IFC International Finance Corporation World Bank Group

GSMA Green Power for Mobile

In partnership with the Netherlands

Best Practice Procurement Guide — Bangladesh

Contents

Glossary

MNO : Mobile network operator or mobile operator
GPM : Green Power for Mobile
DG : Diesel Generator
ESCo : Energy Service Company
CAPEX : Capital Expenditure
OPEX : Operational Expenditure
kWh : Kilo Watt Hour
SLA : Service Level Agreement
ROI : Return on Investment
RFQ : Request for Quotation
SOW : Scope of Work
BOQ : Bill of Quantity
FM : Field Maintenance
NOC : Network Operation Centre
PPA : Power Purchase Agreement

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Executive Summary

The mobile telecom industry of Bangladesh is facing major challenges in terms of energy usage. With the country's electrification rate at around 50%[1], Mobile Network Operators (MNOs) need to find alternative energy solutions to power up their base stations.

This Best Procurement Practice offers guidance for Bangladesh's telecom industry to develop its renewable energy solutions and describes the current best practices in Bangladesh, based on GPM's latest research and analysis.

To date, MNOs have optimized the power configuration of their deployments for unreliable grid connection by implementing DG battery hybrid solutions. The DG battery hybrid solution is the easiest and the fastest solution to make savings. However, implementing renewable solutions at the sites can potentially generate more savings than using hybrid solutions. Therefore, by moving to a greener network, MNOs have the potential to increase savings rather than limiting themselves to DG battery hybrid solutions.

The document presents multiple CAPEX and OPEX business models, detailing the process flows and providing snaps shots of business cases in order for the reader to understand green solution business models. This document will serve as a procurement guideline for MNOs, Vendors or Energy Service Companies (ESCos) to choose suitable business concepts to receive benefits from their investment.

[1] Power Division – www.powerdivision.gov.bd

Introduction

The Telecom market in Bangladesh is still expanding its activity in order to provide a satisfying level of services to the community. The lack of energy/electricity has become one of the key obstacles to extend their coverage in rural remote areas and impacts to MNOs' daily operational cost. On the other hand, the increasing price of diesel as well as green energy regulation in the telecom sector has encouraged MNOs to search for alternative energy solutions.

The telecom Green technology deployments are still in early stage, representing less than 5% of the 25,858 tower sites across the country[2]. In addition, the scalability of green deployments requires high initial CAPEX investments. To tackle the CAPEX issue, MNOs can choose an OPEX business model concept to deploy their green solutions, therefore shifting the responsibilities of all commercial and daily operational activities to the energy service company (ESCo) in exchange for a fee.

1. Principle of Sustainable Procurement

A sustainable procurement is one that finds the best vendor with the best price, quality and assurance in accordance to the organisation's requirements. The principle of sustainable procurement aims at finding the most adequate green energy vendor/ESCo solution based on technical and financial requirements.

Technical aspects are a key for the vendor/ESCo selection of sustainable procurement. The technical requirements can focus on:

- Technical solutions for green technology
- Energy efficiency
- Content of hazardous substances from the solution
- Maintenance capability
- Service Level Agreement (SLA)
- Disposal process from the solution

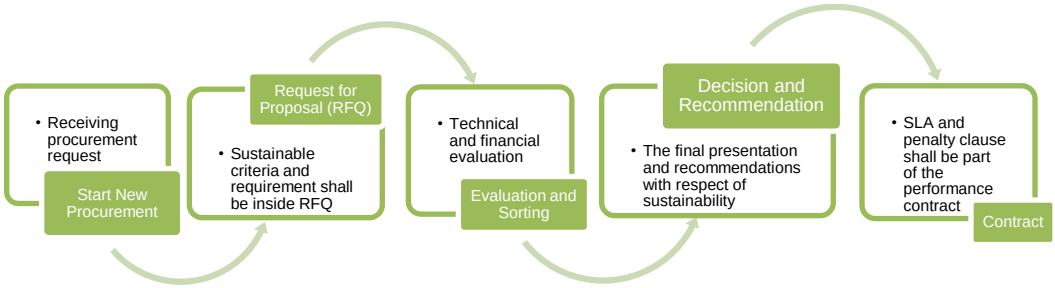
Regarding financial matters, the requirements consist of:

- Vendor/ESCo financial capability to support the project
- OPEX saving target by implementing the solution
- Return on Investment (ROI)
- Net Present Value for each capital that company spent for the solution in future

2. Sustainable Procurement Process Flow

Based on technical and financial requirements, the sustainable procurement shall be applied for each relevant project of the procurement. Figure 1 illustrates how the specific activities/actions are connected to the relevant phases of general procurement process.

Figure 1: Sustainable Procurement Process Flow



2 GPM Research

3. Different Procurement Models

There are two different procurement models providing green technology solutions based on a financing scheme.

- In-house or CAPEX Model
- Outsourcing or OPEX Model

4. CAPEX Model

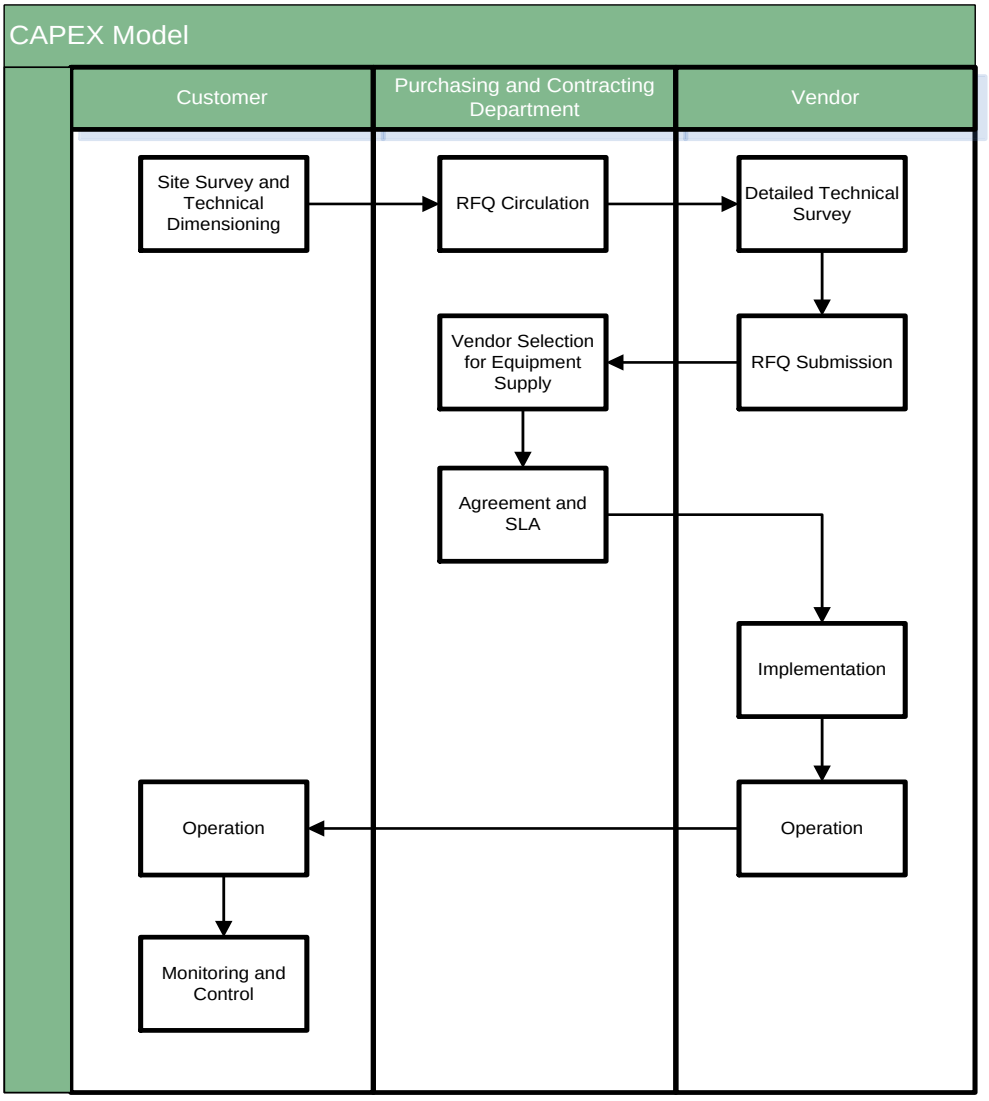
The in-house or CAPEX model is the most common method in the telecom industry for MNO to acquire new assets. The main concern with this model is the company's Return on Investment (ROI) , but by implementing this model the company will be able to make significant OPEX saving.

With this model, MNOs or ESCos need to design, procure and choose the best green technology solution that suits their needs. Finally, the potential to scale through the CAPEX model will depend on strong capital support within the MNO.

4.1 Process Flow for CAPEX Model

As described earlier, the procurement process will start after receiving some requirements from the user. The CAPEX model procurement principal can be describes as follow:

Figure 2: CAPEX Model Process Flow



4.1.1 Site Survey and Technical Dimensioning

Site surveys and technical dimensioning are key points for this model. A site survey allows the MNO/ESCO will have an overview on targeting sites and the environmental requirements on the ground. After getting the results from the survey, the MNO/ESCo will be able to start the technical design. Regarding the technical design, the MNO/ESCo will need to consider all following aspects:

- Site layout and shading surrounding the site
- Target OPEX saving for individual site
- Site power characteristic
- Green site dimensioning and equipment to consider
- Business case development
- Security issue environment on target site

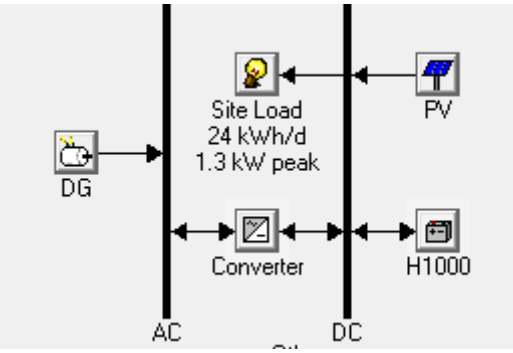
4.1.1.1 Sample CAPEX Model

Example: An off-grid existing site with a 1kW load and a 8 kVA DG, running for 16 hours a day, which is converted to become a renewable site.

Assuming the diesel price per litre, including delivery cost, is around USD 1.2, DG will consume 1.5 litres/hour, while PV solar cost is USD 300 per panel, with a capacity of 250 Watts.

After inserting the assumption values into the HOMER software, HOMER proposes as one of the possible solutions, a 5kW PV, with an 8 kW DG, one string 800AH OPzS battery and a 4kW converter and a 120A controller.

Figure 3: Homer Design Model



	PV (kW)	DG (kW)	H800	Conv. (kW)	Initial Capital	Operating Cost ($/yr)	Total NPC	COE ($/kWh)	Ren. Frac.	Diesel (L)	DG (hrs)
	5.00	8	24	4	$ 23,700	1,352	$ 32,005	0.597	0.72	1,118	645

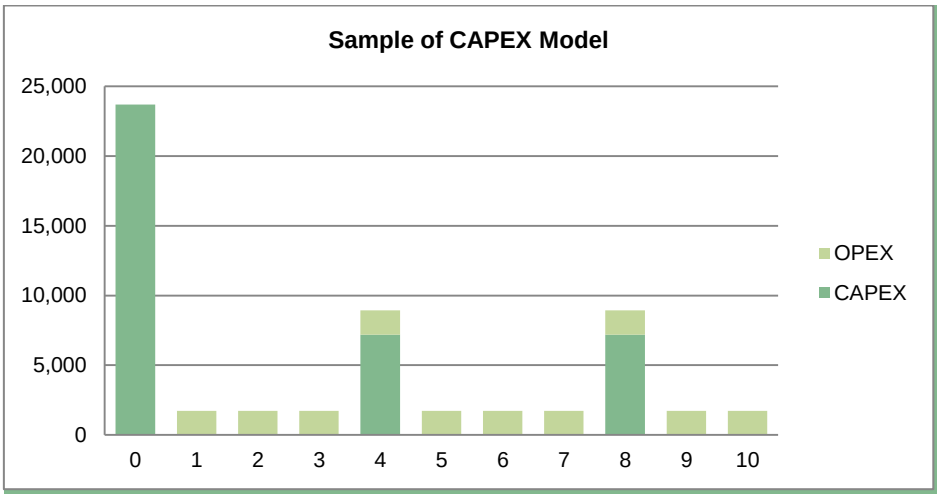
4.1.1.2 CAPEX and OPEX Estimation

Based on the HOMER software result, here are the financial results of a CAPEX business case model calculation.

Figure 4: Sample of CAPEX Model

		0	1	2	3	4	5	6	7	8	9	10
CAPEX	PV	9,000	0	0	0	0	0	0	0	0	0	0
	DG	0	0	0	0	0	0	0	0	0	0	0
	Battery	7,200	0	0	0	7,200	0	0	0	7,200	0	0
	Converter	2,500	0	0	0	0	0	0	0	0	0	0
	Controller	2,000	0	0	0	0	0	0	0	0	0	0
	Eng. Service	3,000	0	0	0	0	0	0	0	0	0	0
	Total	**23,700**	**0**	**0**	**0**	**7,200**	**0**	**0**	**0**	**7,200**	**0**	**0**
OPEX	PV	0	90	90	90	90	90	90	90	90	90	90

	DG	0	226	226	226	226	226	226	226	226	226	226
	Converter	0	72	72	72	72	72	72	72	72	72	72
	Diesel	0	1,341	1,341	1,341	1,341	1,341	1,341	1,341	1,341	1,341	1,341
	Total	**0**	**1,729**	**1,729**	**1,729**	**1,729**	**1,729**	**1,729**	**1,729**	**1,729**	**1,729**	**1,729**

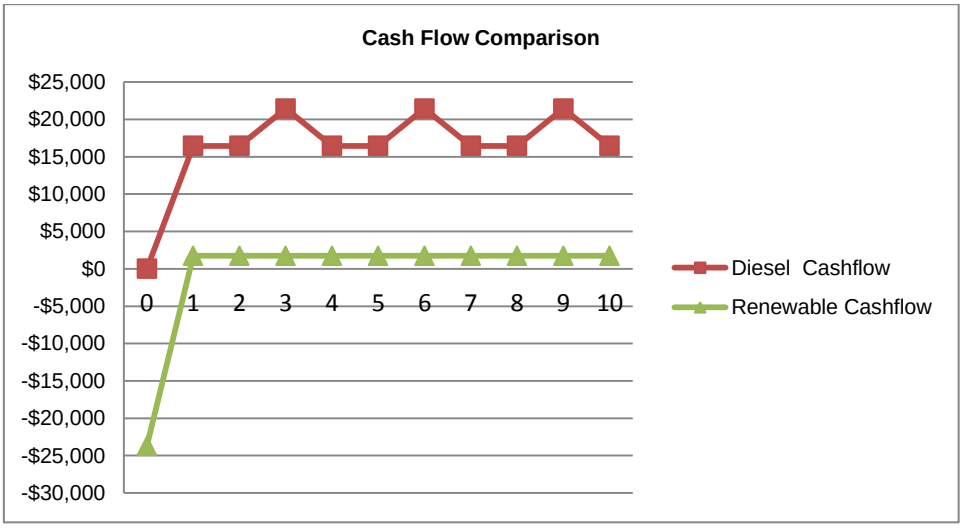


4.1.1.3 Business Case Result

The difference of cash flow between the renewable solution and the existing diesel solution is shown below:

Figure 5: Cash Flow Comparison

	0	1	2	3	4	5	6	7	8	9	10
Diesel Cash flow	$0	$16,452	$16,452	$21,452	$16,452	$16,452	$21,452	$16,452	$16,452	$21,452	$16,452
Renewable Cash flow	-$23,700	$1,729	$1,729	$1,729	$1,729	$1,729	$1,729	$1,729	$1,729	$1,729	$1,729



And financial summary:

PayBack	**1.61**
ROI	**62.3%**
IRR	**62.36%**
NPV	**$38,593**
Discount Rate	**17%**

4.1.2 RFQ Circulation

After technical requirements have been finalised, the next step is preparation for the Request for Quotation from vendors. The RFQ should include:

- Scope of Work (SoW), the Scope of Work needs to give a clear solution proposal based on RFQ requirements. The SoW will suggest a design, the technical feasibility of a selected solution, a material supply mechanism, an installation and integration of an existing monitoring system. The service support will also need to be included, to give clarity with regards to after sales support and training for any new equipment installed in the network
- Site design: for the site design, there needs to be a comparison between the existing site and the green site layout proposed. The layout can be drawn with a single line diagram connection to describe each block's connectivity
- Technical specification: Technical specification has to be described based on the factory specification of each technical element. The specification needs to mention the operation temperature capabilities, the durability of elements, dimensions, weight and warranty. The detail of each specification needs to attach annexes
- Bill of Quantity (BoQ): To complete the proposal, the commercial value needs to be build based on the technical proposal
- Responsibility Matrix: The Responsibility Matrix will separate job responsibilities between purchaser and supplier. Here is a sample of a Responsibility Matrix:

Table 1: Sample of Responsibility Matrix

No	Activity	Purchaser	Supplier
1	RFQ Distribution	R	
2	Technical Site Survey	S	R
3	RFQ Submission		R
4	Supplier Selection	R	
5	Contract Finalization	R	S
6	Release Purchase Order	R	S
7	Installation	S	R
8	Test and Commissioning	S	R
9	Acceptance Test	A	R
10	Final Acceptance Certificate	A	R

Note: R: Responsible, S: Support and A: Approval

- Compliance certification: The supplier needs to provide a compliance certificate to ensure the safety, environmental and quality of any element that is supplied to the site

4.1.3 Detailed Technical Survey

The detailed technical site survey is necessary to get a "hands on" understanding before sending the RFQ feedback. In this survey activity, the supplier needs to consider the following areas:

- Site location: Identify the location by considering road access and the distance from the representative maintenance office.
- Site dimension: The technical survey to provide real site dimension and layout in order to design a new layout, for the required additional equipment on the site.
- Geographical topology: The geographical topology will give a clear understanding of which green technology solution can be offered to specific sites. Example: The wind turbine solution might be applicable in coastal areas with good wind speeds.
- Possibility to extend the grid: The technical survey will see the grid extension possibility to ensure maximum business case for green solution offered.
- Security survey: The security issue needs to be noted during the technical survey. It will give a clear picture if it is required to get permission to install additional equipment in site premises and to ensure security level for the incoming project.

4.1.4 RFQ Submission

Once the detailed technical survey completed, the vendor will be able to develop a solution based on the real situation. The solution needs to be designed by following the RFQ requirement from the submitter.

The RFQ submission schedule will be defined during the RFQ circulation.

4.1.5 Vendor Selection for Equipment Supply

Technical clarification is the next step, once all vendors have returned the feedback from the RFQ. The clarification should consider the following aspects:

- Technical solution offered and its architecture: the Technical aspects are the first that need to be reviewed. Green technology solutions and designs are key factors to rate the solution.
- Durability of each particular element of the solution: The telecom sector requires a high level of availability from the power equipment. The durability has to be mentioned for each particular power equipment element, to ensure the quality of solution and give the estimation of project life cycle.
- OPEX saving opportunity: The saving opportunity for the green solution needs to be analysed carefully, e.g.: how much diesel will be consumed during a year of operation? Operation and maintenance cost of the system? How much will the maintenance of the new solutions cost for a year of operation and what is the expected ROI for the offered solution?
- Lead time: The lead time must be stated to give clear picture when the project will be finished based on each RFQ submission.
- Technical support in the country: The supplier shall share detailed resources for the project, process and support methodology in the country
- Spare part availability in the country: Repair and replacement process flows shall be defined to support the project.
- Warranty and service centre: The customer service contact should be provided

The process also needs to consider the financial aspects as well:

- Term of payment: The term of payment has to be divided in three parts: down payment, progress payment and retention.
- Performance bond: The performance bond will be based on retention value as agreed in the contract. The bond will be released against performance based on agreed period.

4.1.6 Agreement and SLA

The agreement will include the right and the responsibility of each party. Looking at the CAPEX model, the agreement mainly focuses on the supplied equipment and its lead time. Regarding the maintenance, MNOs can choose an in-house model or to outsource to a vendor. If the latter is chosen, the MNO will use the following method:

- Rewarding the maintenance to the vendor by adding a maintenance clause in the agreement.
- Choose another third party for maintenance.
- Rewarding the maintenance contract to current managed service contract.

The key point for maintenance is to agree on a Service Level Agreement (SLA) to guarantee the availability of the service. The table below illustrates an example of SLA based on different levels of severity.

Table 2: SLA Based on Severity

Severity	Criteria	Threshold Time	SLA	Remark
Minor	no service impact	1 day	xx.xx %	Include travelling time
Major	< 4 sites down due to system failure	< 6 hours	xx.xx %	Include travelling time
Critical	> 4 sites down due to system failure	< 4 hours	xx.xx %	Include travelling time

There may be a financial penalty imposed on the vendor or maintenance provider for breach of the SLA. The SLA review is usually conducted every quarter or semester based on an agreed timeline.

4.1.7 Implementation

Once the contract is awarded, the implementation phase begins which is responsibility of the equipment supplier and will be monitored by the purchaser. The implementation must focus on scope, schedule and cost to ensure the quality of the project.

Both parties need to have an agreed time schedule in order to guarantee a smooth implementation process. The aspects to take into account are:

- A specific time line has to be agreed between both parties.
- Regular project meeting need to be conducted to track the progress.
- Site visit on regular basis has to be done to ensure deliverable.
- An acceptance test has to be done based on equipment specification and functionality.

4.1.8 Operation

As mentioned earlier, the maintenance could be done in-house or outsourced. The maintenance becomes the most important action in a CAPEX model, because the correct maintenance activity will ensure the equipment's productivity, minimize the downtime and in turn maintain the ROI.

In the maintenance, some key points need to follow to get maximum result are:

- Regular maintenance visit needs to be set
- Consider site security to prevent any vandalism, theft or pilferage
- If any vandalism occurs in the site, an investigation should be conducted
- On site, a log-book should be maintained to record activity on the site
- An intelligent power management system should be used at the site
- Activate all related power alarms at the site such as, low fuel level, DC high/low voltage, AC high/low voltage, fuel theft, generator failure and fence break
- Create a bi-weekly/monthly/quarterly/yearly check list maintenance based on equipment specification
- Control diesel refuelling by maintenance team

4.1.9 Monitoring and Control

The MNO/ESCo should have an active role in monitoring and control on the site. Usually, this task will be handled by the Network Operation Centre (NOC). The NOC would become the eyes to monitor the site on a real time basis. Regarding the control activities, the NOC will work together with the Field Maintenance (FM) team to keep updating the status on the site and ensure no alarm occurs.

Some key points on the monitoring and control of the site's power performance are:

- NOC should have visibility to every site on real time basis
- A 24/7 monitoring system should be in place
- NOC and FM teams should be able to collect performance data on the status of alarms, outage data, site running hours and fuel levels on regular basis
- NOC and FM teams should control DG usage and compare it with refuelling
- NOC and FM teams should monitor the energy contribution from each of power system equipment on regular basis
- FM team should be in touch with the security guard 2-3 times a week to get field updates
- FM team should ensure the battery backup is operating as expected based on the specification
- Fuel delivery and acceptance must be signed by FM team to ensure the right quantity and quality of diesel

Regular tests on the power management controller and testing all its functionalities should be done on a regular basis by the FM and NOC teams

5. OPEX Model

In emerging markets, where tariff wars between operators occur, it is crucial for the operators to solely concentrate on their core business: sales and marketing. The maintenance of passive infrastructure equipment has therefore become a low priority.

In the current trend, many MNOs have transferred network maintenance to telecom vendors or third parties, including their passive infrastructure. Regarding energy outsourcing, the ESCo or Energy Service Company is the one to bear all the cost of investment in powering and maintaining the equipment. This concept in power is recognized as outsourcing or OPEX model.

5.1 Different Outsourcing Models

There are 3 outsourcing business models that are usually used in the telecom industry:

- A Monthly flat fee model: This model establishes a certain OPEX cost for the MNO based on an agreed price and the ESCo will then install and maintain the green equipment onsite
- A Power Purchase Agreement (PPA) model: The MNO will buy the energy based on a per kilowatt hour rate with a minimum agreed price and consumption
- An Energy Saving Agreement (ESA) model: An OPEX saving model calculates the saving difference before and after implementing the green solution and the savings are split between the MNO and ESCo

5.1.1 Monthly Flat Fee Model

In this model, the MNO will pay the ESCo based on a monthly fixed price rate. The ESCO needs to bear all the cost of the new power equipment, implementation and maintenance. The most crucial part of the solution is the financial risk that can fluctuate on diesel cost and its transportation to the site. The other impact might come from inflation ratio, impacting to daily operational cost and wages of employee.

The monthly flat fee model is usually based on the load commitment between the MNO and the ESCO. The MNO will define the maximum load consumption for any particular site and based on the load-window commitment, the ESCo will calculate the monthly fee.

If the agreement between the MNO and the ESCo is long-term contract based on this model then the ESCo has to be careful about the operational calculation year-by-year. The ESCo has an opportunity to revise the price if the current load exceeds the original commitment.

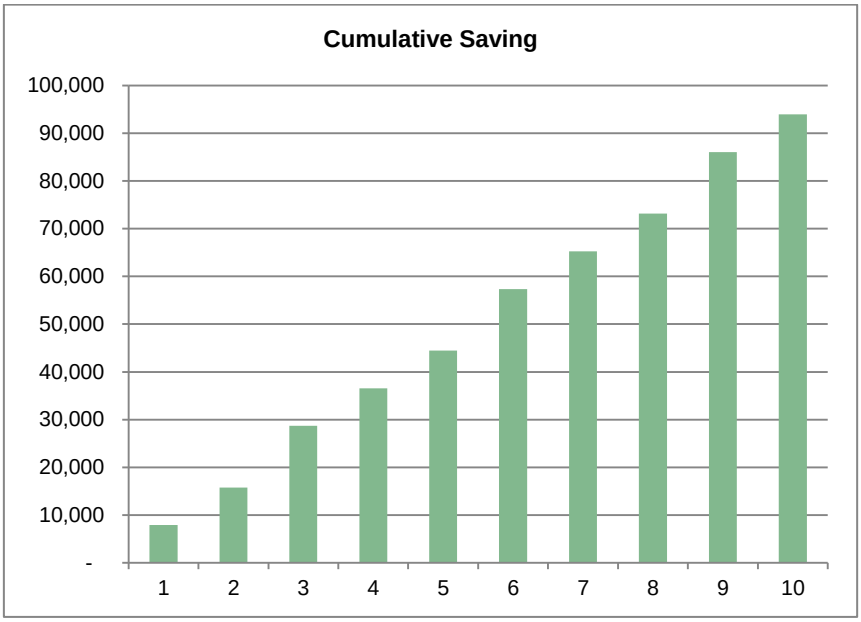
Below is an example of a monthly flat fee structure for a 1kW site.

Table 3: Monthly Flat Fee Cash Flow

	1	2	3	4	5	6	7	8	9	10
MNO Cash Flow	$8,557	$8,557	$8,557	$8,557	$8,557	$8,557	$8,557	$8,557	$8,557	$8,557
ESCo Cash Flow	-$5,290	-$5,290	-$5,290	-$12,490	-$5,290	-$5,290	-$5,290	-$12,490	-$5,290	-$5,290
ESCo Gross Profit	**$3,267**	**$3,267**	**$3,267**	**-$3,933**	**$3,267**	**$3,267**	**$3,267**	**-$3,933**	**$3,267**	**$3,267**

If the system cost is US$23,700 for single site solar solution and ESCo gets some loan platform until 70% from system cost with interest 17%. The ESCo will come up with annual cost based on the total CAPEX, OPEX, financial cost that need to be covered by ESCO. The ROI of flat fee model is less than 2 years foe ESCo. The cumulative saving as describe below:

Figure 6: Cumulative Saving for MNO Based on Monthly Flat Fee Model



5.1.2 Power Purchase Agreement (PPA) Model

The PPA model is another solution on OPEX business model. In this model, the MNO will buy energy from the ESCo per kilowatt hour rate (kWh) and with a minimum agreed price. To calculate this business is a bit tricky as the ESCo needs to consider all aspects to get a per kWh selling price for the MNO.

It should be remembered that the PPA price per kWh will be higher than the commercial grid price in the market. From a maintenance point of view, site clustering will help ESCo to minimize operational cost and effectiveness of maintenance. By clustering method, the MNO will be able to get the best offer from ESCo from the optimizing maintenance team.

Below is an example for PPA model for 1kW site load with total cost of solar investment US$23,700

Table 4: MNO Cash Flow

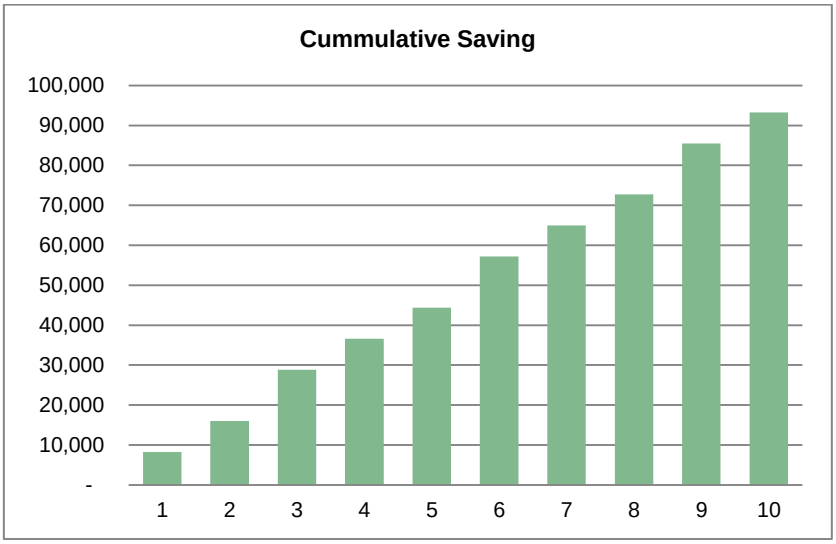
	1	2	3	4	5	6	7	8	9	10
MNO Cash Flow	$8,191	$8,672	$8,672	$8,672	$8,672	$8,672	$8,672	$8,672	$8,672	$8,672

The calculation is based on the estimation of annual energy requirement from MNO with 10% buffer. By considering of CAPEX investment, interest and OPEX calculation, selling price per kWh is about US$0.9. As the result the ROI for PPA model is less than 2 years. The detail payback for ESCo as shown below:

Implied Margin	15%
Annual Power Requirement (kWh)	9,636
Payback for ESCo	1.82
IRR	27.34%
NPV	$ 9,452

And the potential cumulative saving for MNO is shown below:

Figure 7: Cumulative Saving for MNO from PPA Model



5.1.3 Energy Saving Agreement Model

In this model, the MNO and the ESCo will calculate the OPEX difference before and after the green solution deployment. The ESCo will receive a percentage of OPEX saving value from MNO. Some of difficulties of this model are:

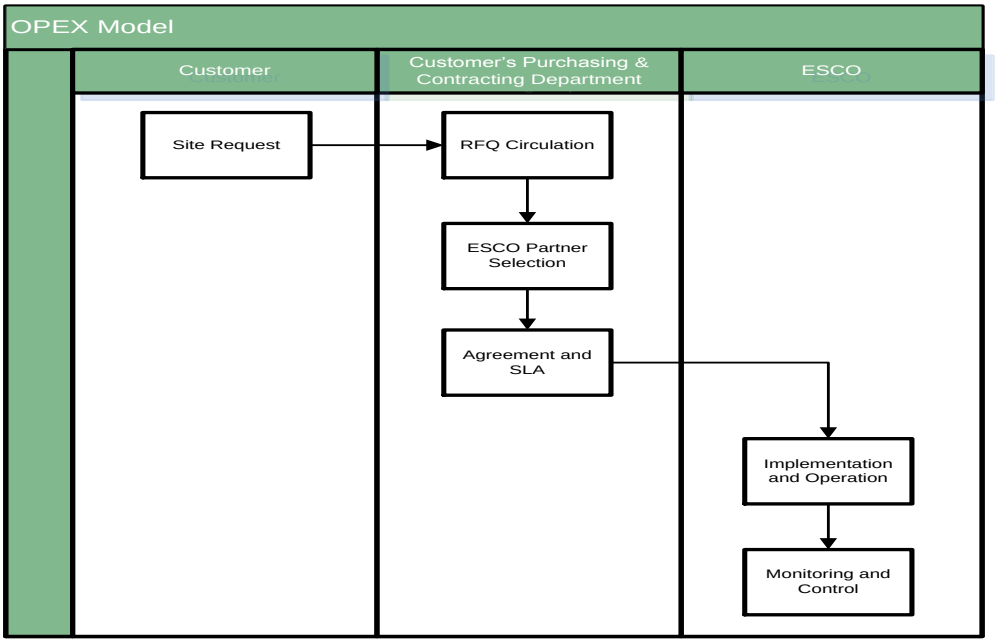
- Actual identification for current OPEX before the green solution deployment and then observe the difference after the deployment
- The site deployments based on this method will have another challenge for the MNO and ESCo - to monitor OPEX performance all the time

The energy saving business model brings its own complication with regards to its calculation method on energy saving result between MNO and ESCo. This method might not be applicable for Bangladesh market.

5.2 Process Flow for OPEX Model

On procuring renewable energy, the process can be described as below:

Figure 8: OPEX Model Process Flow



5.2.1 Site Request

The initial site request inside RFQ will come from MNO. The detail information has to be provided during this initial request, such as the existing power consumption and six months plan for telecom equipment expansion for existing site. The estimation on power requirement is a key value for vendor to design their solution.

5.2.2 RFQ Preparation

Regarding the RFQ preparation, the requirement should be include:

- Renewable technology solution requirement
- Technical specification with expansion plan
- Financial modelling
- Clustering and site distribution
- Response and resolution time expected from the ESCo
- Maintenance team expertise and distribution
- Spare part management system

Clustering is the most important thing to build a RFQ and get the best offer from the ESCo and an optimal team to maintain the network.

5.2.3 ESCo Partner Selection

Filtering and choosing an ESCo must follow on RFQ outline. The MNO has to get an understanding of the ESCo's solution, the potential savings and financial support needed for the project. The technical aspects that must be taken into account when choosing an ESCo:

- The technical solution and its dimensioning in renewable energy
- The ESCo that brings the highest OPEX saving opportunity to the network
- The ESCo background experience to handle the project
- The technical team's experience in maintenance
- The commitment on the SLA

In addition, the ESCo should be able to demonstrate strong financial support as it is critical to successfully run an OPEX model. The criteria are shown below:

- Have financial support during the project (can be bank guarantee)
- Good performance bond scheme
- Flexibility on term of payment
- Availability of working capital

5.2.4 Agreement and SLA

The key terms to be considered for the agreement and SLA are:

- Duration of the agreement: For the OPEX model investment, there is a high risk for the ESCo that bears all the cost of deploying the green solution. A long term agreement between 8-10 years is suitable to give some room for ESCo to pay back their investment.
- Minimum required engineers/technicians per cluster: the OPEX model really depends on the clustering mechanism to provide a cost effective maintenance for the ESCo. By clustering mechanism, the ESCo will be able to maintain their response and resolution time to solve the power problem on their responsible area.
- Minimum energy purchased every month: A Monthly flat fee or PPA model will give a guarantee for the ESCo to maintain their revenue.
- Service Level Agreement (SLA): the SLA needs to cover response and resolution time of power handling. The SLA also needs to calculate based on the clustering mechanism.
- Penalty clause: the penalty clause shall be created based on non-compliance with the SLA and the penalty shall not exceed more than 5% of the contract's value. It gives the chance for the ESCo to fix the problem without severe financial impact.

- Asset ownership clause to cover the asset after the contract end date: The asset ownership needs to be included if the MNO wants to acquire the asset after the contract ends. It will help the ESCo prepare the business plan to meet the MNO's expectation.

The commitment of the SLA is the most important thing here, as the MNO trusts the ESCo with the power management of its sites' 24/7 services. The table below is a sample of the SLA's targets.

Table 5. SLA Sample for OPEX Model

Severity	Target	Response Time	Resolution Time
Minor	> 99.00%	< 8 hours	< 24 hours
Major	> 98.50%	< 15 minutes	< 6 hours
Critical	> 99.00%	< 15 minutes	< 4 hours

The definition of "severity" varies from one MNO to another. In general, a "Minor" issue is any accident that doesn't impact the service, while a "Major" is an accident that impacts the service but is limited to less than 3 sites. A "Critical" is an accident that impacts more than 3 sites in a row.

5.2.5 Implementation and Operation

The ESCo has to handle implementation and operations end to end. Starting with implementation, the ESCo and the MNO need to agree on the following actions:

- A project time line must be agreed by both parties
- Regular meeting should be conducted to update the project status
- Project clustering or phase should be set to optimize the resources
- Acceptance test check list must be agreed by MNO

Operation and maintenance using the OPEX model is the most challenging part and can determine whether the ESCo meets its ROI requirements of not. Strong preventive maintenance and operations management can minimise the SLA risks. The ESCo can take actions on:

- A Power management system to be installed onsite. The automation should be able to send the alarm and performance in real time
- Site security available 24/7. By deploying site security, the site will be protected from any vandalism or pilferage.
- Good site maintenance can help to reduce failures on site. The ESCo should set a minimum number of visits for their technicians. The SLA should be reviewed on a regular basis.

5.2.6 Monitoring and Control

Monitoring and control are key to ensure the ROI of business case will meet expectations. On the monitoring side, a system capable of monitoring the site and sending real time alarms is necessary. These two activities need to have cooperation between monitoring team and field teams. These activities are as following:

- 24/7 monitoring of alarms: The site monitoring system should be integrated into the network and the central monitoring centre to be able to monitor and control the site in real time.
- Maintenance dispatch: If any alarms occur on in the network, the NOC should be able to immediately dispatch the responsible person to ensure the issue is resolved quickly.
- Track all incidents on the system: the trouble ticketing system is one of the ways to track incidents that happen in the network. By implementing trouble ticketing system, the MNO and the ESCo will have a historic for each particular site.
- The monitoring and field team need to analyse the performance data for each energy contribution. It will ensure that the site's characteristics still follow the business case and guarantee the target for ROI.

- The alarms need to be able to available on the web; the flexibility of the alarm notification or alarm monitoring might be needed for engineers that stay on remote area. The engineer will be able to monitor their cluster automatically.
- Field team needs to organise based on the site clusters to minimize travelling time. Putting the engineers into clusters will benefit the ESCo as well as the MNO

6. Conclusion

In Bangladesh's current market, the CAPEX model is MNO's preferred choice for deploying renewable energy solutions. To have solid growth in green technology deployments, MNOs will need to strengthen their capital commitment for CAPEX model implementations.

Based on the Bangladesh market analysis report, the opportunity for ESCos, based on a PPA model, reached US $42 million in 2012 and will climb to US$ 77 million by 2015. The saving opportunity for MNOs is around US $9.4 million by 2012 and it will reach US $30.7 million by 2015.

Bangladesh's telecom market needs strong ESCos to support the OPEX model from the technical and financial perspective.