

BOS Practice Notes

Green Energy
Solar Solutions
By UNDP



March 2021

Introduction & Background

The Business Operations Strategy (BOS) is a results-based framework that focuses on joint business operations to eliminate duplication, leverage the UN's common bargaining power, and maximise economies of scale. The Secretary-General mandates all United Nations Country Teams (UNCTs) to comply with an improved BOS by 2021 to support more effective programme delivery on the 2030 Agenda.

Developing a BOS provides an opportunity for UNCTs to increase and improve sustainable development practices, bringing the UN a step closer to achieving the SDGs. OMTs are strongly encouraged to integrate environmental sustainability considerations for all common services at the earliest opportunity to enhance resource and cost efficiencies of UN operations and limit adverse impacts on the local environment.

SDG number 7, Affordable and Clean Energy, has been adopted and set as a priority by many member countries in the UN. With this in mind, there is a need to have a well-defined process to ensure quality outputs, effective project implementation, and the need to achieve affordable and clean energy for everyone.

To successfully reach greening efforts and strengthen local capacity on sustainable energy in UN Agencies, the Green Energy Team from UNDP's Information Technology Management (ITM) proposes implementing Solar Solutions like Street Lights, Solar Water Pumps, and Solar Home Kits for Staff and Field Missions. The Green Energy Team suggests using the 7-Step Process for Green Energy to implement these solutions.

The 7-Step Process is a tried-and-true process that offers multiple benefits:

- Gives unparalleled advice and support on energy optimisation and solar system solutions;
- Generates a comprehensive picture of UN Agencies' consumption
- Unlocks UN Country Teams' full potential for energy sustainability
- It is a standardised process that enables an effective and sustainable deployment of renewable sources around the world
- Has been recognised as best-practices by UNDSG (formerly UNDG) for solar implementation, and the Joint Inspection Unit (JIU) for UN-wide adoption

Through the deployment of Solar Hybrid Systems for clean energy production, the Green Energy Solar Solution common services for the BOS support the need to achieve SDG 7 and also to advance:

SDG 6: Clean Water and Sanitation,

SDG 8: Decent Work and Economic Growth

SDG 9: Industry, Innovation, and Infrastructure

SDG 11: Sustainable Cities and Communities

SDG 12: Responsible Consumption and Production

SDG 13: Climate Action

Aligned with the BOS goals, implementing the 7-Step Process will help eliminate ambiguities and present clear milestones to implement solar solutions from the project's inception to final commissioning. It enables effective and safe deployment of renewable sources in the respective facilities for normal operations and crises such as the COVID-19 pandemic.

Objectives of the practice

This Practice Note offers guidance to UNCTs and OMTs to implement solar solution common services through the Green Energy Team's 7-Step Process. This process represents a movement towards a more sustainable future through a commitment to carbon reductions and the development of a socially inclusive global environment. It is developed to support UNCTs (including projects) in implementing green energy solar solutions, starting from conducting assessment and data collection to project commissioning and operation and maintenance.

An objective of the Green Energy common services is to build local capacity in the country for the Implementation of Renewable Energy Solutions, which is key to success on the organisation's mandate, interconnecting technologies and people in pursuit of economic and social development, and inspiring other players to enable widespread adoption.

UNDP ITM's Green Energy Team has developed a product and service portfolio that equips UNCTs to advance various SDGs. The design and installation of Solar Hybrid Systems through a well-defined 7-Step Process, Green Energy Solar Solutions include the following:

1. **Solar Street Lights:** harnesses renewable resources to increase the security of a specific area, providing autonomy of at least two consecutive nights when fully charged. Stand-alone Solar Street Lights can be procured as part of greening efforts to provide sustainable solutions for unreliable and unsustainable power supply. Solar Street Lights include the modules and a battery for energy storage, with an autonomy of at least two consecutive nights when fully charged.
2. **Solar Water Pumps:** ensures universal and equitable access to safe and affordable drinking water by replacing non-renewable power sources. Solar Water pumps' main goal is to provide affordable green energy to replace diesel generators currently being used for water pumping. The solar pump setup is based on Solar Pump + Solar Energy. The Solar System serves as the main source of energy to meet the energy requirements of the pumps.
3. **Solar Home Kits:** allows execution of business continuity plans of all UNCTs. This solution has been crucial during the COVID-19 pandemic, which demonstrated the importance of offering a solution to work from home without power supply interruptions. This product is a small solar power system with a battery that will be made available to power primary office equipment for working-from-home for staff in distinct locations who struggle to keep a good workflow due to continuous power supply interruptions.

Key stakeholders and partnerships

The 7-Step Process for Green Energy Solutions is already followed in most UNDP Country Offices, multiple UN houses, UN agencies like FAO, UNICEF, UNHCR, and other external humanitarian players. With the support and collaboration of all the stakeholders involved, the Green Energy Team has the experience to manage and lead the implementation of Solar Hybrid Systems and Solar Powered Products of UN premises.

The Green Energy Team supports field staff like ICT personnel, electricians, and green energy focal points, from the initial phase of data collection to the final operation and maintenance phase. Additionally, it works in continuous collaboration during the procurement phase with UNDP Procurement Service Unit (PSU) who centrally manages the Long-Term Agreements (LTAs) with different solar power providers. These LTAs with various vendors who provide international installations enables the team to streamline the greening process and deliver high-quality,

sustainable, transparent, and cost-effective solutions that will serve as showcases in UNCTs. Furthermore, ITM's approach emphasises engaging with local players in collaboration with these international vendors to create citizen-centric eco-systems.

Neither of these collaborations requires creating additional partnerships or special consideration, as the Green Energy Team has all the technical expertise and capacity to lead these activities for all UN premises.

Implementation of the Project/ Activity

For the Solar Solutions (Solar Hybrid Systems and Solar Powered Products), the UNDP ITM Green Energy Team has established a well-defined and tested 7-Step Process to ensure quality outputs and effective project implementation. The process's distinct steps meticulously define the requirements for each phase, spelling out documentation and activities that different stakeholders should provide.

The 7-Step Approach is a holistic end-to-end process, from the preliminary assessment of the feasibility to the post-installation operation & maintenance. The 7 steps are:

- 1. Step 1 – Energy Audit & Assessment using IoT:** Serves to collect all prerequisite information to draw up a sustainable solution for the compound. In this phase, each compound's energy consumption is monitored live through IoT sensors connected to the office's electrical circuit. The second part of the self-assessment consists of the Preliminary site survey App to collect all the relevant information required for a successful solar solution installation. If the previous options are not applicable, a technical mission from a qualified engineer can be used to complete this step, as well as load estimation based on the information provided by the UNCT.
- 2. Step 2 – Business Case:** Serves to provide essential information and data for decision-making. It is compiled using the information gathered during Step 1, which is entered into simulation software. This simulation analyses various solar system specifications to determine the optimal design that best fits the compound's conditions. The Business Case presents different options that contain a preliminary technical design of the energy facility and a complete financial and environmental analysis.
- 3. Step 3 – Procurement & Site Preparation:** This stage will begin once the UNCT or OMT approves the Business Case. At this point, vendors will be engaged, who will be contacted through UNDP's Procurement Service Unit (PSU). The compilation and publication of solicitation documents will be carried out according to UN rules as applied by PSU in such projects. The tender document will promote local partnerships to build local capacity. The requests are made for three years of operation and include maintenance and risk assessment and online monitoring of the system. Evaluation of bids or proposals will be carried out jointly between ITM, PSU, and, if needed, local staff focal point.
- 4. Step 4 – Site Survey:** The awarded vendor carries out an on-site survey to exhaustively consider all aspects that may adversely affect the project's implementation and information for the final costing of the project, including required materials, equipment, and time frames. The vendor acts as an implementer, working closely with a focal point at the local UNCT or OMT office when necessary and the Green Energy Team, exercising technical oversight and project management. The submission of the final Site Survey Report will mark the end of this step.
- 5. Step 5 – Design:** The selected vendor drafts the final system design, taking into consideration findings from the site survey in the previous step as part of technical

oversight. The ITM team must endorse the final design before the actual installation starts. The submission of the final design certified by the manufacturer and the implementation schedule marks the end of this step.

6. **Step 6 – Installation:** The installation step starts with a compilation of an implementation schedule, covering the shipment of equipment, assembling the team(s), and defining milestones, among other things. This step also covers system documentation, user acceptance (UAT), local staff training, and project commissioning to test and review the installation. The Installation process is carried out by the vendor and an on-site local partner with the Green Energy Team's constant oversight. A signed checklist confirming full compliance with all requirements marks the end of the step.
7. **Step 7 – Operation & Maintenance:** In this step, the supplier provides regular bi-annual maintenance and ITM Green Energy Team helpdesk services for first-level support and remote monitoring of the system. The objective is to ensure correct day-to-day operations and that the mid and long-term system performances are aligned with the

Each phase of the project is expected to be completed in the preliminary time frame outlined in the Gantt chart in [Figure 1](#). Please note this is an estimated timeline and can be affected due to several external factors.

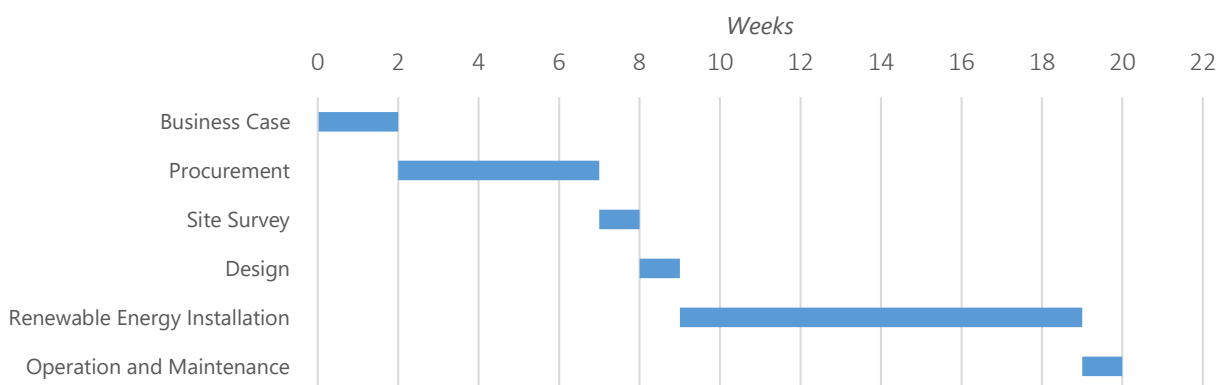


Figure 1: Estimated Timeline

The installation of the Solar Hybrid Systems and Solar Water Pumps should follow the complete 7-Step Process detailed above; however, Stand-alone Solar Street Lights and Solar Home Kits can be procured following a tailored version of the process, covering steps from:

1. **Solar Street Lights:**
 - i. Data collection
 - ii. Development of a Business Case
 - iii. Procurement of the solution
 - iv. Installation.
2. **Solar Home Kits:**
 - i. Procurement of the solution. This can be requested through ITM UNDP's e-Store, and the ITM team can support with recommending the best solution.

Expected Results & Outputs

Behind the 7-Step process, there are several resulting documents that support the full execution and the correct step by step implementation.

1. **Step 1 – Energy Audit & Assessment using IoT:** A more educated, informed, and responsible use of electricity and identification of potential for energy consumption reduction deriving from energy efficiency measures can be expected. Moreover, information such as the overall energy consumption (derived from the IoT sensors) as well as the **Preliminary Site Survey** will help develop a Business Case for locations that have the potential for solar PV solutions. Once having completed it, the local staff will be able to conduct a site survey for data collection or install IoT sensors for energy consumption purposes.
2. **Step 2 – Business Case:** A Business Case document is developed by the Green Energy team as an output of Step 2, presenting the technical, environmental, and economic assessment of the identified Green Energy solution.
3. **Step 3 – Procurement & Site Preparation:** A Terms of Reference (ToR) for the Solar Solution will be published, highlighting the technical requirements of the system. At the end of Step 3, and after completing all offers received, a Purchase Order will be signed with the awarded provider of the solution.
4. **Step 4 – Site Survey:** The awarded vendor will submit the Site Survey Report as a result of Step 4. It consists of a comprehensive document that compiles all the necessary information for the supplier to develop the final technical design.
5. **Step 5 – Design:** The Final Technical Design, along with Endorsement Letters issued by the manufacturers, are provided to ensure compliance with all technical requirements stated in Step 3.
6. **Step 6 – Installation:** The Project Plan, a signed checklist confirming full compliance with all requirements, and the installation of the Solar Solution, will mark the end of the Installation step, giving way to O&M. Training for local staff will be provided by the vendor after the installation to promote the development of the local workforce in Solar Solutions and their operation and maintenance.
7. **Step 7 – Operation & Maintenance:** The Green Energy Team produces a two-pager bi-annual report and shares it with the UNCT or OMT management, highlighting the system's performance, benefits accrued to date, and possible system improvements. As an additional output of this stage, the vendor carries out Bi-annual system maintenance visits.

In summary, the overall result will be a long-lasting and high-quality Solar Solution, efficiently and effectively implemented through the best practices 7-Step Process, which also delivers financial and environmental savings to the client. By following the 7-Step Process, apart from contributing to achieving the SDGs and meeting the commitments set by the organisation, it will build in-country local capacity, and the installation could inspire other players to follow suit.

Cost Factors

There are two cost factors to consider:

1. An estimated summary of costs for the 7-Step Process support and technical advice component from ITM's Green Energy Team, which will vary according to each approach
2. The actual solar solution or product selected

1. 7-Step Process: These cost factors are significantly low. If an agency or OMT pursued solar and renewable services on their own, the required time and risks of selecting an adequate and reliable provider, creating the niche expertise of the solutions, and having the UN specific follow-up would be much higher. The ITM Team has the scale, capacity, and expertise to ensure OMTs implement these services at the lowest cost, with the lowest risk, and achieve the highest success rate. Table 1 below includes the broken down costs according to the stages to be followed.

Table 1: Costing 7-Step Green Energy Solution

| Summary of Activities | Costing ¹ |
|---|---|
| Sizing of a Solar Solution - abridged business case (covering Step 1 and Step 2 partially) | \$990 USD flat fee |
| Compilation, presentation, and delivery of a complete Business Case (covering Step 1 and Step 2) | \$1,500 USD flat fee |
| Technical lead for all steps of the process for a turn-key solution, i.e., from Step 1 through to Step 7 | \$1,500 USD flat fee for the first \$20,000 of project cost plus 6% for any amount above US\$20,000, up to \$1m USD |
| | For projects above \$1m USD: 4% of project cost |
| Technical lead for a project with an existing business case, i.e., execution of Step 3 through to Step 7 ¹ | \$900 USD flat fee for the first \$20,000 of project cost plus 4% for any amount above \$20,000, up to \$1 m USD |
| | For projects above \$1m USD, 2% of project cost |
| On-site assessment and commissioning of completed system where client deems necessary (Activity highly recommended by UNDP) | Travel costs, DSA, and \$200 USD |

¹ Latest and updated prices are always reflected on UNDP e-Store.

2. A rough estimation of the projects' costs for each proposed solar solution is provided in Table 2. However, it is important to note that different locations and situations result in different costs. It is important to consider cost differences resulting from freight, installation, and civil works, and any other site-specific characteristic. The ITM Green Energy team stands ready to assist in the development of a Business Case to assess the actual investment required for the desired Solar Solution tailored to specific needs and constraints.

Table 2 - Project Costs - Rough estimations based on a given size

| Solar Solution example | Size | Costing |
|---|---------------------------|---------------|
| Small Solar PV Installation ² (without storage) | 50 kWp | \$80,000 USD |
| Medium Solar PV Installation (without storage) | 100 kWp | \$140,000 USD |
| Small Solar PV Installation (with battery storage) | 50 kWp 50 kWh | \$145,000 USD |
| Medium Solar PV Installation (with battery storage) | 100 kWp 100 kWh | \$270,000 USD |
| Solar Street Lights | Unit | \$2,080 USD |
| Solar Water Pump | Unit | \$27,400 USD |
| Solar Kit for Staff and Field Mission | Unit (320 Wp / 384 Wh) | \$473 USD |

¹ UNDP will perform basic checks and provide comments but will not take responsibility for system performance.

BOS Stages for Implementing these Common Services

As a first step to the implementation process, reach out to the ITM Green Energy Team and Identify the key common services that your team would like to adopt at helpdesk.green.energy@undp.org with a copy to itm.green.energy@undp.org.

The Common Service offered through the BOS for solar solutions is:

Table 1: Common Services for Green Energy Solar Solutions

| Service Line | Category | Service | Description |
|--------------|---------------------|--|---|
| Admin | Envi/Sustainability | Green Energy Solar Solutions (Solar Panels) | <p>This service offers the assessment, design, and installation of a Solar energy solution through the 7 Step Green Energy process, recognised as the best practice for solar implementation. It is an end-to-end process covering every step from data collection to the solution's installation and operation.</p> <p>The service includes: 1) assessing the energy requirements for the solar solution; 2) developing a Business Case: a technical, economic, and environmental analysis to allow for a well-informed decision; 3) procurement of the solution through a secondary bidding process; 4) installation; 5) commissioning of the system, and 6) Operation and Maintenance of the system for the first three years of its lifetime.</p> |
| Admin | Envi/Sustainability | Green Energy Solar Home Kits for Staff or Field Missions | This product is a small solar power system with a battery that will be made available to power primary office equipment for working-from-home for staff in distinct locations who struggle to keep a good workflow due to continuous power supply interruptions. This product can be requested through Information Technology Management (ITM) UNDP's eStore, and the ITM team can recommend the best solution. |
| Admin | Envi/Sustainability | Green Energy Solar Street Lights | Stand-alone Solar Street Lights can be procured as part of greening efforts to provide sustainable solutions for unreliable and unsustainable power supply. The selection of these products can be made following a tailored version of the 7 Step process, covering steps from 1) data collection, 2) development of a Business Case, 3) procurement of the solution, and 4) installation. Solar Street Lights include the modules and a battery for energy storage, with an autonomy of at least two consecutive nights when fully charged. |

| | | | |
|-------|---------------------|--------------------------------|--|
| Admin | Envi/Sustainability | Green Energy Solar Water Pumps | Solar Water pumps' main goal is to provide affordable green energy to replace diesel generators currently being used for water pumping. The solar pump setup is based on Solar Pump + Solar Energy. The Solar System serves as the main source of energy to meet the energy requirements of the pumps. The design and implementation of this solution follow the 7 Step process, covering every step from data collection to the solution's installation and operation. The service includes 1) the assessment of the energy requirements for the solar water pump solution, and 2) the development of a Business Case, 3) procurement of the solution, 4) installation, and 5) commissioning of the system. |
|-------|---------------------|--------------------------------|--|

Once the UNCT or OMT contacts the ITM team consider the following recommendations along the BOS stages of implementation:

1. Kick-off:

- a. Become familiar with the resources, webinars, and material on sustainable and renewable energy, Green Energy Team and the 7 Step Process in the BOS Library
- b. Determine the participating and hosting agencies for this service
- c. Become familiar with the local, and national legal or national incentives for renewable energy (many countries have incentives to apply renewable energy solutions)

2. Stock-take:

- a. Map the current and previous ways your UNCT and agencies already use renewable or sustainable energy practices and solutions
- b. Identify roadblocks, obstacles that these solutions have had in the past
- c. Identify current energy gaps and inefficiencies in your premises

3. Opportunity Analysis:

- a. Determine which common services you would like to consider for your premises
- b. Brainstorm ways to have the highest impact with the selected services (e.g., where can these services be implemented with the highest benefits, how can the benefits be maximised, what other collaborations can you seek to get these services implemented and funded)
- c. Identify partnerships or available channels of collaboration with organisations advocating for renewable energy

4. Cost-Benefit Analysis:

- a. All the Solar Solutions have a simplified CBA
- b. Determine the one-time and recurring costs for the selected common services
- c. With the help of the ITM Green Energy team, determine what the expected cost-avoidances could be
- d. Determine the break-even point for the common service

5. Planning Framework:

- a. Prioritise to implement the common services with the highest impact—in energy reduction and environmental sustainability—, and cost-avoidance
- b. Identify how the common services will be organised, implemented, monitored, evaluated, and reviewed

- c. Establish the KPIs cost, quality, and environmental that could be used as common metrics
- d. Create the baselines and targets for the service.
- e. Determine how much funding is required in your country's context and the level of UNCTs engagement and costs needed.
- f. Identify any funding opportunities to leverage for the implementation of the proposed plan

6. Implementation Plan:

- a. Establish a detailed list of activities that need to occur to implement this service
- b. Define a roadmap, timeframe, and timeline for implementation of the inclusive disability inclusion HR practices
- c. Establish what the suggested time durations for each activity are
- d. Finalise the budget for each activity
- e. Determine what the risks and assumptions are and propose risk mitigation approaches

7. Sign Off:

- a. Review the details of the plan, ensuring there is an owner for each common service and action
- b. Determine any final recommendations or suggestions for quality assurance before submission, in consultation with the ITM team
- c. During the BOS sign-off, brief the UNCT on these particular common services, how they contribute to cost-avoidance and the 2030 Agenda in numerous SDGs and environmental impact

8. BOS reporting and review:

- a. Review the targeted activities' implementation, timeframes, and report on efficiency gains, challenges, and lessons learned.
- b. Setting a minimum of bi-monthly or quarterly internal reviews are recommended to achieve the set targets.

Enabling factors and constraints

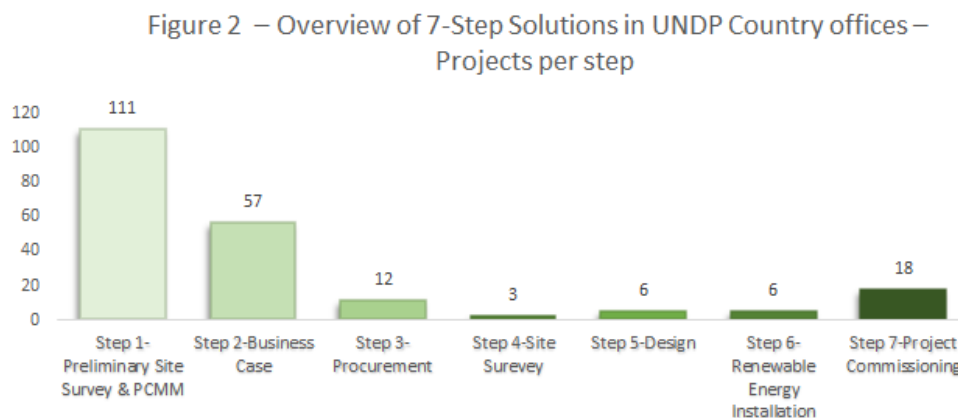
The 7-Step Process has been followed by UNDP ITM Green Energy Team in different locations since the outbreak of Ebola in 2014. Since then, ITM has been called upon by a number of UNCTs to assist in green energy solutions. With several tools now in place to effectively provide support across the organisation, the team is capable and has hands-on experience in deploying these types of activities.

In order to implement a Solar Hybrid System or deploy Solar Powered Products, it is highly recommended that the IoT devices used in Step 1 be already installed, as this helps to fast-track the process. If data is collected for a long time (at least six weeks), the analysis of requirements provides more quality and results in more fact-based as opposed to extrapolation and making assumptions.

When it comes to necessary resources to ensure a high-quality solution, the project would need at least a technical support or local staff focal point available on site for the successful completion of the project since they are likely to have a better understanding of specific information and therefore offer better first-level support. From the Green Energy Team side, a project manager will be assigned who will coordinate the project implementation and the rest of the stakeholders (awarded supplier, local partner, PSU, and on-site focal point).

Many Country Teams have expressed interest in adopting sustainable green energy for their operations, in line with corporate commitments on reducing greenhouse gas (GHG) emissions. Figure 2 below, extracted from one of the ITM online tools, gives an overview of the numbers of projects at each step of the 7-Step Process.

Figure 2 – Overview of 7-Step Solutions in UNDP Country offices – Projects per step



As reflected in the figure above, there are a number of potential Business Cases (Step 2) that have stalled due to funding challenges. Corporate efforts to push these to the next steps would go a long way in enhancing the organisation's chances to meet commitments made on GHG emissions. With tools and processes in place, ITM is well set to fulfil the mandate if funding is made available.

Together with the lack of funding, the non-ownership of the UN premises and the need to look for all tenants' acceptance in multi-agency compounds will constitute one of the biggest constraints for the project implementation.

Sustainability and replicability

The implemented Solar Solutions will be long-lasting and provide accumulative benefits after installation. Consuming less electricity, having financial savings, or supplying energy with renewable resources are directly leading towards a more sustainable operation at UNCTs.

The 7-Step Green Energy Solution removes the need of engaging external consultant(s) for the project implementation, who may not be available for ongoing support, while significantly reducing costs associated with engaging an external consultant by directing these funds towards the actual installation.

Having the Green Energy Team constantly involved in the process adds value by ensuring alignment with corporate standards for any proposed system or recommendations. The Green Energy Team's involvement is also an opportunity to become familiar and relate more closely with the situation on the ground and offer better technical support during the implementation of the Solar Solutions.

The only specific requirements for the implementation of the Solar Solutions following the 7-Step Process are the available funding, willingness from all tenants, and a potential location for the Solar PV installation. Once these requirements are met, the process can be applied and tailored to fit the conditions of any location, therefore making this service line easily replicable.

With the 7-Step Process completed, local staff will be able to conduct a site survey for data collection, all the way to implementing project management best practices and carrying out operation and monitoring of solar PV solutions. In the long term, the knowledge obtained can be used in the deployment of projects wherever required within the UNCT. This can also facilitate any remote support that ITM engineers provide to UNCTs and help speed up the implementation time.

Cost Factors

There are two cost factors to consider:

1. An estimated summary of costs for the 7-Step Process support and technical advice component, which varies according to each approach.
2. The actual solar solution or product selected.

1. **7-Step Process with IMT's Green Energy Team:** These cost factors are significantly low. If an agency or OMT were to pursue solar and renewable service solutions on their own, without the support of the IMT, the required time and risks of selecting an adequate and reliable provider, creating the niche expertise of the solutions, and having the UN specific follow-up would be much higher. The ITM Team has the scale, capacity, and expertise to ensure OMTs implement these services at the lowest cost, with the lowest risk, and achieve the highest success rate. Table 1 below includes the broken-down costs according to the 7-Steps to be followed.

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development of a Business Case to assess the actual investment required for the desired Solar Solution tailored to specific needs and constraints.

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Conclusion

The 7-Step Green Energy Solution, which has been recognised as best-practices by UNDSG (formerly UNDG) for solar implementation, is a holistic approach that has been structured in seven distinct steps that enable a sustainable deployment of not just Solar Hybrid Systems but also other products such as Solar Street Lights, Solar Water Pumps and Solar Home Kits.

The main objectives of the process are to build the local capacity of UNCTs for the Implementation of Renewable Energy Solutions, interconnect technologies and people in pursuit of economic and social development. These targets are expected to inspire other agencies of UNCTs to enable widespread adoption.

The Green Energy Team, with the support and collaboration of all stakeholders involved, has the technical expertise, experience, and capacity to manage and lead the implementation of Green Energy Solutions of all UN premises.

Aligned with the BOS goals, these common services provide an opportunity for UNCTs to increase and improve renewable energy practices, bringing UN personnel and operations a step closer to achieving the SDGs.

If further information or any clarification is required, please contact the UNDP ITM Green Energy Team: Green Energy Helpdesk: helpdesk.green.energy@undp.org with a copy to itm.green.energy@undp.org.