



REQUEST FOR PROPOSAL (RFP)

Full economic appraisal of the potentials of solar PV energy in Cambodia (Process 9753)

Dear Sir / Madam:

We kindly request you to submit your Proposal for **Full economic appraisal of the potentials of Solar PV energy in Cambodia.**

Please be guided by the form attached hereto as Annex B and C, in preparing your Proposal.

Proposals, **comprising of a Technical and Financial Proposal, in separate sealed envelopes**, must be submitted on or before **no later than 31 October 2018 by 12:00 pm, Cambodia time** address below. **Late submission shall be rejected. Submission by email will not be accepted.**

**UNDP Cambodia, Registry Office (Building No. 5)
No. 53, Pasteur Street, Boeung Keng Kang I
PO Box 877, Phnom Penh, Cambodia
Attn: Procurement Analyst, Procurement Unit**

Your Proposal must be expressed in the English Language, and valid for a minimum period of 120 days.

In the course of preparing your Proposal, it shall remain your responsibility to ensure that it reaches the address above on or before the deadline. Proposals that are received by UNDP after the deadline indicated above, for whatever reason, shall not be considered for evaluation. If you are submitting your Proposal by email, kindly ensure that they are signed and in the .pdf format, and free from any virus or corrupted files.

Services proposed shall be reviewed and evaluated based on completeness and compliance of the Proposal and responsiveness with the requirements of the RFP and all other annexes providing details of UNDP requirements.

The Proposal that complies with all of the requirements, meets all the evaluation criteria and offers the best value for money shall be selected and awarded the contract. Any offer that does not meet the requirements shall be rejected.

Any discrepancy between the unit price and the total price shall be re-computed by UNDP, and the unit price shall prevail and the total price shall be corrected. If the Service Provider does not accept the final price based on UNDP's re-computation and correction of errors, its Proposal will be rejected.

No price variation due to escalation, inflation, fluctuation in exchange rates, or any other market factors shall be accepted by UNDP after it has received the Proposal. At the time of Award of Contract or Purchase Order, UNDP reserves the right to vary (increase or decrease) the quantity of services and/or goods, by up to a maximum twenty-five per cent (25%) of the total offer, without any change in the unit price or other terms and conditions.

Any Contract or Purchase Order that will be issued as a result of this RFP shall be subject to the General Terms and Conditions indicated herein. The mere act of submission of a Proposal implies that the Service Provider accepts without question the General Terms and Conditions of UNDP in this link: <http://www.undp.org/content/undp/en/home/procurement/business/how-we-buy.html>

Please be advised that UNDP is not bound to accept any Proposal, nor award a contract or Purchase Order, nor be responsible for any costs associated with a Service Providers preparation and submission of a Proposal, regardless of the outcome or the manner of conducting the selection process.

UNDP's vendor protest procedure is intended to afford an opportunity to appeal for persons or firms not awarded a Purchase Order or Contract in a competitive procurement process. In the event that you believe you have not been fairly treated, you can find detailed information about vendor protest procedures in the following link: <http://www.undp.org/content/undp/en/home/operations/procurement/protestandsanctions/>

UNDP encourages every prospective Service Provider to prevent and avoid conflicts of interest, by disclosing to UNDP if you, or any of your affiliates or personnel, were involved in the preparation of the requirements, design, cost estimates, and other information used in this RFP.

UNDP implements a zero tolerance on fraud and other proscribed practices, and is committed to preventing, identifying and addressing all such acts and practices against UNDP, as well as third parties involved in UNDP activities. UNDP expects its Service Providers to adhere to the UN Supplier Code of Conduct found in this link : http://www.un.org/depts/ptd/pdf/conduct_english.pdf

Thank you and we look forward to receiving your Proposal.

Sincerely yours,



Kolap Hul
Operations Manager
17 October 2018

Description of Requirements

Context of the Requirement	Full title of consultancy Full economic appraisal of the potentials of solar PV energy in Cambodia
Implementing Partner of UNDP	UNDP
Brief Description of the Required Services	As per Term of Reference
List and Description of Expected Outputs to be Delivered	<ol style="list-style-type: none"> 1. Prepare Scoping Report including detailed work plan and briefing partners and stakeholders. 2. Conduct Analysis Brief Including key research inputs (quantitative and qualitative) that will support the analysis. 3. Prepare Draft Report Including components discussed above and estimated economic growth analyse. 4. Prepare Final Report.
Person to Supervise the Work/Performance of the Service Provider	Country Director of UNDP
Frequency of Reporting	Weekly report.
Progress Reporting Requirements	As and when required
Location of work	Phnom Penh, Cambodia
Expected duration of work	180-working days over a 12-month period
Target start date	From 15 November 2018 to 15 November 2019
Travels Expected	N/A
Special Security Requirements	N/A
Facilities to be Provided by UNDP (i.e., must be excluded from Price Proposal)	N/A

Implementation Schedule indicating breakdown and timing of activities/sub-activities	<input checked="" type="checkbox"/> Not Required															
Names and curriculum vitae of individuals who will be involved in completing the services	<input checked="" type="checkbox"/> Required															
Currency of Proposal	<input checked="" type="checkbox"/> United States Dollars															
Value Added Tax on Price Proposal	<input checked="" type="checkbox"/> Must be exclusive of VAT and other applicable indirect taxes															
Validity Period of Proposals (Counting for the last day of submission of quotes)	<input checked="" type="checkbox"/> 120 days In exceptional circumstances, UNDP may request the Proposer to extend the validity of the Proposal beyond what has been initially indicated in this RFP. The Proposal shall then confirm the extension in writing, without any modification whatsoever on the Proposal.															
Partial Quotes	<input checked="" type="checkbox"/> Not permitted															
Payment Terms ¹	<table border="1"> <thead> <tr> <th>No</th> <th>Deliverables/Outputs</th> <th>Payment amount</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Upon satisfactory completion of the Scoping report</td> <td>10%</td> </tr> <tr> <td>2</td> <td>Upon satisfactory completion of the Analysis Brief</td> <td>30%</td> </tr> <tr> <td>3</td> <td>Upon satisfactory completion of the draft report</td> <td>40%</td> </tr> <tr> <td>4</td> <td>Upon satisfactory completion of the final report</td> <td>20%</td> </tr> </tbody> </table>	No	Deliverables/Outputs	Payment amount	1	Upon satisfactory completion of the Scoping report	10%	2	Upon satisfactory completion of the Analysis Brief	30%	3	Upon satisfactory completion of the draft report	40%	4	Upon satisfactory completion of the final report	20%
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Person(s) to review/inspect/ approve outputs/completed services and authorize the disbursement of payment	UNDP Cambodia's Country Director															
Preliminary Examination	UNDP shall examine the Proposals to determine whether they are complete with respect to minimum documentary requirements, whether the documents have been properly signed, whether or not the Proposer is in the UN Security Council 1267/1989 Committee's list of terrorists and terrorist financiers, and in UNDP's list of suspended and removed vendors, and															

¹ UNDP preference is not to pay any amount in advance upon signing of contract. If the Service Provider strictly requires payment in advance, it will be limited only up to 20% of the total price quoted. For any higher percentage, or any amount advanced exceeding \$30,000, UNDP shall require the Service Provider to submit a bank guarantee or bank cheque payable to UNDP, in the same amount as the payment advanced by UNDP to the Service Provider.

	whether the Proposals are generally in order, among other indicators that may be used at this stage.															
Criteria for Contract Award	<p><input checked="" type="checkbox"/> Highest Combined Score (based on the 70% technical offer and 30% price weight distribution)</p> <p>The total score for each proposal will be calculated independently by the following formula:</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p><u>Rating the Technical Proposal (TP):</u></p> <p style="text-align: center;">TP Rating = (Total Score Obtained by the Offer / Max. Obtainable Score for TP) x 100</p> <p><u>Rating the Financial Proposal (FP):</u></p> <p style="text-align: center;">FP Rating = (Lowest Priced Offer / Price of the Offer Being Reviewed) x 100</p> <p><u>Total Combined Score:</u></p> <p style="text-align: center;">(TP Rating) x Weight of TP (70%) + (FP Rating) x Weight of FP (30%)</p> <p style="text-align: center;">Total Combined and Final Rating of the Proposal</p> </div> <p><input checked="" type="checkbox"/> Full acceptance of the UNDP Contract General Terms and Conditions (GTC). This is a mandatory criteria and cannot be deleted regardless of the nature of services required. Non acceptance of the GTC may be grounds for the rejection of the Proposal.</p>															
Criteria for the Assessment of Proposal	<p><u>Technical Proposal (70%)</u></p> <p>The Technical Proposal of the offerors will be evaluated based on the following criteria:</p> <p>The total number of points allocated for the technical proposal is 1000. The technical proposal of the offeror is evaluated based on following criteria:</p> <table border="1" data-bbox="630 1662 1560 1953"> <thead> <tr> <th>No.</th> <th>Summary of Technical Proposal Evaluation Forms</th> <th>Points Obtainable</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Expertise of organization</td> <td>250</td> </tr> <tr> <td>2</td> <td>Proposed Approach and methodology</td> <td>200</td> </tr> <tr> <td>3</td> <td>Proposed Personnel</td> <td>450</td> </tr> <tr> <td></td> <td>Total</td> <td>1000</td> </tr> </tbody> </table>	No.	Summary of Technical Proposal Evaluation Forms	Points Obtainable	1	Expertise of organization	250	2	Proposed Approach and methodology	200	3	Proposed Personnel	450		Total	1000
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	Total	1000														

No.	Technical Proposal Evaluation Form 1: Expertise of organization	Points Obtainable
1	Reputation of Organization and Staff / Size of the Organization/Credibility / Reliability / Financial stability	50
2	List of clients within the last 3 years	30
3	At least 5 years' professional experience in renewable energy research, policy, and investment particularly on solar PV.	50
4	Experience with quantitative analyses and reporting. Experience of similar assignments is a further advantage.	50
5	Experience working in developing country context. Experience writing the region is an asset.	50
6	Experience working with multilateral organization and the UN system is preferred.	20
	Total:	250

No.	Proposed Approach	Points Obtainable
1	To what degree does the Offeror understand the task? Have the important aspects of the task been addressed in sufficient detail?	100
2	Is the scope of task well defined and does it correspond to the TOR?	50
3	Is the presentation clear and is the sequence of activities and the planning logical, realistic and promise efficient implementation to the project?	50
	Total	200

No.	Proposed personnel	Points Obtainable
1	<p>Team Leader (1 person)</p> <ul style="list-style-type: none"> • Master, in economics or development economics, specialized in energy economics (PhD is an asset). (30 points) • At least 7 years' experience in economic analysis, including specific experience in renewable energy economics and in developing country contexts. (50 points) • Technical knowledge and proven research skills related to energy economics and/ or economic 	250

		<p>growth modelling. (40 points)</p> <ul style="list-style-type: none"> • Ability to use/ interpret modelling techniques, quantitative analyses, and evaluation methods (e.g. LCOEs, and SAM/CGE modelling, econometric methods). (40 points) • Experience in analysis/ qualitative research of high-level policies (20 points) • Ability to write and present in high quality English to both policy and technical audiences. (20 points) • Fulfilment of similar assignments and/ or knowledge of the Cambodian/ South-East Asian development context. (20 points) • Strong Publication record/ policy and/ or technical reputation. (30 points) 	
	2	<p>International Consultants/Analyst (1 person)</p> <ul style="list-style-type: none"> • Master's degree, in environmental engineering, environmental economics, energy or related fields. (30 points) • At least 5 years' experience in renewable energy economics and energy financing. (30 points) • Skill in research-based financial modelling including LCOEs. (30 points) • Knowledge about energy markets developing country contexts. (10 points) • Technical knowledge and proven research skills related to economic analysis and/ or economic growth modelling. (20 points) 	150

	<ul style="list-style-type: none"> • Ability to write and present in high quality English to both policy and technical audiences. (20 points) • Fulfilment of similar assignments and/ or knowledge of the Cambodian/ South-East Asian development context. (10 points) 	
3	<p>National Consultants /Analyst (1 person)</p> <ul style="list-style-type: none"> • Master’s degree, in environmental engineering, environmental economics, energy or related fields. (30 points) • At least 5 years’ experience in renewable energy economics and energy financing. (40 points) • Skill in research-based financial modelling and quantitative analyses. (20 points) • Knowledge about Cambodia and its energy sector. (20 points) • Technical knowledge and proven research skills related to economic analysis and/ or economic growth modelling. (20 points) • Ability to write and present in high quality English to both policy and technical audiences. Knowledge of Khmer. (10 points) • Fulfilment of similar assignments and/ or knowledge of the Cambodian/ South-East Asian development context. (10 points) 	150
	Total	550
<p>The minimum score required to pass the evaluation of technical proposal is 70% of the total obtainable score of 1,000 points.</p>		

	<p>Financial Proposal (30%) To be computed as a ratio of the Proposal's offer to the lowest price among the proposals received by UNDP.</p>
Post Qualification Review	<p>UNDP reserves the right to undertake a post-qualification exercise aimed at determining, to its satisfaction the validity of the information provided by the Proposer. Such post-qualification shall be fully documented and, among those that may be listed in the Terms of Reference, may include, but need not be limited to, all or any combination of the following:</p> <ul style="list-style-type: none"> a) Verification of accuracy, correctness and authenticity of information provided by the Proposer on the legal, technical and financial documents submitted; b) Validation of extent of compliance to the RFP requirements and evaluation criteria based on what has so far been found by the evaluation team; c) Inquiry and reference checking with other previous clients on the quality of performance on ongoing or previous contracts completed; d) Physical inspection of the Proposer's offices, branches or other places where business transpires, with or without notice to the Proposer; and <p>Other means that UNDP may deem appropriate, at any stage within the selection process, prior to awarding the contract.</p>
UNDP will award the contract to:	<input checked="" type="checkbox"/> One Service Provider
Type of Contract to be Signed	<input checked="" type="checkbox"/> Purchase Order <input checked="" type="checkbox"/> Contract Face Sheet (Goods and-or Services) UNDP (this template is also utilised for Long-Term Agreement ² and <i>if LTA will be signed, specify the document that will trigger the call-off. E.g., PO, etc.</i>)
Contract General Terms and Conditions ³	<input checked="" type="checkbox"/> General Terms and Conditions for de minimi contracts (services only, less than \$50,000) Applicable Terms and Conditions are available at: http://www.undp.org/content/undp/en/home/procurement/business/how-we-buy.html

² Minimum of one (1) year period and may be extended up to a maximum of three (3) years subject to satisfactory performance evaluation

³ Service Providers are alerted that non-acceptance of the terms of the General Terms and Conditions (GTC) may be grounds for disqualification from this procurement process.

Annexes to this RFP ⁴	<input checked="" type="checkbox"/> Form for Submission of Proposal (Annex 2) <input checked="" type="checkbox"/> Form for Submission of Financial Proposal (Annex 3) <input checked="" type="checkbox"/> Detailed TOR <input checked="" type="checkbox"/> Others ⁵ (General Terms and Conditions)
Contact Person for Inquiries (Written inquiries only) ⁶	<p>Sereyvattaana Chan Procurement Analyst Sereyvattana.chan@undp.org; and cc: procuremet.kh@undp.org</p> <p>Any delay in UNDP's response shall be not used as a reason for extending the deadline for submission, unless UNDP determines that such an extension is necessary and communicates a new deadline to the Proposers.</p>
Other Information: Required Documents for Submission	<p><input checked="" type="checkbox"/> Technical Proposal: Form for Submitting Service Provider's Technical Proposal is duly completed and signed as per Annex-B (the form would allow bidders to confirm its conformity with the requirements defined in the Request for Proposal and all its attachments, as well as the provision of UNDP General Contract Terms and Conditions required under this process) and complete the information and supporting document for Qualification of Service Provider, Proposed Methodology for Completion of Service, and Qualification of Key Personnel.</p> <p><input checked="" type="checkbox"/> Financial Proposal: Form for Submitting Service Provider's Financial Proposal is duly completed and signed</p> <p>Technical and Financial Proposals are submitted in separate sealed envelopes.</p> <p>No. of copies of Proposal that must be submitted: Original : 1 Copies : 1 1 CD ROM or USB drive containing of technical proposal should be submitted in the technical proposal envelop</p>

⁴ Where the information is available in the web, a URL for the information may simply be provided.

⁵ A more detailed Terms of Reference in addition to the contents of this RFP may be attached hereto.

⁶ This contact person and address is officially designated by UNDP. If inquiries are sent to other person/s or address/es, even if they are UNDP staff, UNDP shall have no obligation to respond nor can UNDP confirm that the query was received.

FORM FOR SUBMITTING SERVICE PROVIDER'S PROPOSAL⁷

(This Form must be submitted only using the Service Provider's Official Letterhead/Stationery⁸)

[insert: Location].
[insert: Date]

To: [insert: Name and Address of UNDP focal point]

Dear Sir/Madam:

We, the undersigned, hereby offer to render the following services to UNDP in conformity with the requirements defined in the RFP dated **10/17/2018** , and all of its attachments, as well as the provisions of the UNDP General Contract Terms and Conditions.

[Name of the Organization submitting Proposal].....
[Signature Authorized Person and Stamp]
[Name of Authorized Person].....
[Title of Authorized Person].....
[Date].....

⁷ This serves as a guide to the Service Provider in preparing the Proposal.

⁸ Official Letterhead/Stationery must indicate contact details – addresses, email, phone and fax numbers – for verification purposes

A. Qualifications of the Service Provider

The Service Provider must describe and explain how and why they are the best entity that can deliver the requirements of UNDP by indicating the following:

- a) Profile – describing the nature of business, field of expertise, licenses, certifications, accreditations;*
- b) Business Licenses – Registration Papers, Tax Payment Certification, etc.*
- c) Latest Audited Financial Statement – income statement and balance sheet to indicate its financial stability, liquidity, credit standing, and market reputation, etc. ;*
- d) Track Record – list of clients for similar services as those required by UNDP, indicating description of contract scope, contract duration, contract value, contract references;*
- e) Certificates and Accreditation – including Quality Certificates, Patent Registrations, Environmental Sustainability Certificates, etc.*
- f) Written Self-Declaration that the company is not in the UN Security Council 1267/1989 List, UN Procurement Division List or Other UN Ineligibility List.*

B. Proposed Methodology for the Completion of Services

The Service Provider must describe how it will address/deliver the demands of the RFP; providing a detailed description of the essential performance characteristics, reporting conditions and quality assurance mechanisms that will be put in place, while demonstrating that the proposed methodology will be appropriate to the local conditions and context of the work.

C. Qualifications of Key Personnel

If required by the RFP, the Service Provider must provide:

- a) Names and qualifications of the key personnel that will perform the services indicating who is Team Leader, who are supporting, etc.;*
- b) CVs demonstrating qualifications must be submitted if required by the RFP; and*
- c) Written confirmation from each personnel that they are available for the entire duration of the contract.*

FORM FOR SUBMITTING SERVICE PROVIDER'S FINANCIAL PROPOSAL⁹(This Form must be submitted using the Service Provider's Official Letterhead¹⁰)

[insert: Location].

[insert: Date]

To: [insert: Name and Address of UNDP focal point]

The Financial Proposal must provide a detailed cost breakdown. Provide separate figures for each functional grouping or category.

Cost Breakdown per Deliverable*

	Deliverables <i>[list them as referred to in the RFP]</i>	Percentage of Total Price <i>(Weight for payment)</i>	Price <i>(Lump Sum, All Inclusive)</i>
1	Deliverable 1		
2	Deliverable 2		
3		
	Total	100%	

*This shall be the basis of the payment tranches

Cost Breakdown by Cost Component [This is only an Example]:

Description of Activity	Remuneration per Unit of Time	Total Period of Engagement	No. of Personnel	Total Rate
I. Personnel Services				
1. Services from Home Office				
a. Expertise 1				
b. Expertise 2				
c. Expertise 3				
2. Services from Field Offices				
a. Expertise 1				
b. Expertise 2				
c. Expertise 3				
3. Services from Overseas				
a. Expertise 1				
b. Expertise 2				
c. Expertise 3				

⁹ This serves as a template to the Service Provider in submitting the Financial Proposal.

¹⁰ Official Letterhead/Stationery must indicate contact details – addresses, email, phone and fax numbers – for verification purposes

II. Out of Pocket Expenses				
1. Travel Costs				
2. Daily Allowance				
3. Communications				
4. Reproduction				
5. Equipment Lease				
6. Others				
III. Other Related Costs				

[Name and Signature of the Service Provider's Authorized Person]
[Designation]
[Date]

TERMS OF REFERENCE
Professional Service

1. Assignment Information

Assignment Title:	Full economic appraisal of the potentials of solar PV energy in Cambodia
Cluster/Project:	Policy and Advocacy Cluster
UNDP Practice Area	Energy
Contract Type:	Consultant Team (1 Lead and 2 Analysts)
Duty Station:	Home based and Phnom Penh
Expected Place of Travel:	Phnom Penh
Contract Duration:	12-month-period from November 1, 2018

2. Background

Cambodia's Context

The last decade has seen renewable energy, particularly solar energy, becoming increasingly economically competitive and taking a growing place in the electricity generation mix around the world. This has been driven by a steep decline in cost of solar energy technologies and accommodating policy interventions. In the last ten years, the price of photovoltaic (PV) panels has fallen by 83% and is predicted to decrease by approximately 70% more by 2050.¹¹ The technical feasibility of solar power is further strengthened by the complementary fall in the price of battery storage, which has progressively become a solution for the variability issues inherent to modern forms of renewable energies. This places solar competitiveness well within the range of traditional sources of electricity generation, with the forecast likelihood it continues to become increasingly competitive.

Cambodia is endowed with one of the largest levels of solar radiation in the world, averaging an estimated 5.8 hours of peak sunlight a day. The abundance of solar resources in the country remains an untapped opportunity to meet the rapidly growing electricity demand, which is predicted to increase annually by approximately 15% up to 2030.¹² The domestic power generation mix in Cambodia today is dominated by coal (36%) and hydroelectricity (40%), with sources of non-hydro renewable energy comprising just 0.6% of the mix. The remaining 19% is imported from neighbouring countries.¹³ Clearly, these sources have major environmental implications and hidden costs – nationally, regionally and globally.

¹¹ Bloomberg New Energy Finance's New Energy Outlook, 2018

¹² Ministry of Mines and Energy, 2017

¹³ EAC, 2017

While household rates of access to grid electricity has expanded in Cambodia to reach 71.5%, reliability remains a major challenge as nearly two thirds of households that have access to the grid experience frequent power shortages. Although the Royal Government of Cambodia (RGC) has been implementing a plan for the reduction of electricity costs, these are still among the most expensive in the region, posing significant difficulties to the international competitiveness of Cambodian industries.

Solar power's minimal share of total electricity generation in Cambodia's future electricity planning is underpinned by a highly cautious policy stance. The government is on the verge of committing to an expansion of its hydropower program and coal plants, and this will limit the scope for solar development and potentially lead to additional social and environmental consequences. Some commentators have suggested this is further underpinned by an unfavourable political economy which favours the status quo.

However, there are opportunities for solar energy to take a bigger place in Cambodia's energy mix. *Electricity Authority of Cambodia (EAC)*, which is a government agency managing and administering the provision of electric power in Cambodia, recently announced a new regulation allowing larger customers to connect to the grid under the condition of an installed capacity charge. Some customers have installed solar panels on their roofs. In addition, Cambodia has completed a pilot for a solar park and is realizing its first solar park (utility-sized) project this year.

To sum up, the abundance of solar irradiance, the growing electricity demand, as well as the recent advances in global PV technology and the decline in their price, have now positioned solar to become an economically profitable source of electricity generation in Cambodia, with far fewer negative social and environmental impacts.

Assessing the Cost of Solar Energy

Standard assessments of the cost-competitiveness of solar energy usually rely on the levelized cost of electricity (LCOE) methods. The LCOE represents the lifetime costs of energy generating technologies divided by the amount of energy produced and includes all plant-level expenses such as initial investment, operational costs, and fuel costs on the plant's lifetime. Therefore, the LCOE is a handy tool to engage in an economic comparison between various sources of electricity generation, that have different life durations, upfront capital costs, investment portfolios, maintenance fees, risks, and rates of return.

During 2017 and 2018 UNDP supported a major study on De-Risking Renewable Energy Investment (DREI). This study examined and estimated the LCOEs for the existing mix and different segments of solar – On-grid utility-scale PV, on-grid rooftop PV, off-grid solar-battery mini-grid (solar-battery MG) and off-grid solar home systems (SHS). The study found that the cost of solar energy production in Cambodia is getting closer to be competitive to conventional energy generation. As a result, policy debate continues on whether a shift to solar would be economically efficient versus the alternatives.

However, these standard measures based on aggregate costs fail to consider specific advantages, and new technological advances that distinguish solar PV from other types of energy production, and

crucially, they fail to account for environmental impacts and other externalities. While the study found that solar PV were not close to being cost-competitive for rooftop systems, it did find it was close on utility-scale plants (to the current power generation baseline mix of coal and hydro). Given this, it is clear that a full economic evaluation – i.e. using more realistic valuations and taking account of the externalities of solar - would provide a better evidence base and support a move to an optimal energy mix with a greater solar share.

3. Objective of the Assignment

The overall objective of the study is to measure the benefits of solar energy to economy and livelihoods taking into account environmental externalities, and to present a more realistic commercial assessment of costs and benefits. The overarching goal is to examine how including a greater share of solar into the electricity mix would diversify Cambodia’s sources of generation, ensure future energy security, and reduce the negative environmental impacts of the existing mix - and in turn boosting economic efficiency and decreasing dependency on external power imports.

This would also fit with wider RGC policy aims like achieving electrification targets, which aim at providing electricity access to all villages by 2020, and grid-quality electricity access to 90% of all households by 2030; increasing local livelihoods and the competitiveness of SMEs (improved distributional effects); and stimulating economic growth for the country.¹⁴ There are many economic, social and environmental benefits from having cleaner generation mix, ranging from carbon abatement to job creation.

Building on the DREI results, this study aims at analysing the full economic cost of solar energy in Cambodia. This study will begin by revisiting the LCOEs (for each of the solar models against the existing mix) given in the DREI study by testing different assumptions that are more commercially-relevant. Then, it will adjust the LCOEs by adding the economic costs of significant externalities and estimate the current and future electricity mix based on supply and demand. Finally, it will present a model that measure the potential impact on economic growth of solar PV having a higher share within different mixes of sources.

4. Scope of the Work

Drawing on the above, the analyse and subsequent report should be structured under four main sections.

1) Revisiting the LCOEs found in the DREI study by testing different assumptions

- Using the DREI methodology, update the LCOEs of solar PV by making more commercially realistic assumptions:

¹⁴ We note that lower cost and lower prices may in time, also lead to energy inefficiency (due to greater use/ low take up of technology) and hence lower productivity and competitiveness, but this is a pricing issue, not a cost one. Some commentary may be merited on pricing issues therefore.

- Using only areas of Cambodia that receive the highest sun exposure¹⁵ (See solar radiation map in the Annex.);
- Using lease of land instead of owning the land by investors for solar projects / using cheaper land (for example closed landfill sites);
- Including the transmission costs in both the baseline and the solar models¹⁶;
- Modelling a special case of the utility-scale PV. This would be a combination of hydro and solar, where floating solar PV power system would be installed on the backwater of dams;
- Examining the use of empirical data in the calculation of LCOEs.
- Comparing the benchmark LCOE against the existing energy mix (2018) and projected mix for 2030.

2) Assessing the externalities of the current electricity mix and evaluating their economic costs

- Research and determine the externalities of the solar PV sector in Cambodia and an approach to measure their economic costs.
- These externalities should include the following:
 - Natural resource impacts (aquatic ecosystem, sediments, deforestation);
 - Livelihoods and food security impacts;
 - Amenity impacts (quality of life), local air pollution and associated health costs;
 - Resettlement costs due to hydro construction;
 - Greenhouse gas emissions and cost of abatement;
 - Effects on industries and tourism.
- Value these (based on rigorous methods of valuation) and adjust the LCOE of the baseline electricity mix by including the cost of these externalities.
- Examine and comment on the distributional effects of the existing/ proposed mix versus greater use of solar.

3) Estimating the current and future electricity mix based on supply and demand

- Examine and comment on the current generation supply and demand.
- Assess the impact of (i) keeping current regulation and installed capacity charge on solar systems and (ii) proposed optimal capacity charge (e.g. the case of garment industry).
- Assess qualitatively the risks that Cambodia is facing regarding its current electricity mix. These should include the following:
 - High reliance only on hydro and coal (lack of diversity in the electricity mix);
 - Disruption supply risk related to dependency on electricity imports from neighbouring countries;
 - Environmental and climatic risks (collapse of a dam in Laos PDR);

¹⁵ The yearly average daily radiation is about 5.03kWh/m²-day while the maximum is about 5.83kWh/m²-day – the different is of about 16%. The highest value of sun expose is for areas of north-eastern part which far from load centre, whereas Phnom Penh area receives solar radiation of around 5.1kWh/m²-day.

¹⁶ Only relevant to rooftop PV off-grid

- Greenhouse gas emissions from increasing use of coal.

4) Developing a model to measure the economic growth of solar PV

- Propose an economically optimal mix of electricity that included solar PV by 2030 (per the INDC) and by 2050.
- Propose the optional share for solar, based on the four solar PV sub-sectors' revised LCOEs (DREI Report).
- Model economic growth for both the current electricity mix and the optimal electricity mix, including the distribution of growth (poor and vulnerable versus other). Modelling could be based on a Social Accounting Matrix/ computable general equilibrium (SAM/CGE) method or alternative methods.
- Perform sensitivity analyses to evaluate how the scenario approaches would vary.

5) Policy analysis recommendations

- Suggest policy and market changes to enable optimal energy mix.
- Consider sustainability and distribution aspects.
- Set out a possible roadmap for policymakers.

The final output should consist of a report presenting the components discussed and the estimated economic growth impact of including solar PV in Cambodia's energy mix. The assignment requires the report to be completed over a 12-month period starting November 1, 2018 and ending October 30th 2019.

Prior to completion of the final report, there are four stages (and the payment milestones are aligned with these):

- Stage 1: Scoping Report, to identify the detailed work plan and meet all key stakeholders and identify an RGC counterpart;
- Stage 2: Analysis Brief, to gather technical quantitative and qualitative inputs that will support the analysis;
- Stage 3: Draft Report, delivery of a draft report including the four sections discussed above, a summary of the key findings and recommendations;
- Stage 4: Final Report.

5. Expected Outputs and Deliverables

	Deliverables/Outputs	Estimated Duration (Equivalent team working days)	Target Due Dates	Review & Approvals Required
1	Scoping report Including detailed work plan and briefing partners and stakeholders.	30 days over 1 months	December 1, 2018	Country Director

2	Analysis Brief Including key research inputs (quantitative and qualitative) that will support the analysis.	75 days over 5 months	June 1, 2019	Country Director
3	Draft Report Including components discussed above and estimated economic growth analyse.	45 days over 3 months	September 1, 2019	Country Director
3	Final Report	30 days over 2 months	November 1, 2019	Country Director
Total # of Days:		180 days over 12-month period (Inc. missions, home-based work and travel)		

6. Institutional Arrangements, Duration of the Work and Duty Station

This assignment will be tendered as an RFP based on a lump sum fee to service provider which will work under the supervision and guidance of a Country Director. The total duration of this assignment is 180-working days over a 12-month period from November 1, 2018 to November 1, 2019.

During the assignment the service provider is expected to carry out three incountry missions (appromitely 15 days) to Cambodia (Phnom Penh) to undertake research, with analytical work and reporting completed at the service provider's home base (as given above), and including a final trip to launch the report. These costs (along with the total fees) should be priced within tender submissions.

7. Qualifications of the service provider at various levels

Qualification of the Service Provider:

The qualifications of the service provider will be assessed through these minimum requirements as follows:

- At least 5 years' professional experience in renewable energy research, policy, and investment particularly on solar PV.
- Experience with quantitative analyses and reporting. Experience of similar assignments is a further advantage.
- Experience working in developing country context. Experience writing the region is an asset.
- Experience working with multilateral organization and the UN system is preferred.

Qualificaitons of Key Personnels:

It is envisaged the team would comprise three members, a lead and two supporting analysts, but others may also be included.

Qualifications of the International Consultant (Team Lead)

Education	Master, in economics or development economics, specialized in energy economics (PhD is an asset).
Experience	At least 7 years' experience in economic analysis, including specific experience in renewable energy economics and in developing country contexts.
Competencies	Technical knowledge and proven research skills related to energy economics and/ or economic growth modelling. Ability to use/ interpret modelling techniques, quantitative analyses, and evaluation methods (e.g. LCOEs, and SAM/CGE modelling, econometric methods). Experience in analysis/ qualitative research of high-level policies
Language Requirement	Ability to write and present in high quality English to both policy and technical audiences.
Other Requirements (if any)	Fulfilment of similar assignments and/ or knowledge of the Cambodian/ South-East Asian development context. Strong Publication record/ policy and/ or technical reputation

Minimum Qualifications of the International Consultants (Analyst)

Education	Master's degree, in environmental engineering, environmental economics, energy or related fields.
Experience	At least 5 years' experience in renewable energy economics and energy financing Skill in research-based financial modelling including LCOEs Knowledge about energy markets developing country contexts.
Competencies	Technical knowledge and proven research skills related to economic analysis and/ or economic growth modelling.
Language Requirement	Ability to write and present in high quality English to both policy and technical audiences.
Other Requirements (if any)	Fulfilment of similar assignments and/ or knowledge of the Cambodian/ South-East Asian development context.

Minimum Qualifications of the National Consultants (Analyst)

Education	Master's degree, in environmental engineering, environmental economics, energy or related fields.
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Experience	At least 5 years' experience in renewable energy economics and energy financing Skill in research-based financial modelling including LCOEs Knowledge about Cambodia and its energy sector.
Competencies	Technical knowledge and proven research skills related to economic analysis and/ or economic growth modelling.
Language Requirement	Ability to write and present in high quality English to both policy and technical audiences. Knowledge of Khmer.
Other Requirements (if any)	Fulfilment of similar assignments and/ or knowledge of the Cambodian/ South-East Asian development context.

Note: UNDP reserves the rights to request bidders to replace team members prior to awarding the contract.

8. Payment Milestones

The consultant (after appointment on a lump sum basis) will be paid in four instalments (of the total contract value) linked to performance and deliverables (as given below). Requests for payment should follow the standard UNDP certification process (details will be made available after appointment).

	Outputs/Deliveries	Payment Schedule	Payment Amount
1	Scoping report	December 1, 2018	10%
2	Analysis Brief	June 1, 2019	30%
3	Draft Report	September 1, 2019	40%
4	Final Report	November 1, 2019	20%

9. Annexes

The following links can be requested:

- a) UNDP (2018 forthcoming). De-Risking Renewable Energy Investment (DREI) – Draft Version.
- b) Electricity Authority of Cambodia (2017). EAC's Consolidated Report for year 2017: Salient Features of Power Development in Kingdom of Cambodia, 8p.