TERMS OF REFERENCE FOR CONSULTANTS
Regional Knowledge and Support Technical Assistance
Floating Solar Energy Development

A. Background

1. Central and West Asian countries are heavily reliant on fossil fuels, or on hydropower, or on imported fuels and power, which make them carbon-intensive, energy insecure, or vulnerable to climate and external supply shocks. Power supply in Afghanistan is 80% imported while in Azerbaijan, 85% of power is supplied from fossil-fuel-based plants. In the Kyrgyz Republic, 90% of power is supplied by hydropower plants. All countries have little or no installed solar capacity. Meanwhile, the cost of solar energy has decreased rapidly in recent years and is expected to decrease further, below traditional power sources. Countries are therefore urged to take advantage of their solar potential and the cost reductions and diversify into indigenous low-carbon technologies to enhance energy security and reduce emissions. Despite supporting policies, the solar energy potential remains untapped due to lack of awareness, and insufficient technical skills and knowledge on costs, benefits and financing options.

2. The proposed knowledge and support technical assistance (TA) aims to pilot and build expertise on the emerging floating solar photovoltaic (FPV) technology.[1] Afghanistan, Azerbaijan, and the Kyrgyz Republic (the countries) represent critical vulnerabilities of Central and West Asian countries and are the targeted beneficiaries. The TA has three outputs: (i) pilot-scale floating solar plants installed and scaled-up plants assessed in three countries; (ii) business models with private sector participation developed; and (iii) institutional capacity in designing, constructing and operating floating solar photovoltaic systems enhanced. The TA activities will be closely linked with Central Asia Regional Economic Cooperation (CAREC) activities.

3. Countries are now prioritizing solar energy development to address energy challenges given their reasonable solar resources and climate commitments. Solar energy is inexhaustible and PV cost-effectiveness is proven globally. While FPV requires stricter standards given the exposure to water, it has added advantages over land-based PV in that it (i) frees up land for other use and saves on land acquisition and preparation costs; (ii) allows higher yields due to the cooling effect of water; (iii) conserves water through reduced evaporation; (iv) has readily available water for module cleaning; (v) is quick to install; and, (vi) addresses issues related to the energy-water-food and climate nexus.

B. Objective

4. The TA will address country specific challenges as well as the following common issues: (i) aging infrastructure; (ii) insufficient technical and institutional capacity; (iii) limited financial resources, (iv) tariffs below cost recovery, and (v) energy insecurity due to over-reliance on a single type of energy source. The TA will support Afghanistan, Azerbaijan and the Kyrgyz Republic to enhance their knowledge and technical skills in designing, constructing and operating solar PV plants, particularly floating PV, through pilot projects, commercial scale project feasibility studies, and hands-on institutional capacity building including in-depth study tours in leading FPV

[1] Compared with about 400 gigawatts of installed land-based photovoltaic capacity worldwide, only 106 FPV plants totaling 211 megawatts (MW) were in operation by the end of 2017. Japan has the most number of plants. The People's Republic of China has the largest, at 40 MW, and is constructing 150 MW and 70 MW plants. Several plants are in operation in 17 countries, such as Italy, the Republic of Korea, the United Kingdom, and the United States.

countries. The intended outcome is for the beneficiary countries to initiate the building of their first large-scale FPV plant. A consulting firm is required to perform the necessary tasks under the TA.

C. Scope of work and detailed tasks

5. The TA aims to demonstrate the feasibility and benefits of FPV through pilot projects which will serve as platforms for hands-on technical capacity building, in addition to the phased regional training program which includes study visits to leading FPV countries. FPV performance in different configurations and water characteristics, and the potential for scale-up and replication will be assessed, also using business models for private sector participation formulated under the TA.

6. The TA will install three pilot FPV systems of up to 100 kW each, and consisting of solar PV panels, floating platform, mooring system, inverter/power conditioner station (land-based or above the water), cables, grid connection infrastructure, including as appropriate, battery energy storage system, and auxiliary facilities. The pilot systems must also include ground-mounted PV systems of up to 5 kW each and equipped with a complete meteorological station with rotating shadow band pyranometer, air transmissivity sensor[2] and pyrheliometer, to be installed adjacent to the three FPV systems to enable performance comparison and to facilitate hands-on technical training. FPV systems have minimal adverse environmental impacts, which are found to be lower than those of a land-based system. Nonetheless, initial environmental examinations will be done to assess potential impacts including on aquatic flora and fauna. The following project sites have been identified and agreed with the target countries:

a) **The Qargha lake and reservoir in Kabul, Afghanistan** is a 50-hectare recreational area developed for trout fishing and hatchery. The reservoir is planned to supply additional drinking water to Kabul, provide irrigation to expand horticulture, and feed a hydropower plant (HPP). The **Naghlu reservoir** 40 kilometers (km) east of Kabul will also be assessed for suitability. It has electrical and grid infrastructure via the 100 MW Naghlu Hydropower Plant, the country's largest. A 20 MW land-based photovoltaic plant is expected to be built 2 km from the reservoir under an approved ADB grant tranche, and an additional 20 MW is planned under a future tranche. Qargha lake could fit up to 25 MW, while the Naghlu reservoir could fit over 200 MW of FPV. Further due diligence and environmental sensitivity of the proposed project sites will be considered in the final site selection for Afghanistan.

b) **Lake Boyukshor**, the largest of 9 lakes in **Azerbaijan's** Absheron peninsula, is saline and was used as a dumping site for sewage and oil effluents. A 2012-2015 lake remediation program cleaned 300 out of the 1,100 hectares and built a promenade and park on its bank fronting the Baku Olympic stadium. Sustainable lake restoration could be demonstrated.

c) The 284 km^2 **Toktogul reservoir** feeds a 1,200 MW HPP and provides 40% of power supply in the **Kyrgyz Republic**. FPV could balance the seasonality of the HPP with year-round generation thus demonstrating the synergy between PV and hydro.

7. The scope of work is divided into three main components/outputs:

[2] Transmissivity is a measure of how much light passes through a substance (such as glass or air). Air transmissivity sensors are used to monitor solar radiation, weather, visibility, or pollution.

Component 1: Design, procure and supervise implementation of pilot projects and develop corresponding scaled-up projects in the three selected countries. This task will include, but will not be limited to, the following key activities;

(i) The consulting firm shall carry out an inception mission to the selected countries. Checklists, questionnaires, documents and information/data requirements and agencies to meet must be developed and provided prior to the missions.

(ii) Conduct site-specific feasibility studies for the pilot and, later, the scaled-up FPV projects and recommend the optimum technical solution (module, floatation, anchoring, mooring and other FPV system technologies, electrical, electromechanical, auxiliary and protection, control and monitoring systems) size and configuration, including grid integration and, proposals for battery storage systems. Environmental sensitivity of the site must be considered for the final pilot site selected in Afghanistan. The technical, financial, environmental and social safeguards due diligence shall include, but will not be limited to, site, water, grid infrastructure and resource assessments, design criteria, conceptual design, cost estimation, financial and economic analyses, and environmental and social safeguards assessments following ADB's Safeguard Policy Statement (2009). For each pilot project, submit, a Construction Code of Conduct to mitigate any minimal impacts or, as appropriate, an Initial Environmental Examination (with Environmental Management and Monitoring Plan) and safeguards due diligence report (DDR). The technical due diligence and feasibility studies must provide recommendations on, but not limited to: (a) main sources of information or databases, (b) considerations on meteorological, solar and hydrodynamic data; (c) material, equipment and system gains/losses; (d) electrical and electromechanical design of system (d) system simulations and performances.

(iii) Develop the design criteria and conceptual design for the pilots and scaled-up FPV systems, including grid connection, and any relevant support facilities. The pilot projects must include a ground-mounted system with a complete meteorological station equipped with a complete meteorological station with rotating shadow band pyranometer, air transmissivity sensor and pyrheliometer to enable performance and yield comparison with the pilot floating system. Assess potential for battery energy storage system and include in the design for the pilot system, as appropriate. For the scaled-up plant, include design of required grid connection/transmission system, access road and other required civil works, buildings, substation, foundations, and related facilities.

(iv) For the pilot projects, develop technical specifications and bidding documents, following ADB's Procurement Policy (2017, as amended from time to time), and standard bidding documents for procuring a design-build-operate (DBO) contractor, with a 1-year operation services and related operation and maintenance (O&M) training to local operators. Develop related pilot project administration manuals (PAMs). The DBO contract must include any required mitigation measures for the potential minimal impacts during construction, operation and decommissioning of the pilot projects through a code of conduct or environmental management and monitoring plan.

(v) Procure on behalf of ADB the DBO contractors for the three pilot projects. Assist the government executing and implementing agencies, and their Project Management Units (PMUs), and ADB in the procurement including issuing invitation for bids, providing clarifications, evaluating the bids, and during contract discussions.

(vi) Supervise, in collaboration with the PMUs, the contractors' implementation of the pilot projects and act as owners' engineer to verify progress and corresponding

payments, and supervise testing, commissioning and operations and maintenance up to operational acceptance. Collaborate with the contractors in providing O&M training and in developing O&M Manuals, for dissemination.

(vii) Provide input for capacity development in terms of generating a feasible system configuration in the selected countries.

(viii) Identify and describe reservoirs and lakes suitable for FPV in the pilot countries and include in the feasibility study reports

(ix) Determine and assess the potential for replication and scale up within each pilot DMC and in other CAREC countries and include in the feasibility study reports and final report.

Component 2: Analyze policies and tariff structures and recommend suitable for business models for the three selected countries

(i) Assess the current tariff structure of the power sector in the selected countries; and the long-term investment demand in the power sector to meet the countries' renewable energy development target and climate commitments.

(ii) Identify any gap or shortcoming in the tariff structures that hinder development of solar energy and recommend mechanisms or frameworks for adjusting tariff, considering any recent ADB analyses and recommendations, to enable and promote renewable energy development, particularly solar PV and FPV, in the selected countries.

(iii) Propose financing plans after through market analyses, evaluate and discuss any prospective co-financing opportunities for future projects.

(iv) Analyze and recommend suitable business models for the selected countries, ranging from pure public to public-private partnership (PPP), independent power producer (IPP) and other suitable modalities, with several different ownership and operational options while ensuring adequate balancing of risk and benefits. Each suggested business model shall clearly state stakeholders' roles, responsibilities and risks.

(v) Conduct a gap analysis of legislation related to pollution, health, and safety risks and recommend provisions to cover missing mitigation measures relevant to floating solar, if applicable.

(vi) Prepare an Environmental Assessment and Review Framework (EARF) as part of the business model to be attached to draft request for proposals. The EARF will guide future projects.

(vii) Provide input for capacity development in terms of generating a feasible business model with relevant stakeholders of the selected countries;

(viii) Develop model tender documents and requests for proposals and corresponding recommended procedures for each business model

Component 3: Institutional Capacity Building for Stakeholders

(i) Conduct relevant capacity needs assessment at the national and sub-national level.

(ii) Design, organize and conduct a capacity building program in pilot countries and within CAREC to develop institutional capacity on FPV. Capacity building program must include, (a) study tours to FPV leading countries, such as, Japan, People's Republic of China, Republic of Korea or Singapore; (b) training on project planning, site and resource assessments, conceptual design, engineering, procurement, construction, and operation and maintenance, including cost estimation, financial and economic analyses, developing technical specifications, bidding documents and request for proposals, and formulating business models

(iii) Design and conduct hands-on technical trainings tied to the pilot projects;

(iv) Develop training materials and reports including user guides or manuals for solar PV system of various configurations.
(v) Convene training and workshops in the international venues and disseminate knowledge products through online, including but not limited to the ADB website.
(vi) Organize and conduct national training workshops (3 per target country), two international conferences linked with CAREC-ESCC events for wider exposure;
(vii) Create three country-specific and one regional knowledge products on the TA findings and lessons learned and disseminate through international conferences, publications and ADB-supported platforms with government partnerships, such as CAREC.

D. Institutional arrangement

8. ADB will be the executing agency working closely with the country implementing agencies (IAs), and CAREC-ESCC country focal points. The counterparts are: Da Afghanistan Breshna Sherkat (DABS), the Ministry of Energy and OJSC Temiz Shahar of Azerbaijan, and OJSC Electric Power Plants (EPP) of the Kyrgyz Republic. The TA consultants will support TA administration and coordination, working closely with, assisting, and training the existing project management units (PMUs) in DABS, EPP and Temiz Shahar. The TA consultants will also work closely and coordinate with the country IAs and ESCC focal points, and other consulting teams for CAREC Regional TAs [3] and country specific TAs.[4] Afghanistan's Ministry of Energy and Water and Kyrgyz Republic's State Committee for Industry, Energy and Subsoil Use and Azerbaijan's State Agency for Alternative and Renewable Energy Sources will also be consulted.

9. The country counterparts and their PMUs will provide data, office space with utilities and telecommunication connections, and technical staff, and assist in additional data collection, logistics, meeting arrangements and other arrangements needed to accomplish the tasks.

E. Reporting Requirements

10. The TA consultants will submit the following reports and project documents in English, with the interim report 1, 2, and 5, Midterm report, draft final and final reports translated into Dari/Pashto, Azerbaijani, and Russian.

Table A2.1: Reporting Requirements

Report	Deadline (months from Notice to Proceed (NTP))	Copies	
		Hard	Soft
1. Inception report	Within 1 month from NTP	5	1
2. Inception workshops and Interim report 1	Within 2 months from NTP	5	1
3. Interim report 2	Within 4 months from NTP	5	1
4. International conference proceedings	Within 5 months from NTP	5	1
5. Interim report 3	Within 7 months from NTP	5	1
6. Midterm workshops and Interim report 4	Within 9 months from NTP	5	1
7. Midterm report	Within 15 months from NTP	5	1

[3] The TA consultants must work closely with consultants of ongoing CAREC TA projects: ADB. Regional Cooperation on Renewable Energy Integration to the Grid. https://www.adb.org/projects/documents/reg-51148-001-tar. (TA-9365-REG).; ADB. Access to Electricity with New Off-Grid Solar Technology in Central Asia. https://www.adb.org/projects/documents/access-to-electricity-new-off-grid-solar-technology-central-asia-tar. (TA-9168-REG); and ADB. Leapfrogging of Clean Technology in CAREC Countries through Market Transformation. https://www.adb.org/projects/49413-001/main. (TA-9299-REG).

[4] Such as, but not limited to, AZE TA8730 on Preparing an Enabling Environment for Private Sector Participation in the Power Sector and AZE TA9151 on Preparing a Power Sector Financial Recovery Plan for Azerbaijan

8. Interim report 5	Within 22 months from NTP	5	1
9. Interim report 6	Within 24 months from NTP	5	1
10. Final workshops and draft final report	Within 26 months from NTP	10	4
11. International conference proceedings	Within 27 months from NTP	5	1
12. Final report.	Within 29 months from NTP	30	4

a) Inception Report: includes implementation schedule, personnel schedule and procurement plan;
b) Interim report 1: includes capacity needs assessment report, site, water, and resource assessment reports for the 3 pilot projects, with 3 Initial Environmental Examinations and related Environmental Management Plans or Code of Conduct, Safeguards Due Diligence reports, tariff structure recommendations
c) Interim report 2: Includes feasibility studies, technical specifications and bidding documents for the pilot projects; capacity development plan; Pilot Project Administration Manuals
d) Interim report 3: includes procurement reports and bid evaluation reports;
e) Interim report 4: Includes contractors' mobilization, supervision and management reports, training workshops and study tours reports
f) Midterm report: includes feasibility studies of scaled-up plants and supervision reports
g) Interim report 5: Includes business models and draft requests for proposals
h) Interim report 6: Includes Operational Acceptance, Commissioning and Testing reports, Operation and Maintenance manuals

11. At least 2 international conference, at least 9 in-country training and capacity building seminars (at least 3 per country), and technical visits/study tours to at least 3 leading FPV countries will be conducted, plus one regional/international conference/workshop after submission of the draft final report. Other workshops and on-the-job training will be conducted as necessary. A training report with participant evaluation must be submitted after each event. The consultants will also prepare regular status reports that highlight issues affecting timely completion of the assignment. The Summary of Major Outputs and Activities are in Table A2.2.

F. Major Outputs and Activities

12. The major outputs and activities are summarized in Table A2.2. All outputs will be submitted in English to both ADB and the national implementing agencies. All documents and reports will be made available in an electronic format to ADB.

Table A2.2: Summary of Major Outputs and Activities

Major Activities	Major Outputs	Expected Completion
Component 1: Design, procure and supervise implementation of pilot projects and develop corresponding scaled-up projects in the three selected countries		
- Site, water, solar resource, load profiles and grid connection assessments - Design of 3 floating solar PV plant, floatation and anchoring systems, structure and support systems, grid connection/transmission and/or battery storage system, electrical, auxiliary, and support facilities - Safeguards: 3 Initial Environmental Examinations (IEE); and 3 social and social safeguards due diligence reports (DDRs), including land acquisition requirements, as part of the feasibility studies to be attached to the bidding documents - Prepare feasibility studies (3 pilots and 3 scaled-up plants) and project administration manuals (PAM)	- Implementation and procurement plan; - Safeguards assessments and code of conduct - 3 IEEs and 3 DDRs - Design and technical specifications - 3 pilot project feasibility studies - PAMs - 3 scaled- up project feasibility studies	month 1 month 2 month 4 month 4 month 7 month 9

Major Activities	Major Outputs	Expected Completion
- Prepare bidding documents for the pilot projects	- 3 bidding documents;	Month 4
- Procure on behalf of ADB, the pilot project contractors, assisting the PMUs in procurement	- Invitation for bids - Bid evaluation reports	Month 5 Month 7
- Lead in evaluation and assist in contract discussions	- Recommendation to award	Month 8
- Supervise and manage pilot project implementation assisting and training the PMU; Act as owners' engineer	- Monthly reports	Month 9-24
Component 2: Analyze policies and tariff structures and recommend suitable for business models for the three selected countries		
- Assess/analyses current tariff structure and renewable energy sector environment;	- Tariff and policy assessment report	Month 4
- Prepare an Environmental Assessment and Review Framework (EARF) as part of the business model to be attached to draft request for proposals	- EARF	Month 8
- Recommend appropriate tariff structure and potential solar PV business models in the selected countries	- Business models and draft requests for proposals	Month 22
Components 3: Institutional Capacity Building for Stakeholders		
- Capacity development needs assessment	- Capacity assessment report	Month 2
- Strategy and action plan for capacity development	- Capacity Building Plan	Month 4
- Targeted trainings, international conferences including technical study tours	- Training materials and reports and evaluation	Month 4-30

Source: Asian Development Bank

G. Qualifications of Experts and Detailed Tasks

13. The assignment is expected to be executed over 30 months requiring 34 person-months of international and 93 person-months of national consultants. A consulting firm will be recruited using the quality- and cost-based selection method (quality: cost weighting of 90:10), using full technical proposals, following ADB's Procurement Policy (2017, as amended from time to time). The consulting team shall work closely with the national implementing agencies and ADB, including relevant resident missions to efficiently and effectively perform the tasks. The significant field days in the pilot countries will be required from the team during TA implementation.

Table A2.3: Summary of Consulting Services Requirement

International Experts Name of Positions	Person months	National Experts Name of Positions	Person Months
Firm		**Firm**	
Floating PV/Grid Expert – team leader	7	3 Electrical Engineers/National team leaders	21
Electrical/Instrumentation Expert	5	3 Procurement/Regulatory Experts	15
Financials Expert	2	3 Civil/Structural Engineering Experts	15
Economist	2	3 Financial Experts	9
Procurement/Contracts Expert	5	3 Economists	6
Transaction Advisor/PPP expert	3	3 Environmental Safeguard Experts	12
Environmental Expert	4	3 Social and Gender Experts	6
Social safeguards Expert	2	3 Training coordinators	9
Capacity Development Specialist	4		
Total	**34**	**Total**	**93**

Source: Asian Development Bank

1. International Consultants (34 person-months)

14. **Floating solar PV(FPV)/Grid Expert/Team leader (7 pm).** The expert shall have a bachelor or higher degree in engineering, with at least 10 years of team leadership and experience in design, development and implementation of solar PV power plants totaling at least 50MW aggregated capacity including at least 100kW grid-connected FPV projects. The expert should have previous experience in procurement, engineering, grid integration design of intermittent generation such as solar and wind power. Previous work experience of ADB financed project, in ADB developing member countries (DMCs), is desirable. The expert will manage the TA consultant team as team leader and be the FPV/Grid Expert at the same time. The Team Leader will be responsible for the overall administration of the TA assignment. To enable advanced actions on equipment procurement, the expert shall develop the design, prepare technical specifications and drawings, and draft bidding documents and contract in collaboration with the procurement experts and other technical experts. The expert shall closely cooperate with ADB and the national IAs and PMUs during the TA implementation and especially the procurement process. The expert's task will include following:

(i) Work closely with and coordinate with IAs and PMUs to ensure effective and efficient TA implementation
(ii) Lead the site, water, solar resource and grid infrastructure assessments
(iii) Develop and produce the technical specifications and required drawings of the FPV system, and necessary implementation arrangement for power evacuation, including battery storage systems, as appropriate, and support facilities.
(iv) Conduct capacity building needs assessment for solar technologies, which may include technology, site selection criteria, due diligence process, operation and maintenance, design, implementation, and management.
(v) Develop training programs, training materials, reports, and evaluation including relevant manuals. Work with contractors to enhance their operation and maintenance manuals.
(vi) Work closely with international and national procurement experts and technical experts in preparing bidding documents. Ensure bidding documents technical specification is adequate and are able to attract bidders.
(vii) Prepare the inputs for bid documents particularly for the technical specifications such as, desired output and related parameters, performance warranties etc.
(viii) Prepare terms of reference and checklists for technical and financial bid evaluation in accordance with ADB's Guide to Bid Evaluation.
(ix) Lead preparation of relevant reports and outputs under the TA, particularly the feasibility studies and project administration manuals.
(x) Provide expert inputs to the capacity development plan and act as resource person/trainer/facilitator in the capacity development activities.
(xi) Any other related activity as may be reasonably requested by ADB.

15. **Electrical/Instrumentation expert (5 pm).** The expert shall have a bachelor or higher degree in electrical engineering or similar fields and at least 8 years of relevant experience in engineering and design, operation, and management of power plants, especially grid-connected solar photovoltaic projects and related transmission and support systems. The expert shall have at least one grid-connected FPV experience. Previous experience in ADB DMCs, particularly in Central and West Asia, is desirable.

(i) Act as Deputy Team leader and assist the Team leader in the performance of tasks and supervision of the TA team. Coordinate closely with the national team leaders.
(ii) Coordinate with other team members and help team leader to develop a detailed work plan and implementation schedule.

(iii) Work closely with the team leader, international and national procurement experts and technical experts in preparing bidding documents especially the technical specifications.
(iv) Supervise and monitor the project implementation with electrical/control and instrumentation related equipment.
(v) Ensure adherence to project safety plan and quality assurance plan.
(vi) According to area of expertise, provide inputs to the capacity development plan and act as resource person/trainer/facilitator in the capacity development activities
(vii) Any other related activity as may be reasonably requested by ADB.

16. **Financial expert (2 pm**). The expert shall have at least bachelor's degree or higher in accounting, economics, finance or similar fields. The expert should preferably possess a professional accountancy/finance qualification such as a Chartered Accountant, CPA, or equivalent. The expert should have a minimum of 8 years' experience in financial analysis and due diligence of energy projects, at least 5 years of which were dedicated to power generation facilities. Experience in Solar PV and in ADB DMCs, particularly within Central and West Asia and with ADB is highly desirable. The expert's tasks will include the following:

(i) Conduct the financial due diligence of the pilot and scaled-up projects following the Technical Guidance Note (TGN) for Financial Management Assessment (2014 and 2015) and the ADB's latest Guidelines for the Economic Analysis of Projects, Handbook on Economic Evaluation of Environmental Impacts; and Financial Management and Analysis of Projects (2005).
(ii) Prepare the overall project costs using a spread sheet, separating foreign exchange and local currency, including physical price and contingencies. Identify applicable local taxes and duties and all risks to project revenues and costs and conduct relevant sensitivity analyses.
(iii) Work closely with the technical and procurement experts in the development of the financial model and corresponding financial analysis and evaluation.
(iv) Assist and work closely with the Team leader, procurement expert, transaction advisor and economist in structuring and developing business models and request for proposals.
(v) Identify potential financing resources for future solar PV projects and recommend potential financing structures, particularly with participation of private entities.
(vi) Assess the national IAs capacity for financial management and provide input for the capacity development program.
(vii) Assist ADB mission team as required and in preparing reports

17. **Economist (2 pm).** The expert shall have a master's degree or higher in economics or a related field. The expert should have at least 10 years of experience in energy sector including tariff analysis. Experience in Solar PV and in ADB DMCs, particularly within Central and West Asia and with ADB is highly desirable. The expert's tasks will include the following:

(i) Conduct economic analysis of the pilot and scaled-up FPV projects, including least cost analysis and comparison of alternative solar technologies and configurations, considering economic costs and benefits following ADB's latest Guidelines for the Economic Analysis of Project, Handbook on Economic Evaluation of Environmental Impacts and Financial management and Analysis of Projects (2005).
(ii) Assess the current tariff structure of the selected countries and long-term investment demand to meet the country's renewable energy targets and climate commitments.

(iii) Identify any gap in the tariff structure that hinder development of renewable energy including solar and recommend mechanisms for adjust tariff.
(iv) Assist and work closely with the Team leader, procurement expert, transaction advisor and financial expert in structuring and developing business models.
(v) Identify potential financing resources for future solar PV projects, particularly with participation of private entities
(vi) Assess the national IAs capacity for long-term planning for energy sector including resource allocation and provide input for the capacity development program
(vii) Assist ADB mission team as required and in preparing reports

18. **Procurement/Contracts expert (5 pm).** The expert shall have a bachelor or higher degree in engineering or related fields, with minimum 8 years of relevant experience in procurement in accordance with ADB Procurement Guidelines or similar, preparation of bidding documents and contract documentation or supervision of the execution of works. Previous experience in ADB DMCs and ADB funded projects is desirable. Experience in managing stringent material/equipment standard for FPV is desirable. The international expert will guide the national expert.

(i) The expert will work closely with the team leader and technical expert and collect information on unit costs of materials, machinery and equipment,
cost of civil works and metal works, transportation, labor cost. etc., based on recent similar projects in Central and West Asia.
(ii) Based on the inputs from other technical team members, recommend the most appropriate procurement approaches. Propose the most appropriate contract packages, as agreed with the EAs and ADB, following ADB's Procurement Policy (2017, as amended from time to time).
(iii) Prepare bidding documents working closely with the team leader and with assistance from relevant experts following ADB's *Procurement Guidelines (20*15, as amended from time to time) and latest standard bidding documents and user's guide.
(iv) Assist the IAs, PMUs and ADB in tendering including during the technical and financial evaluation of bids and assist in preparation of bid evaluation reports.
(v) Working with the transaction advisor, financial and economic experts, develop model tender documents and requests for proposals for private sector investments in solar PV or FPV, including through public-private partnership and similar arrangements.
(vi) Conduct procurement capacity assessment of the national EAs.
(vii) Provide input to the capacity development plan and assist in the conduct of training workshops as required.

19. **Environmental Expert (4 pm).** The expert shall have a bachelor or higher degree in environmental sciences or similar. The expert should preferably have relevant professional experience of 10 years or more with significant experience for preparing environmental impact assessment for energy projects. Familiarity with the implementation of selected countries' environmental protection law is desirable. Previous experience in water environmental impact assessment is desirable. The expert will be responsible for conducting environmental safeguard due diligence in accordance with ADB's Safeguard Policy Statement (2009). The international expert will guide the national expert.

(i) For each project prepare an Initial Environment Examination (IEE) report presenting the environmental impacts, taking into account aquatic or ecological aspects, and mitigation measures of the proposed FPV pilot projects. Recommend environmental management and monitoring plans (EMPs) to address identified/potential environmental impacts. For the pilot projects, prepare a construction Code of Conduct

similar to the EMPs and incorporate in the bidding documents. The DBO contractor shall abide by this Code of Conduct or EMPs.

(ii) Prepare Due Diligence studies as part of the IEEs, if required.

(iii) Prepare an Environmental Assessment and Review Framework following ADB's Safeguard Policy Statement (2009). Ensure that the cost of implementing mitigation measures for identified environmental management and monitoring plans, and any strengthening measures, are included in the proposed cost.

(iv) Monitor safeguards and Code of Conduct/EMP implementation to ensure the safeguards and EMPs are properly implemented.

(v) Update Code of Conduct or EMP if required due to unexpected impacts identified during construction stage and produce Corrective Action Plans, if required.

(vi) Ensure the environmental safeguard compliance during construction of the FPV power plant and grid connection and support facilities.

(vii) Prepare updated IEE, if required, which meets both the Government's requirements and ADB's Environmental Assessment Guidelines (2003).

(viii) Assist the team leader for capacity building on environmental safeguards. According to the area of expertise, provide inputs to the capacity development plan and act as resource person/trainer/facilitator in the capacity development program.

20. **Social safeguards expert (2 pm).** The expert shall have a Bachelor degree or higher in sociology, anthropology, social sciences or related fields with minimum 8 years of professional experience. The expert will be responsible for conducting social safeguard due diligence including land acquisition requirements in accordance with ADB's Safeguard Policy Statement (2009). Experience with similar assignments with ADB and ADB DMCs is highly preferred. The international expert will guide the national expert.

(i) Conduct social analysis, including gender analysis, of the pilot and scaled-up projects following ADB's Safeguard Policy Statement (2009), ADB's Policy on Gender and Development (2003) and government requirements. Propose detailed implementation arrangements in compliance with the Safeguard Policy Statement.

(ii) Assess land acquisition requirements of the pilot projects and, if required, design of mitigation measures in accordance with ADB's Safeguard Policy Statement (2009).

(iii) In collaboration with the environmental safeguard experts, prepare an Environmental Assessment and Resettlement Framework following ADB's Safeguard Policy Statement (2009).

(iv) Review government policy on social safeguards, corporate social responsibility, and local community development and ascertain how these can be streamlined into the overall implementation of the TA.

(v) Establish network with the relevant women's organizations

(vi) Develop monitoring tool and regular reporting system

(vii) Conduct regular monitoring and reporting

(viii) According to the area of expertise, provide inputs to the capacity development plan and act as resource person/trainer/facilitator in the capacity development program

21. **Transaction advisor/PPP expert** (**3 pm**). The expert shall have at least Master's degree or higher in finance or related fields. The expert should preferably have relevant professional experience of 8 years or more in financial advisory services for energy projects, including at least 5 years of experience in the renewable energy projects. The expert will work closely with the Procurement and the Financial and Economics expert for defining an optimized way of structuring PV projects in the selected countries. The expert should have experience in identifying and allocating project risk and role and responsibilities of the stakeholders.

(i) The expert will develop various business models to improve bankability of solar PV project and enhance private sector participation.
(ii) The expert will work closely with the team leader and finance, economics and procurement expert on structuring potential business models considering policy, tariff and market environment of selected countries. Provide advice, recommendations and guidance to the EAs.
(iii) Provide other risk and financial advice as may be required.
(iv) According to the area of expertise, provide inputs to the capacity development plan and act as resource person/trainer/facilitator in the capacity development program

22. **Capacity Development expert (4 pm):** The expert should preferably have a bachelor or higher degree in energy related fields with minimum 8 years of professional experience, previous experience in the energy sector is desirable. The expert shall have strong leadership, excellent communication and presentation skills. Excellent command of English is required and fluency in Russian is highly desirable. The expert's responsibilities will include the following;

(i) Conduct a detailed capacity assessment of the key stakeholders at national and sub-national levels; assess and identify capacity gap of the countries considering its goal of renewable energy development, in terms of planning, designing, implementation and operation and maintenance. Coordinate with energy sector stakeholders to define common priority area in terms of energy sector capacity development, particularly for further solar PV deployment.
(ii) Formulate a strategy and action plan for capacity building around FPV.
(iii) Design a phased training program which includes study tours to the countries with existing floating solar capacity such as China, Singapore, Korea and Japan.
(iv) Identify potential hosts, sites, FPV plants and additional resource persons to be included in the capacity development plan and coordinate accordingly.
(v) Arrange at least 9 in-country training or workshops and capacity building seminars (3 per country), technical visits/study tours to at least 3 leading FPV countries, and at least 2 international conference/seminar
(vi) Work closely with the CAREC-ESCC and national training coordinators in the design, organization and conduct of the workshops and training seminars.
(vii) Provide inputs into TA related research, studies (sector, strategy, or thematic), and other analytical work, including assistance in monitoring implementation of the TA, and other related activities.
(viii) Prepare standard evaluation questionnaires and reports for the training events.
(ix) Training materials shall be produced and disseminated to the public via ADB, EAs' or projects' website in English, Russian and Pashto.

2. National Consultants in AFG, AZE, KGZ - (31 person-months (pm) per country, or 93 pm total)

23. **Three Electrical Engineer/national team leaders** (**7 pm each**). The experts should preferably have a bachelor degree or higher and professional certification in electrical engineering or related fields, with at least 8 years of relevant professional experience in engineering and design, operation, and management of power plants and transmission systems. The expert, as the nationals team leader, will assist the team leader to execute his/her responsibilities, providing due diligence and recommendations for compliance with respective country standards, codes, laws and regulations.

24. **Three Procurement/Contracts Experts (5 pm each).** The experts should preferably have a bachelor or higher degree in engineering or related fields and at least 8 years of relevant

experience in procurement, preparation of bidding documents, bid evaluation and contract documentation or supervision of the execution of works. Previous experience in procurement and administration of works contracts under ADB funded or similar projects is highly desirable. The expert will provide inputs and assistance to the International Procurement/Contracts expert to deliver required outputs, providing due diligence and recommendations for compliance with relevant country standards, codes, laws and regulations.

25. **Three Civil/Structural Engineering Experts (5 pm each).** The experts should preferably have a bachelor or higher degree in engineering or related fields with at least 8 years of relevant experience in geotechnical, topographic, or hydrological surveys in accordance with international best practices. The Expert shall conduct due diligence on required civil works and provide inputs to the feasibility studies, technical specifications and bidding documents. Previous experience in ADB funded or similar projects is desirable. The Expert will provide inputs and assistance to the international experts to deliver required outputs, providing due diligence and recommendations for compliance with respective country standards, codes, laws and regulations.

26. **Three Financial experts (3 pm each).** The experts should preferably have a bachelor or higher degree in finance, economics or similar. The experts should preferably have relevant professional experience of 8 years or more and preferably possess a professional accountancy/finance qualification such as a Chartered Accountant, CPA, or equivalent. The experts will assist the international Financial expert to deliver required outputs, providing recommendations for financial evaluation of the pilot and scaled-up projects., providing recommendations for tariff structure and feasible business models development relevant to their respective country.

27. **Three Economists (2 pm each).** The experts should preferably have a bachelor or higher degree in economics and similar. The experts should preferably have relevant professional experience of 8 years or more. The experts will assist the international economist to deliver required output, providing recommendations for tariff structure and feasible business models development relevant to their respective country

28. **Three Environmental Safeguard Experts (4 pm each).** The experts should preferably have a bachelor or higher degree in environmental sciences or related fields with minimum 8 years of relevant professional experience. The experts will assist the international Environmental Expert to deliver required outputs, providing due diligence and recommendations for compliance with respective country standards, codes, laws and regulations.

29. **Three Social and Gender Experts (2 pm each).** The experts should preferably have a bachelor or higher degree in sociology, anthropology or related fields with minimum 8 years of relevant professional experience. The experts will assist the international Social and Gender Expert with focus on social safeguards to deliver required outputs, providing due diligence and recommendations for compliance with respective country standards, codes, laws and regulations as well as cultural context.

30. **Three Training coordinators (3 pm each).** The experts should preferably have a bachelor or higher degree with minimum 5 years of experience in convening international workshops and training in the energy sector. The experts shall have a good capacity of organizing events, good interpersonal and collaborative skills with fluency in English, fluency in the local language is required. The experts will assist the international capacity development expert to organize, conduct and evaluate training, disseminate training materials and monitor the roll-out of

training activities. The experts shall provide overall logistics support for the capacity development component and report to national IAs, and CAREC-ESCC focal points and ADB as necessary.