Green Power for Mobile

Best Practise Procurement Guide for Green Energy in India

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This document presents a best practise procurement guide for the mobile telecoms sector in India. The Green Power for Mobile best practise guide is based on current intelligence of the Indian Market.

The GSMA Development Fund launched the Green Power for Mobile (GPM) Programme in September 2008 to 'extend mobile beyond the grid' through the promotion of renewable energy technologies and energy-efficient base stations. The programme is supported by the International Finance Corporation (IFC).

The telecom industry is an essential service sector. In emerging markets, lack of stable, commercial power is the biggest threat to the industry. Like any other service industry, telecoms utilises power to provide communication services. Due to a shortage of commercial power availability, Mobile Network Operators (MNO) and Infrastructure Providers (IP) are forced to generate their own power supply. As diesel generators (DG) are easy to deploy, they have been used widely across the world as either a back-up power solution or a standalone power source for off-grid areas. However, due to environmental factors and the tendency for diesel prices to increase, DG is no longer the preferred standalone solution for the industry which, instead, has moved towards greener, renewable energy solutions.

The document hopes to guide the reader through to identifying the right approach for moving forward with renewable energy solutions. This guide can be equally useful for MNOs and IPs but, with the latter holding the largest market share of 'last mile' passive infrastructure, we considered IPs the main beneficiary of this document.

Introduction

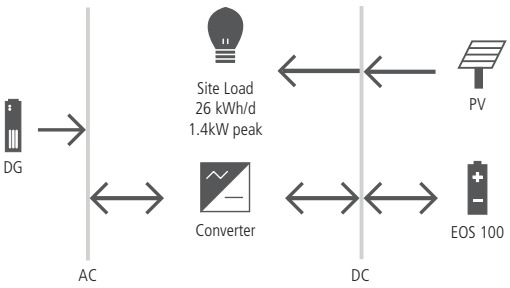
The lack of grid power, the increasing cost of diesel, and the commitment to reducing greenhouse gas emissions are a number of factors forcing the telecom industry to come up with alternative energy solutions. Renewable energy solutions have the potential to reduce OPEX, which increases the scale-up potential. Since an MNO's core business is to provide voice/data services, the investment for renewable energy solutions remains a low priority. The CAPEX requirement for renewable power sources is also high. To get rid of this CAPEX, OPEX models can be very useful. In various OPEX models, an ESCO (Energy Service Company) can take the total responsibility and risk to generate and provide power to the MNO. The MNO pays for the power it uses, leaving the ESCO to take on the entire commercial responsibility, making it a profitable business for them.

Different Models

There are two models that the industry currently uses for deploying renewable power solutions:

- In-house CAPEX Model.
- Outsourcing OPEX Model.

Equipment to Consider



In-house CAPEX Model

The CAPEX model is the most widely used model in the telecoms industry. In the CAPEX Model, the capital investment for the renewable energy equipment is made by the IP or MNO. The ROI (Return on Investment) and OPEX saving is higher in a CAPEX model, but the IP or MNO has to invest the entire CAPEX in this model, which makes it's scalability dependant on the funds the IP or MNO are able to allocate to the power equipment.

Sample CAPEX Model

As an example, if we consider:

- An existing site with a load of 1kW.
- Site has a 15kVA DG and it runs for 16hrs every day.

Assuming current fuel cost US$1.00/litre, fuel consumption for a DG 2lt/hr and solar PV costs $2.00/Wp. After a careful analysis, a solar hybrid system is dimensioned HOMER (HOMER is a software application for renewable solution dimensioning developed by National Renewable Energy Lab). Homer proposed 4kW PV, 1 string 1000Ah OPzS series battery, an 8kW converter and 120A controller. Using these estimates for the equipment and operating costs, the following results were calculated.

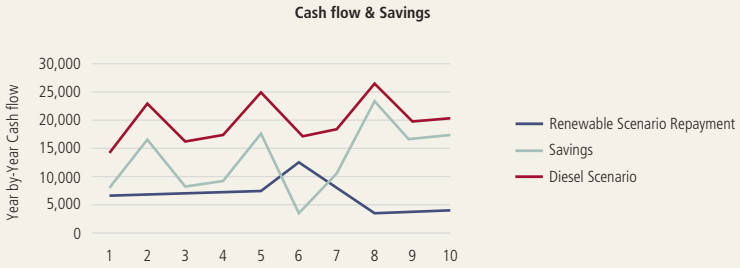
PV (kW)

	PV (kW)	DG (kW)	EOS 1000	Conv. (kW)	Initial Capital	Operating Cost ($/yr)	Total NPC	COE ($/kWh)	Ren Frac.	Diesel (L)	DG (hrs)
	4.00	12	24	8	$28,008	2,243	$40,683	0.750	0.53	2,150	780

CAPEX and OPEX Estimation

CAPEX		0	1	2	3	4	5	6	7	8	9	10
	PV	7,000	0	0	0	0	0	0	0	0	0	0
	Generator	4,000	0	0	0	0	0	0	0	0	0	0
	Battery	6,000	0	0	0	0	0	6,000	0	0	0	0
	Eng Service	3,500	0	0	0	0	0	0	0	0	0	0
	Controller	4,500	0	0	0	0	0	0	0	0	0	0
	Converter	3,000	0	0	0	0	0	0	0	0	0	0
	Total	**28,000**	**0**	**0**	**0**	**0**	**0**	**6,000**	**0**	**0**	**0**	**0**
OPEX												
	PV		100	100	100	100	100	100	100	100	100	100
	Generator		200	200	200	200	200	200	200	200	200	200
	Generator Fuel		1,720	1,830	1,950	2,070	2,200	2,340	2,500	2,670	2,820	3,010
	Converter		100	100	100	100	100	100	100	100	100	100
	Total		**2,120**	**2,230**	**2,350**	**2,470**	**2,600**	**2,740**	**2,900**	**3,070**	**3,220**	**3,410**

CAPEX and OPEX Estimation



Renewable Scenario Including Repayment	6,359	6,468	6,587	6,708	6,845	12,979	7,144	3,091	3,240	3,431
Diesel Scenario	14,090	22,674	15,287	15,931	24,607	17,317	18,062	26,845	19,667	20,530
Savings	7,731	16,206	8,701	9,223	17,763	4,338	10,919	23,754	16,247	17,099

For this Example, Financial Summary will be

PayBack	**1.91**
ROI	**45%**
IRR	**124.2%**
NPV	**$55.,234**
Discount Rate	**12%**

All figures are in US$

Process Flow for In-house CAPEX Models

The following steps are what an IP should follow to deploy a renewable power solution through an In- house CAPEX model:

- Site survey and technical dimensioning.
- RFP circulation.
- Vendor selection for equipment supply.
- Operation & Maintenance partner selection.
- Agreement.
- Implementation.
- Operation.
- Control and monitoring.

Site Survey and Technical Dimensioning

The IP has to conduct an explicit survey to their target sites to identify the site situation. Based on the survey, technical dimensioning should be prepared. The technical dimensioning should balance the CAPEX cost and the OPEX savings. In order to do that, the technical team should have enough experience dealing with such technology and creating business models as this will allow them to examine all the possibilities and find the right balance to suit the IP's needs. A third party consultant can also be hired for this activity.

RFP Circulation

Once the survey and technical dimensioning are done, a RFP can be launched based on the technical specifications of the solution. The RFP should be outlined with:

- Technical expectation for each individual equipment.
- After sales support from a vendor.

Vendor Selection for Equipment Supply

Before selecting a vendor the IP should do an extensive technical analysis of all the products being proposed by the various vendors. Proven products should ideally be chosen for renewable power deployments given the high demand on reliability of the telecom industry.

Operation and Maintenance Partner Selection

O&M is a crucial part of a renewable energy deployment. An O&M partner should be selected at the beginning of the project. In many cases the equipment vendor will also be the O&M partner for the project. When validating an O&M partner a few of the key criteria should be for the partner to have the technical experience to operate and maintain the equipment, industry knowledge, a proven track record of reliability and local knowledge and the ability to be able to handle possible logistic issues that may arise.

Agreement

For the CAPEX model, there may be two agreements. One with an equipment vendor and another with the O&M service provider. The agreement with the equipment vendor typically has two major focus areas; supply of equipment and an Annual Maintenance Contract (AMC) for the supplied equipment. The agreement with the O&M service provider will mainly focus on O&M processes and SLAs (Service Level Agreement). On many occasions the equipment vendor acts as the O&M service provider. The IP should consider imposing a penalty clause if the supplied equipment does not perform as committed, or if the O&M service does not meet the SLA.

Implementation

In most cases the equipment vendor will also be responsible for the implementation. However, it is important that the IP takes control of the project monitoring process and manages the progress. Some of the key things to be considered should involve:

- Ensuring that the implementation is done in phases so that IP can efficiently utilise their available resources, overcome any weaknesses that they (or the ESCO) may have, as well as ensuring proper control over the project.
- A specific time-plan has to be agreed between parties for each phase of deployment.
- An Acceptance Test has to be formalised.

Operation

Operation is the most crucial part of CAPEX model deployment. Some of the operational field issues may prevent the project from being successful. Therefore, the IP has to be very careful while preparing the operational plan for renewable sites. Some of the key points to keep in mind are:

- An intelligent controller should be used at the site.
- Set a minimum number of times the O&M partner should visit the site.
- SLA for individual components (PV, Battery, DG, Controller, rectifier etc.) should be agreed. If any of these components are down or malfunctioning then the O&M partner should be responsible for that and be penalised.
- Site security should be the responsibility of the O&M partner.
- The site security guard should live within the security fence 24hrs/a day.
- The security supervisor, who will supervise the individual security guards, should be appointed for every cluster/area.
- In the event of fuel theft/pilferage, the primary investigation should be done by the security supervisor and the security guard should be replaced immediately.
- The security guard should not be provided with any keys other than for the front gate.
- The O&M partner should maintain a strict log-book of all their activities.
- Diesel refuelling should be done by the O&M partner.

It is essential that the IP sets a strict O&M process otherwise the OPEX saving potential, by implementing a renewable solution, may not be achieved.

Monitoring and Control

The IP should set a specific process to monitor and control the site. Some of the key areas that require extra attention are:

- A site performance data collection process has to be set.
- Performance data collection should be automated where possible.
- Site performance data should be collected at regular intervals.
- Site performance data should be transmitted real time to the Network Operation Centre (NOC).
- Performance data collection mechanisms/ automation tools should not be tampered with.
- Monitor energy contribution of individual equipment throughout the year.
- Monitor diesel fuel level on a real-time basis.
- Closely monitor DG usage and the reason for its usage.
- Security supervisors should report 2-3 times a week on the performance of site guards.
- A site performance analysis process needs to be set to identify operational challenges.
- A mitigation plan should be made for every site operation challenge.

Besides the above, a NOC should be set to monitor the site performance in real time. The performance monitoring should be both for individual sites and for the entire network.

Outsourcing OPEX Model

The telecom industry is currently evolving models to outsource the power generation for telecom sites. It helps the IP to reduce dependency on diesel generators without having to invest the capital for renewable energy solutions. Since power generation and maintenance is not the core competency for IP, outsourcing the power generation will help the IP to get rid of the challenges associated with power. The concept of an Energy Service Company (ESCO) has been introduced to the telecoms industry to facilitate the outsourcing model.

Different Outsourcing Models

- Operating lease or monthly flat fee outsourcing model.
- Power Purchase Agreement (PPA) model.
- OPEX saving recovery or Energy Savings Agreement (ESA) model.

In an operating lease or monthly, flat fixed fee structure the ESCO would own, install, operate and maintain the renewable energy equipment and provide power to the operator's site for a fixed monthly cost. In addition to capital expense being the responsibility of the ESCO, it stabilises the IP's OPEX associated with power so it is no longer a variable part of the budget.

A PPA Model is where the ESCO owns, installs and maintains the renewable energy power system and sells power to the IP or MNO at an agreed per kilowatt-hour rate. The main benefits of a PPA to the IP or MNO are that the payments for energy are an operating expense. The operator is only paying for the power they use and the financing of the power equipment is the responsibility of the ESCO. In this type of arrangement the IP must typically commit to a minimum take or capacity payment or otherwise assume the risks of energy load levels.

An OPEX saving recovery or ESA is where an ESCO installs the renewable energy system, and operators pay based on a portion of verified energy cost "savings". The key component to the ESA is the operator payment formula which will determine how much of the saving will be passed through to the operator and how much will go to the ESCO to recover the capital cost of the equipment. This formula, to split the saving, will sometimes change at an agreed time during the term of the contract.

Operating Lease or Monthly Flat Fee Model

In an operating lease, the ESCO bears the financial risk of OPEX increases for any of the power sourcing components. For any given power requirements the ESCO is required to provide uninterrupted power (99.95% power availability) for the entire duration of the contract. While calculating the monthly fee, ESCO usually has an implied margin of 10% – 15% on its cost. In addition, the ESCO has to be careful while considering all possible operating costs as some can be unpredictable (i.e. diesel fuel cost etc.) Since this model precisely triggers a specific power requirement of telecom equipments, the ESCO gets the monthly fee regardless of whether or not the telecom equipment consumes maximum power. For a similar sample site as before, with 1kW power requirement, and the same technology and technical dimension of the CAPEX model, the year-by-year cash flow for the ESCO will be:

Year-by-Year Cash Flow for the ESCO will be

	0	1	2	3	4	5	6	7	8	9	10
Total Cost for ESCO	-7,500	-5,237	-5,346	-5,465	-5,586	-5,723	-11,857	-6,022	-6,188	-6,337	-6,528

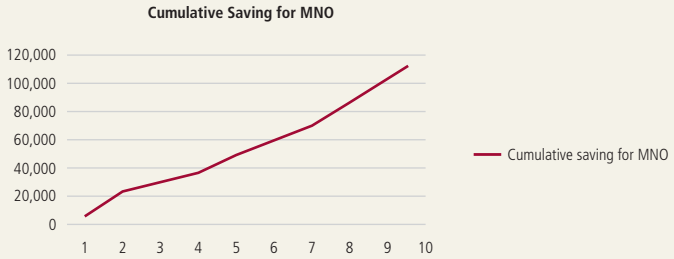
For an Operating Lease, the Estimated Flat Fee for the ESCO will be

Implied Margin	15%
Annual Fee	8,256
Monthly	688

Cash Flow for the IP in the Operating Lease or Monthly Fee Model

	1	2	3	4	5	6	7	8	9	10
MNO Cash Flow	8,256	8,256	8,256	8,256	8,256	8,256	8,256	8,256	8,256	8,256

However, the IP or MNO will Still have a Significant Saving Compared to the Current Diesel



Cumulative Saving for MNO	5,834	20,253	26,784	34,460	50,811	59,373	69,179	87,769	98,680	110,954
Cumulative Saving for MNO in %	41%	55%	52%	51%	55%	55%	54%	57%	57%	57%

All figures are in US$

Cumulative Savings

Cumulative Savings To MNO In %	41%	55%	52%	51%	55%	55%	54%	57%	57%	57%

For this Model, the ESCO's Financial Summary will be as Follows

PayBack to ESCO	2.59 yrs
ROI to ESCO	39%
IRR	27.5%
NPV	$11,404
Discount Rate	12%

Power Purchase Agreement Model

The PPA is a more complicated model. In this model, the IP pays for power on a per kilo-watt hour (kWh) basis for the exact usage of power. The rate for per kWh may become more difficult to calculate as the market scenario may change over the 10 years of the business case. The key to implementing this model successfully is aligning the per kWh price expectations of the IP with the rate that the ESCO is able to provide. It should always be remembered that the per kWh rate may not be as competitive as commercial grid power as the power generation is a renewable energy source. Due to the distributed model, and the O&M cost for ESCOs, it is costly to maintain the required uptime demanded by the telecoms industry.

Considering the same sample site again, with a 1kW load and the same technical solutions, the generic year-by-year cash flow for ESCOs will look like this:

Cash Flow for the IP in the Operating Lease or Monthly Fee Model

	0	1	2	3	4	5	6	7	8	9	10
Total Cost for ESCO	-7,500	-5,237	-5,346	-5,465	-5,586	-5,723	-11,857	-6,022	-6,188	-6,188	-6,528

If the IP requires 10% of extra power on top of the current side load:

Power Requirement Per Annum (kWh)	**9,636**

From an investment perspective, 25% is a desired IRR value. To achieve that, an estimated price for power will be: **$0.85/kWh**

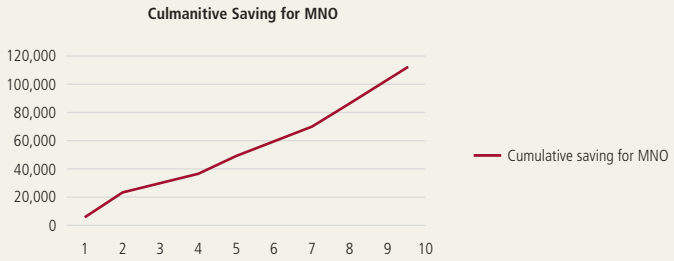
The Estimated Cash Flow for the IP will be

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

NB. the cash flow may be different if site load increases

The MNO will still be saving OPEX in comparison to the current diesel solution:

Cumulative Savings for MNO



Culminative Saving for MNO	5,899	20,383	26,979	34,720	51,136	59,763	69,634	88,289	99,265	111,604

Cumulative Savings

Cumulative Savings for MNO in %	**42%**	**55%**	**52%**	**51%**	**56%**	**55%**	**55%**	**57%**	**57%**	**58%**

All figures are in US$

For a PPA Model, The ESCO's Financial Summary will be as Follows

PayBack to ESCO	2.61 yrs
ROI to ESCO	38%
IRR	26.2%
NPV	$11,037
Discount Rate	12%

OPEX Saving Recovery or Energy Savings Agreement Model

In this model, a 3rd Party ESCO invests the CAPEX for renewable energy solution and implementation. After the implementation, the ESCO measures how much the energy OPEX has been reduced due to renewable energy power implementation. The difference between the OPEX and current OPEX is calculated to determine the gross savings. The ESCO will receive a percentage of the OPEX savings value from MNO.

Some of the difficulties of this model are:

- It is challenging to identify actual OPEX savings. In order to do that, an ESCO must observe the current OPEX due to the diesel-based solution, and then observe the OPEX for a renewable solution.
- Sometimes unavailability of the current energy OPEX can lead to delays in deployment as progression cannot be made until the ESCO has examined the current energy OPEX.
- If the energy requirement at the site increases, it becomes very difficult for the ESCO to measure the OPEX saving.

Taking the CAPEX Model Example Again

	1	2	3	4	5	6	7	8	9	10
Renewable Scenario Including Repayment	6,359	6,468	6,587	6,708	6,845	12,979	7,144	3,091	3,240	3,431
Diesel Scenario	14,090	22,674	15,287	15,931	24,607	17,317	18,062	26,845	19,667	20,530
Savings	7,731	16,206	8,701	9,223	17,763	4,338	10,919	23,754	16,427	17,099

From the figures above, we can see that there is an OPEX saving each year. In an ideal case, if the ESCO returned 50% of the saved OPEX, the ESCO's net revenue would be:

The Estimated Cash Flow for the IP will be

	1	2	3	4	5	6	7	8	9	10
ESCO Revenue	3,865	8,103	4,350	4,611	8,881	2,169	4,560	11,877	8,214	8,550

Process Flow for the Outsourcing Model

From an overall industry point of view, below are the steps an IP should follow to outsource power:

- RFP preparation with all requirements.
- ESCO partner selection.
- Agreement.
- Implementation.
- Operation.
- Control and monitoring.

RFP Preparation

For the ESCO outsourcing model, articulating an RFP is the first and most important step for the IP. The RFP should be outlined with:

- Objective from the project.
- Technical expectation for the ESCO.
- Financial expectation from the project.
- Deployment sizing.
- Expected operational process from the ESCO.
- Control, monitoring and evaluation processes.
- The ESCO's previous track record and financial strength.

Since ESCO will prepare proposals based on the RFP outline, it is important that the Infrastructure Provider documents its complete requirements through the RFP. Otherwise the ESCO may not be able to prepare a comprehensive proposal.

ESCO Partner Selection

Choosing the right ESCO for renewable power generation is the most important part in the outsourcing model. As the telecoms industry is a customer service provider, power availability should be 99.95% to ensure the telecom network elements are providing a seamless service. For this reason the partner ESCO should have the capacity to provide an extensive service. Below are some of the key cross-check points for the IP, before selecting any ESCO, as their renewable energy power outsourcing partner:

- Benefit outlined for IP at proposal stage.
- Background and current activities of the ESCO.
- Financial liability & strength of the ESCO.
- Field outreach of the ESCO.
- Methodology to identify proper solution and dimensioning of solution.
- Commitment for a strict SLA.

Agreement

Apart from the standard legal clauses that usually come in an agreement, some of the areas that require special attention for an ESCO outsourcing contract are:

- Duration of agreement.
- Minimum usage definition set for PPA.
- Service Level Agreement.
- Penalty clauses.
- Penalty relaxation clause.
- Exit clause.
- Asset ownership.

Duration of Agreement

Since the ESCO outsourcing model bears large financial risk by nature, the ESCO will always ask for a long term agreement. On the other hand, as the industry will be re-shaping in the next few years, the IP may not be interested in restricting themselves to a long term agreement. From an overall industry prospective, 7-10 years can be a good duration for an ESCO outsourcing model. It will give enough room for an ESCO to repay its debt and overcome all financial risks. Over the term of the agreement, regardless whether or not the service costs remain the same, need to be well judged to make the model sustainable.

Minimum Usage Definition Set for PPA

If the IP and ESCO agree to a Power Purchase Agreement (PPA), there should be a definition for minimum power consumption at each site. No matter whether IP consumes that much power or not, they will pay for it. For example, for a site with 1kW load, a minimum energy requirement definition will be set for 24x1 kWh of power. If for any reason, the IP does not consume 24kWh power, the IP will still be obligated to pay the amount of 24kWh to the ESCO. Conversely if the IP consumes higher than 24kWh, a regular per kWh rate will be applicable. Since the ESCO will be bearing all the risk associated with CAPEX and OPEX, they should have a minimum guarantee of energy usage by IP.

Service Level Agreement

The IP requires an extensive Service Level Agreement (SLA) from the ESCO to maintain maximum uptime of telecom network equipment. To agree on such an extensive SLA is a big challenge for ESCO, especially those who are new in the market place. Some of the identified areas that are more sensitive and require scrutiny are:

- 99.95% power availability.
- Site security.
- Damage and theft recovery.
- Re-fuelling.

Penalty Clause

The IPs are usually under a penalty clause with MNO. If MNO's services are interrupted due to any reason associated to IP's scope, the IP has to pay penalty for revenue loss to the MNO. In most of the cases, the main reason of such service interruption is due to power unavailability and site security. Since both of these two activities will be outsourced to the ESCO, the penalty cause may transmit to ESCO. In the agreement, it has to be clearly stated how the penalty can be enforced. It is also important to select a right partner ESCO that has a strong financial record to be able to bear the potential penalty.

Penalty Relaxation Clause

While starting a new business model, both predictable and unpredictable difficulties may arise. The ESCO has to deal with whatever situation may arise. Sometimes it becomes extremely difficult for the ESCO to provide the agreed service from day one as there will be a transition period. Since any deviation from SLA may have a sizable penalty for the ESCO, the business model may not be attractive to ESCO if the penalty clause is imposed from the outset. A specific duration of time can be allowed for the ESCO to fine-tune any of their shortcomings to provide the agreed SLA, and ESCO should get a penalty free duration after installation. It can be for two weeks or for two months. This will give enough time to the ESCO to overcome any technical or non-technical difficulties they may be facing.

Exit Clause for the Renewable Outsourcing Model

The exit clause for any contract may become a crucial point to settle in the ESCO outsourcing model. Since there are so many different variables and uncertainty, creating an exit clause for this deal may become tricky. The exit clause may require for various situations to have occurred. While preparing agreement, both parties have to be reasonable to articulate an exit clause. From industry aspects, an exit clause may be applicable if:

- The ESCO fails to start providing service on time.
- The ESCO is unable to meet the SLA repeatedly.
- Commercial power becomes available at the site and if commercial power price is substantially cheaper than the ESCO outsourcing model price.
- The IP repeatedly fails to pay energy bill on time etc.

Please note, the exit clause may be applicable for an individual site or for all the sites covered in the agreement.

Asset Ownership

Typically in the ESCO outsourcing model, assets on site contributed by the IP remain in their balance sheet, and the assets on site contributed by the ESCO remain in their balance sheet. At the time of exiting the agreement, the IP can take ownership of the ESCO's assets deployed on the site at depreciated price, or the ESCO can take out all of its installation. Usually it is stated in the agreement whether the IP has the first right to purchase the existing ESCO equipment on site. During the duration of the contract the passive assets, that are owned by the IP, may be used by the ESCO either for free for a predetermined leasing amount.

Implementation

Implementation is typically a responsibility of the ESCO. However, planning for implementation is equally important for the IP since their will be several internal tasks have to be completed before starting the power outsourced era. Some of the key implementation guidelines should be:

- Implementation should be done in phases, instead of deploying a large number of sites at one time.
- A specific time-plan has to be agreed between parties for each deployment phase.
- A site survey and selection should be done diligently.
- A specific Acceptance Test process has to be formalised.

During implementation the ESCO has to deal with a large number of challenges, such as:

- The specific technical dimensioning for each site.
- Verification of site information including the site survey.
- Non-cooperation from the local community.

Operation

Operation of the ESCO OPEX model is the most challenging part. In this model, the IP has no responsibility of site operation. All responsibility and liability goes to the ESCO. Therefore the ESCO has to be very careful while preparing the operation plan for OPEX model. In order to manage the site operations efficiently, these three areas should be looked at in depth:

- Site automation.
- Site security.
- Technical maintenance.

Site Automation

- Site should have an efficient automation system.
- The automation should be applicable for site controlling and monitoring.
- Automation should have uptime of 99.95%.
- Site technician will be responsible to make sure automation is working properly.
- Any tampering of automation should result in immediate dismissal of site technician.

Site Security (applicable for areas that require security)

- An independent but professional security guard should be appointed to each site.
- Site security guard should be living within the security fence for 24/7.
- Except for the entrance gate, the security guard should not be provided with any other keys.
- A security supervisor has to be appointed for every cluster or area. The security supervisor will be responsible for supervising individual security guards.
- Security guard will be responsible for any sort of theft or pilferage.
- Primary investigation of every fuel theft/ pilferage should be done by security supervisor. Security guard of the site should be immediately replaced after such incident.
- Diesel re-fuelling should be done under close supervision.

Site Technical Maintenance

- The ESCO should set a minimum number of times for its technician to visit the site.
- A strict SLA within the ESCO for individual components (PV, Battery, DG, Controller, rectifier etc.) should be fixed. If any of these components are down or malfunctioning, operations team of ESCO should be responsible and penalised.
- The ESCO should maintain a strict log-book for all their activities.

The ESCO outsourcing OPEX model will only be successful if it can maintain a strict and efficient operational process. Otherwise the model may not be successful.

Control and Monitoring

Control and monitoring is one of the key areas the ESCO should be very attentive to from the beginning. A specific data collection and data analysis process should be set. This will allow the ESCO to monitor its performance and trigger a mitigation process for underperforming areas. Some of the key suggestions include:

- A site performance data collection process has to set.
- Performance data collection should be mainly automated.
- Site performance data should be collected after every specific interval.
- Monitoring of the energy contribution of individual equipment throughout the year.
- Monitor diesel fuel level on real-time basis.
- Closely monitor DG running and reason for the DG running.
- A site performance analysis process has to be set to identify operational challenges.
- A mitigation plan should be made for every site operation challenge.

A remote monitoring facility should be in-built with a controller and the controller should be able to provide a visual output.

To monitor real-time site performance, ESCO should have a Network Operations Centre (NOC). The NOC should be monitoring individual sites. Below is a sample site monitoring platform's snapshot from Flexenclosure:

Conclusion

CAPEX model is widely practised in the telecom industry. As the IRR of this model is higher, IPs may prefer to go for this model. In case the site load is lower, a higher ROI can be achieved which gives increased benefit to the IP. However, this model requires the IP to invest the full CAPEX which may be challenging. After deployment, operation and maintenance of such sites becomes another challenge for the IP. The CAPEX model can be implemented completely by the existing IP team. But to avoid the complexities of overheads costing and site operation and maintenance, many IPs prefer to outsource the implementation and O&M part to a third party.

On the other hand, the market is gradually moving towards an OPEX model due to various reasons. Since the OPEX model gives financial and operational flexibility to the IP, there is an increasing interest to outsource their energy requirements and related operations to an ESCO partner. Though the OPEX model is better for the IP, it may turn into a difficult model for the ESCO since they have to take all the financial and operational risks and responsibilities. The Indian telecom market is large in nature. The number of off-grid and unreliable grid is comparatively high. If an ESCO can come-up with a strong and effective business case, OPEX model can be a very profitable business for them. However, ESCO should be very careful while developing operational processes. The more efficient they are able to be with the site management the greater the margin they will be able to achieve.

Renewable energy will be scalable in the Indian telecom market only if a strong and flexible business model can be established. The CAPEX model may still lead the market unless ESCO players come up with a competitive business case (and pricing) and are able to demonstrate their reliability. Due to increasing fuel costs, operational challenges, government & social pressures, but decreasing ARPU, Mobile network operators have little choice but to force IPs to reduce the OPEX costs associated with power. One of the main ways an IP can do this is by outsourcing the energy side of things to a 3rd party who is specialised in energy management. Eventually this outsourcing may happen for a large percentage of off-grid and unreliable grid sites.

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