## Regional: Floating Solar Energy Development

**Project Name**: Floating Solar Energy Development  
**Project Number**: 52079-001  
**Country**: Afghanistan, Azerbaijan, Kyrgyz Republic  
**Project Status**: Active  
**Project Type / Modality of Assistance**: Technical Assistance  
**Source of Funding / Amount**: TA 9564-REG: Floating Solar Energy Development  
**Strategic Agendas**: Environmentally sustainable growth, Inclusive economic growth  
**Drivers of Change**: Governance and capacity development, Knowledge solutions, Partnerships, Private sector development  
**Sector / Subsector**: Energy - Renewable energy generation - solar  
**Gender Equity and Mainstreaming**: No gender elements  

### Description
Central and West Asian countries are heavily reliant on either fossil fuels, hydropower, or imported fuels and power, which make them carbon-intensive, energy-insecure, and vulnerable to climate and external supply shocks. The proposed knowledge and support technical assistance (TA) aims to pilot test and build expertise on the emerging floating solar photovoltaic (FPV) technology to diversify the energy mix, increase energy security, and reduce greenhouse gas (GHG) emissions. Afghanistan, Azerbaijan, and the Kyrgyz Republic represent these critical vulnerabilities of Central and West Asian countries and are the targeted beneficiaries.

The TA is aligned with the Energy Policy 2009; the energy sector group work plan, 2018-2019; and the Central Asia Regional Economic Cooperation (CAREC) Strategy 2030 and Work Plan, 2016-2020. The TA outcome will contribute to the Asian Development Bank (ADB) target of providing at least $6 billion in climate financing annually from 2020. The countries requested the TA and agreed with the scope during reconnaissance missions in November 2017 and January 2018. All member countries concurred with the TA concept at the CAREC Energy Sector Coordinating Committee (ESCC) meeting in Ashgabat, Turkmenistan in March 2018. The TA is not included in ADB’s country operations business plans and regional cooperation operations business plan. The concept clearance was obtained on 6 June 2018.

### Project Rationale and Linkage to Country/Regional Strategy
Power supply in Afghanistan is 80% imported, while 85% of power in Azerbaijan is supplied from fossil fuel-based plants. In the Kyrgyz Republic, 90% of power is from hydropower plants. All countries have little or no installed solar capacity despite rapid cost reductions in the last 5 years and supporting policies. This is due to lack of awareness, and insufficient technical skills and knowledge on the costs, benefits, and financing options. The availability, suitability, and cost of land for solar energy are additional constraints to its development. Land with competing uses, such as agriculture and housing, is expensive, and hilly terrains are costly to develop and prepare for land-based solar projects. However, the countries have large lakes and reservoirs with perennially sunlit surfaces. The installation of FPV on these water bodies optimizes the use of water and solar resources, diversifies the energy mix, enhances energy security, and avoids emissions. The total installed generation capacity of the region is only a fraction of the potential FPV capacity on the region’s hydropower reservoirs alone. With the existing grid infrastructure for hydropower, the cost of installing FPV is reduced while the power density in megawatts (MW) per flooded area is significantly increased. The FPV output also allows time-shifting of hydropower output, creating a virtual pumped storage capability. Moreover, FPV installed in reservoirs used for drinking water, fishing, irrigation, and hydropower has added environmental benefits. It reduces evaporative losses (water conservation) and algal growth, increasing water clarity and resulting in plant growth, increased oxygen, and fish growth.

Solar energy is inexhaustible and available year-round, and photovoltaic cost-effectiveness is proven globally. Land-based and floating photovoltaic are sustainable options, given that (i) the countries have adequate solar resources, (ii) photovoltaic is becoming even more cost-effective, (iii) photovoltaic is quick to install, and (iv) photovoltaic mitigates climate change while enhancing energy security. Photovoltaic development also supports the countries’ nationally determined contributions targets to reduce GHG emissions by 2030.

The TA will pilot test high technology, enabling the countries to leapfrog in knowledge and capacity and increase readiness for private sector participation in large-scale, land-based, and floating solar development. The TA will also address critical challenges and vulnerabilities such as (i) insufficient technical and institutional capacity, (ii) limited financial resources, (iii) tariffs below cost recovery, and (iv) energy insecurity due to reliance on a single type of energy source.

Afghanistan remains in the lowest 5% of electricity use globally, with only 30% of the population connected to the grid. Domestic capacity is only 520 megawatts (MW); and imports from Iran, Tajikistan, Turkmenistan, and Uzbekistan account for 80% of the power supply. Unreliable supply and lack of grid connection have caused reliance on expensive (about $0.50 per kilowatt-hour) and carbon-intensive diesel generation. The country aims to diversify into renewable energy and encourage private sector participation, but its inaccessible and insecure land, and limited baseload generation and grid capacity, have hindered solar development.

In Azerbaijan, oil and gas supply over 90% of power while hydro accounts for 7%. The government aims to diversify its energy mix and improve sector efficiency, but the low user tariffs hinder investments in renewable energy. A 2016 Presidential decree mandated reforms to develop non-oil sectors, increase the use of domestic resources to free up oil and gas for additional export revenues, and incentivize private sector entry into renewable energy. The high-cost, limited availability, and competing uses of land have stalled photovoltaic development.

The Kyrgyz Republic relies heavily on hydropower, which represents 80% of capacity and 90% of supply. It is a net electricity exporter, but a net importer of fossil fuels to feed cogeneration plants in winter when reservoir water is low. Excess water is spilled without generating electricity in the summer, while coal-based plants supply the winter electricity shortage. The country needs to diversify to clean year-round power generation sources as the seasonality of hydropower threatens its energy security and increases emissions. The country’s rugged terrain and low user tariffs have contributed to the lack of investments in solar and other clean technologies.

While FPV requires stricter standards, given the exposure to water, it has advantages over land-based photovoltaic, as it (i) frees up land for other uses and saves on land acquisition and preparation costs, (ii) allows higher yields because of the cooling effect of water, (iii) conserves water through reduced evaporation, (iv) has readily available water for module cleaning, and (v) is quick to install. FPV systems have been largely installed on lakes, irrigation ponds, and reservoirs. Some plants have been built and tested in marine environments, and pile- or stilt-mounted plants have been installed over aquaculture farms, canals, and wetlands.

### Impact
Selected countries’ energy security enhanced (CAREC Energy Strategy and Work Plan, 2016-2020)  
Greenhouse gas emissions reduced (United Nations Framework Convention on Climate Change)
Project Outcome

Description of Outcome
Utility-scale floating solar projects in selected countries initiated

Progress Toward Outcome

Implementation Progress

Description of Project Outputs
Pilot-scale floating solar plants installed and scaled up plants assessed in selected countries
Business models with private sector participation developed
Institutional capacity in designing, constructing, and operating FSP systems enhanced

Status of Implementation Progress (Outputs, Activities, and Issues)

Geographical Location
Afghanistan - Nation-wide, Qarghah; Azerbaijan - Nation-wide, Lake Boyukshor; Kyrgyz Republic - Nation-wide, Toktogul

Summary of Environmental and Social Aspects

Environmental Aspects

Involuntary Resettlement

Indigenous Peoples

Stakeholder Communication, Participation, and Consultation
During Project Design
During Project Implementation

Business Opportunities

Consulting Services
An international consulting firm will be selected through the quality- and cost-based selection (QCBS) method using full technical proposal. The ratio of quality against cost will be 90:10 given the relatively new technology. Individual consultants recruited as resource persons or presenters/trainers will also be recruited and lump sum and/or output based contracts will be considered.

Procurement
Three Design-Build-Operate (DBO) contracts for the pilot projects will be procured by the TA Consultant on behalf of ADB using ICB

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OJSC Electric Power Plants
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The Ministry of Energy of the Republic of Azerbaijan
Haydar Aliyev Avenue 152, Chinar Plaza

Timetable
Concept Clearance 06 Jun 2018
Fact Finding -
MRM -
Approval 17 Aug 2018
Last Review Mission -
Last PDS Update 28 Sep 2018

TA 9564-REG

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