First, they have proven to be the most successful support instrument for renewable electricity. Second, feed-in tariffs can be designed flexibly according to the framework conditions of the national electricity markets and according to the specific national energy policy objectives. They can be designed in order to include an increasing share of renewable electricity and according to the needs of developing countries and emerging economies. Third, feed-in tariffs have helped to create national markets for the manufacturing industry, thus leading to a number of secondary macro-economic benefits such as job creation. Finally, they have also helped to 'democratise' energy markets by allowing a large number of actors to participate in the power generation business, including small and medium size companies, farmers and private persons.

6.2 Future Work

Including Biomass, biogas, wind will be our focus. Try to implement all sorts of renewable energy will be our future work. Introducing banking rules and regulations for companies and household will be another inclusion.

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