GEF-8 REQUEST FOR CEO ENDORSEMENT/APPROVAL

TABLE OF CONTENTS

General Project Information

Project Title Supporting Energy Transition for Remote Settlements in Turkmenistan (SET)	
Region Europe and Central Asia	GEF Project ID 11838
Country(ies) Turkmenistan	Type of Project MSP
GEF Agency(ies): UNDP	GEF Agency Project ID 9811
Project Executing Entity(s) United Nations Office for Project Services	Project Executing Type Others
GEF Focal Area (s) Climate Change	Submission Date 2/27/2026
Type of Trust Fund GET	Project Duration (Months) 60
GEF Project Grant: (a) 4,173,630.00	GEF Project Non-Grant: (b) 0.00
Agency Fee(s) Grant: (c) 396,495.00	Agency Fee(s) Non-Grant (d) 0.00
Total GEF Financing: (a+b+c+d) 4,570,125.00	Total Co-financing 29,700,000.00
PPG Amount: (e) 125,000.00	PPG Agency Fee(s): (f) 11,875.00
Total GEF Resources: (a+b+c+d+e+f) 4,707,000.00	
Project Tags CBIT: No NGI: No SGP: No Innovation: Yes Competitive Window: No	
Project Sector (CCM Only) Renewable Energy	

Taxonomy

Influencing models, Deploy innovative financial instruments, Transform policy and regulatory environments, Stakeholders, Private Sector, Capital providers, SMEs, Beneficiaries, Civil Society, Trade Unions and Workers Unions, Type of Engagement,

Information Dissemination, Consultation, Communications, Public Campaigns, Capacity, Knowledge and Research, Capacity Development, Knowledge Exchange, Knowledge Generation, Gender Equality, Gender results areas, Gender Mainstreaming, Sex-disaggregated indicators, Gender-sensitive indicators, Focal Areas, Climate Change, Climate Change Mitigation, Renewable Energy

Rio Markers

Climate Change Mitigation	Climate Change Adaptation	Biodiversity	Land Degradation
Principal Objective 2	No Contribution 0	No Contribution 0	No Contribution 0

Project Summary

Provide a brief summary description of the project, including: (i) what is the problem and issues to be addressed? (ii) what are the project objectives, and if the project is intended to be transformative, how will this be achieved? iii), how will this be achieved (approach to deliver on objectives), and (iv) what are the GEBs and/or adaptation benefits, and other key expected results. The purpose of the summary is to provide a short, coherent summary for readers. (max. 250 words, approximately 1/2 page)

Turkmenistan is a fossil fuel-reliant country with the lowest rate of renewable energy (RE) deployment in the Central Asia region. Turkmenistan has not yet embarked on the sustainable energy transition, despite the unprecedented decline in RE technology cost and increasing RE market penetration globally. This is due to its access to abundant low-cost gas, dominance of fossil fuel in the economy and lack of demonstrable experience in RE. The Law of Turkmenistan "On Renewable Energy Sources" reflects the government's effort to boost RE adoption. Turkmenistan is in its early stages of tapping into RE potential and requires significant technical support and transfer of international expertise for the development of RE market.

The project aims to build policy frameworks for energy transition and support the deployment of distributed RE solutions, particularly in remote rural settlements. To achieve this, the project will strengthen the policy and regulatory framework for RE deployment, design technical standards, build the capacity of local energy actors and demonstrate the technical feasibility of distributed solar photovoltaic (PV) by operationalising pilot small-scale solar PV projects. The project will also provide technical assistance for scale-up and replication of the pilots.

The project will lead to a direct lifetime GHG emission reduction of 75,853 tCO_2eq and an indirect emission reduction of 51,660 tCO_2-eq. The number of direct beneficiaries due to the project's interventions is estimated to be 147,170 (with ~50% women). The project is also expected to bring socio-economic benefits, such as improved access to clean energy and reduced demand for diesel-powered electricity, thereby reducing air pollution and enhancing quality of life.

Project Description Overview

Project Objective

To assist Turkmenistan in building a policy framework to transition away from gas-powered energy generation towards renewable energy by 2030 and support the adoption of distributed renewable energy solutions.

Project Components

Policy, Regulations and Plans for RE deployment

Component Type	Trust Fund

Technical Assistance	GET
GEF Project Financing ($)	Co-financing ($)
547,350.00	610,000.00

Outcome:

An enabling policy environment for countrywide uptake of renewable energy solutions established

Output:

Output 1.1: Technical, economic, financial, environmental and social analysis carried out to support the Ministry of Energy (MoE) and other stakeholders in the design and implementation of appropriate clean energy policies, programmes and regulations, including recommendations on repurposing of fossil-fuel subsidies towards RE development.

Output 1.2: Appropriate policies and regulations for on- and off-grid large and small-scale RE solutions prepared for government adoption.

Output 1.3: Capacity of key stakeholders strengthened through gender-sensitive coaching, training seminars and study tours (with 40% women trainees).

Output 1.4: A technical unit within MoE to conduct RE planning and technical assessments established.

Output 1.5: Guidelines for e-waste management plans prepared.

Pilot distributed RE projects

Component Type	Trust Fund
Technical Assistance	GET
GEF Project Financing ($)	Co-financing ($)
322,130.00	700,000.00

Outcome:

Piloted distributed solar photovoltaic (PV) solutions (both on-grid and off-grid) to showcase economic viability and environmental co-benefits

Output:

Output 2.1: Tender package for large scale distributed PV farm prepared with technical assistance from the project.

Output 2.2: Tender package prepared to procure pilot small-scale solar PV that streamlines environmental and social safeguards and gender, with a focus on women entrepreneurs and women's associations wherever possible.

Output 2.3: Monitoring, reporting and verification (MRV) systems to monitor solar PV performance established

Output 2.4: A developed monitoring system for tracking GHG emissions

Pilot distributed RE projects

Component Type	Trust Fund
Investment	GET
GEF Project Financing ($)	Co-financing ($)
2,594,095.00	2,800,000.00

Outcome:

Piloted distributed solar photovoltaic (PV) solutions (both on-grid and off-grid) to showcase economic viability and environmental co-benefits

Output:

Output 2.5: Pilot small-scale solar PV systems deployed in remote settlements

Scale-up and replication of distributed RE projects

Component Type	Trust Fund
Technical Assistance	GET
GEF Project Financing ($)	Co-financing ($)
312,567.00	23,130,000.00

Outcome:

Use of capital subsidies for renewable energy expanded into a government to support replication; and local capacity to operate RE system established

Output:

Output 3.1: Government plans for scale-up of additional solar PV investments developed.

Output 3.2: Gender-sensitive training for Government, private sector personnel, and local residents on O&M of RE installations developed and rolled out.

Output 3.3: Renewable energy planning and technical assessments conducted in support of replication of new distributed RE projects (with focus on small-scale projects, women entrepreneurs or women's associations).

Component 4. Knowledge management

Component Type	Trust Fund
Technical Assistance	GET
GEF Project Financing ($)	Co-financing ($)
83,734.00	400,000.00

Outcome:

Knowledge management systems established

Output:

Output 4.1: Knowledge management frameworks developed to collate data/lessons learned and foster peer to peer learning

M&E

Component Type	Trust Fund
Technical Assistance	GET
GEF Project Financing ($)	Co-financing ($)
115,010.00	550,000.00

Outcome:

Monitoring system developed

Output:

Output 5.1: Monitoring and evaluation framework to assess project performance established and followed

Component Balances

Project Components	GEF Project Financing ($)	Co-financing ($)
Policy, Regulations and Plans for RE deployment	547,350.00	610,000.00
Pilot distributed RE projects	322,130.00	700,000.00
Pilot distributed RE projects	2,594,095.00	2,800,000.00
Scale-up and replication of distributed RE projects	312,567.00	23,130,000.00
Component 4. Knowledge management	83,734.00	400,000.00
M&E	115,010.00	550,000.00
Subtotal	**3,974,886.00**	**28,190,000.00**
Project Management Cost	198,744.00	1,510,000.00
Total Project Cost ($)	**4,173,630.00**	**29,700,000.00**

Please provide Justification

PROJECT OUTLINE

A. PROJECT RATIONALE

Describe the current situation: the global environmental problems and/or climate vulnerabilities that the project will address, the key elements of the system, and underlying drivers of environmental change in the project context, such as population growth, economic development, climate change, sociocultural and political factors, including conflicts, or technological changes. Describe the objective of the project, and the justification for it. (Approximately 3-5 pages) see guidance here

A1. The global environmental significance and regional context

The transition to low-carbon power generation has been gaining momentum in Central Asia. Despite that, the share of renewable energy in Turkmenistan is merely 0.06%[1][1], contributed mainly from hydropower. Turkmenenergo, the vertically integrated power utility, has no significant medium or large-scale RE generation in operation.

Turkmenistan due to its geographic location has tremendous potential for harnessing solar energy. With more than 300 sunny days annually and with average annual intensity of solar radiation ranging between 700–800 watts per square meter (W/m2), the total technical potential of solar energy amounts to 655 GW[2][2]. The annual energy potential of solar energy is estimated at the level of 110 billion tons of equivalent fuel[3][3]. Photovoltaic power potential in most parts of the country is around 4 - 4.7 kWh/kWp. Gas sector suffers from significant losses because of gas leaks; hence, diversifying the energy system to include more renewables would be a partial solution to this problem.

Turkmenistan's adoption of renewable energy would have significance beyond its national borders, given its strategic location and role in Central Asia's energy landscape. As a major natural gas producer and exporter, Turkmenistan's energy policy choices strongly influence regional energy markets, infrastructure development, and perceptions of energy security.

There is a strong case for adoption of solar energy in Turkmenistan from an economic perspective as well. While fossil fuels have historically underpinned national revenue, the economics of power generation are shifting. Recent studies indicate that the Levelized Cost of Electricity (LCOE) for solar energy in Turkmenistan's high-irradiance zones is between 0.037 and 0.044 USD per kWh[4][4]—already comparable or lower than natural gas generation once full fuel and maintenance costs are included. As global solar technology costs continue to decline, maintaining a gas-dependent energy portfolio becomes less financially viable. LCOE of natural gas is around $0.04-0.07 per kWh[5][5], depending on price volatility, plant efficiency, operations and maintenance costs. Natural gas prices tend to fluctuate depending on the international market demand and supply. Hence, with relatively stable costs, and with a trend of decreasing costs in the long run, solar energy is a suitable alternative to natural gas.

A2. Baseline – The national context

Turkmenistan, covering an area of 491,000 square kilometres is a Central Asian country, surrounded by Caspian Sea to the West, Iran and Afghanistan to the South, and Uzbekistan and Kazakhstan to the north. It has population of around 7.6 million[6][6], with high density of population seen in the cities of Ashgabat, Turkmenabat and Dasoguz. It is vastly covered by Karkum desert where the population is sparse. It has 4th largest gas reserves

and the 16th largest oil reserves in the world[7][7]. The country's landscape is dominated by the Karakum Desert (Black Sand Desert), which stretches across over 80% of Turkmenistan's territory[8][8].

Abundant fossil fuel reserves have led the country to become the most carbon-intensive in the region. It has high concentration of oil and mineral resources with total proven reserves of oil being 600 million barrels and 13,600 bcm of natural gas reserves[9][9]. Hence, oil and natural gas extraction forms a major part of Turkmenistan's economy. According to international Trade Centre, 92.4% of total exports were attributed to oil and gas commodity exports, valued at ~USD 13.3 billion (2022)[10][10]. Turkmenistan is the third largest emitter of carbon dioxide in the central Asian region, releasing 63,655 kt CO_2 in 2022 with a CO_2 intensity amounting to 152% greater than the global average[11][11]. Energy sector alone contributes 86.3% of GHG emissions[12][12]. Turkmenistan's energy usage trends are not energy efficient. For instance, the average lightbulb used in a household is of 60W[13][13], driving up the overall household energy consumption in Turkmenistan. Energy intensity of GDP of Turkmenistan is 173% higher than the global average with 0.71 kg CO2 per unit of GDP(PPP)[14][14]. This makes it the 2nd highest energy intense economy in the world.

Turkmenistan relies heavily on oil and gas resource to meet its domestic energy demand as well as exports. Hence, it is characterized by high energy independence, having negligible energy diversification with 99% of its sources being natural gas and oil. Natural gas (87%) and oil (13%) dominate the energy supply mix with negligible contributions from hydropower and biofuels[15][15]. The energy sector is entirely government/state owned in Turkmenistan, with no private sector involvement.

Turkmenistan generates 32 billion kWh[16][16] of electricity annually. Source of electricity generation as of 2022 is mostly taken over by natural gas producing (~100%) with minimal contribution from hydropower sources (0.15%)[17][17]. Oil / diesel is used as reserve fuel; gas is the primary power generation fuel. Industry and agriculture sectors are the highest electricity consumers, followed by residential and transport sectors. 72% of electricity generated in the country is consumed nationally, remaining is exported to neighbouring countries[18][18]. Total energy consumption has been growing rapidly since 2020 (by 6%/year), reaching 43 Mtoe in 2024.[19][19]

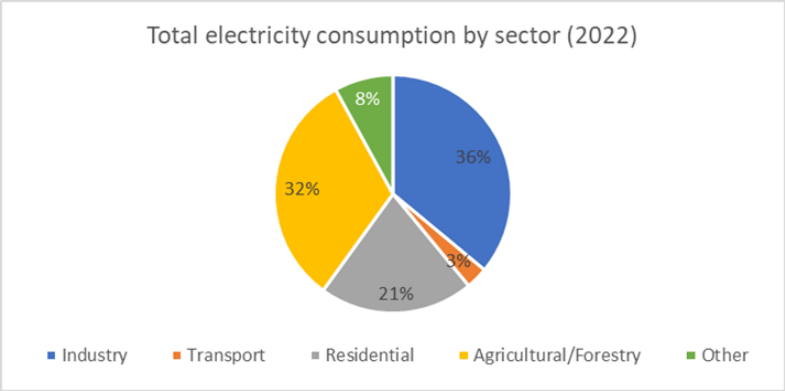

Figure 1: Total electricity consumption (by sector)

The Ministry of Energy has the exclusive right to export electricity - if state-owned power plants have excess, it should be sold to the Ministry of Energy which will then be exported. The energy sector in Turkmenistan is centralized and state controlled. The Ministry of Energy oversees policy, planning, and regulatory functions, maintaining tight government supervision over all segments of the industry. The state corporation Turkmenenergo manages the national power system, including generation, transmission, and distribution of electricity across the country. In the hydrocarbon sector, Türkmengaz and Turkmennebit—both state concerns—dominate natural gas and oil operations respectively, handling exploration, production, and exports. Reflecting extensive state investment in energy infrastructure, electrification in Turkmenistan is effectively universal, with 100% of the population having access to electricity[20][20].

Although there is no prominent commercial Solar PV installation in the country as of date, there are several pilot projects sanctioned. For example, a hybrid system is installed with 4 MW wind turbines and 6 MW solar with no batteries in the Southwest Balkan region[21][21]. It is in the process of starting operations (on-grid system), owned and operated by the Ministry of Energy. Local manufacturing of solar PVs is absent in Turkmenistan due to low demand and a lack of investments in this sector. Table 3 gives a detailed collation of renewable energy projects in the country.

Interventions in electronic waste management are also critical in Turkmenistan for the RE deployment envisaged under the proposed project. Currently, there is no regulatory framework in place for the management of e-waste. According to the Regional e-waste monitor report by UNITAR, e-waste generated in Turkmenistan in 2019 was 6.5 kg/inhabitants, totalling ~39 kilotons, with no imports or exports of hazardous waste reported. Categories of e-waste generated (2019) are as follows: Temperature exchange equipment (19%); Screens and monitors (15%); Lamps (2%); Large equipment (24%); Small equipment (31%); and Small IT (9%)[22][22].

Energy and climate challenges in remote settlements of Turkmenistan

The Karakum desert is known for its expansive sandy dunes, sparse vegetation, and extreme aridity, making it one of the most challenging environments. Karakum Canal, an engineering feat, connects Amu Darya River in the east to the Tejen river in the south. This supports both agriculture and human settlement in the otherwise

inhospitable terrain. Remote settlements in the arid regions of Turkmenistan, particularly within the expanse of the Karakum Desert, embody resilience and adaptability in the face of an adverse environment. The Karakum covers about 70% of Turkmenistan, with a population density averaging only one person per 6.5 square kilometres, making these small communities among the most isolated in Central Asia[23][23]. The country has experienced intense warming over the past 55 years, with temperatures rising 1.4°C, significantly faster than the global average of 0.8°C over 100 years[24][24]. This trend is expected to continue, with projected increases in temperature, decreased precipitation, and more extreme weather events. Climate projections indicate a warmer and drier future, with temperatures rising 2-3°C (optimistic) to 6-7°C (pessimistic) by 2100, relative to the 1990 baseline norm[25][25]. Turkmenistan's climate vulnerability is linked to more frequent and intense hydrometeorological events, including droughts storm winds, frosts, heatwaves, floods and mudflows. Drought, fuelled by rising temperatures and water scarcity, poses a major climate risk. Drought poses risks to Turkmenistan's socio-economic development, particularly in water management, agriculture, and healthcare. Economic growth and rising population will lead to a significant rise in water demand, posing challenges to already scarce water resources in Turkmenistan, which are threatened by climate change. Extreme heatwaves are a reality, with temperatures often breaking records. The government warns of increased heat-related illnesses and cardiovascular disease due to rising temperatures[26][26].

Traditionally, the inhabitants rely on nomadic pastoralism, utilizing deep wells to survive in a landscape shaped by shifting dunes, scarce precipitation, and extreme temperatures**.** Many of these nomadic groups have settled into permanent or semi-permanent villages centered around oases or artificial water sources, where livestock raising and small-scale agriculture are possible. Livestock rearing of arvana dromedary camel, sheep, and alabai dogs is one of their primary occupations. There are over 130 settlements (63 are civilian / social settlements and the rest are military settlements) spread across the vast Karakum Desert with a population of about 147,050.

Due to the topography of these settlements, water is a scarce commodity. Water scarcity in Turkmenistan is being exacerbated by decreasing water supplies and an increasing population. Annual water availability per capita has reduced by 50% from the 1990s to the early 2020s[27][27]. Accessing water involves the use of water pumps, which require reliable electricity, which is absent in these regions. The settlements in the desert have limited access to the central grid. Livestock rearing requires an uninterrupted electricity supply for water pumping and water desalination to feed animals. These settlements also have small clinics / hospitals that require electricity and water supply for their operations. Electric demand in many remote settlements often reflects reliance on older, inefficient technologies—such as incandescent light bulbs, outdated air conditioners, and aging appliances—which significantly increases overall energy consumption. This older equipment with outdated technology has higher power requirements. Harsh weather conditions during both summers and winters require heavy use of cooling and heating systems, driving up the energy demand in the settlements.

The majority of the population residing in remote settlements in Turkmenistan relies on diesel generator sets for their electricity needs. This is particularly concerning as the settlements are spread across the vast Karakum desert. These diesel generators serving remote settlements are typically deployed and owned by the Government through capital grant mechanisms. The diesel fuel required for these generators is supplied by the Government, and transportation costs are also covered by the state. Land ownership in these settlements is state-owned. As a

result, the current ownership and financing model is fully public and centrally managed, with limited scope for structural reform.

Because of poor road infrastructure, transporting diesel to remote settlements is extremely costly. Although the base price of diesel is 1 manat per liter ($0.286/L), transportation over 100 km in desert terrain adds approximately 0.8 manat per liter ($0.2285/L), increasing the delivered cost to about 1.8 manat per liter ($0.514/L) — an 80% increase over the original fuel price. Moreover, transport of diesel to these remote settlements results in an average of 5 to 7 fuel spills, accounting for 31,000 litres of diesel spilled annually. These fuel spills have extreme environmental impacts with high risk of polluting ground water sources for these settlements. High diesel costs are due to difficulties in transporting/storing the fuel, fuel shortages in the winter months, high operation and maintenance costs, and low system efficiency. The heavy reliance on diesel as a fuel source have an adverse impact on the environment and public health.

Diesel generators emit air pollutants such as nitrogen oxides, sulphur oxides, carbon monoxide, hydrocarbons, carbon dioxide, as well as particulate matter, which causes severe health risks like respiratory and cardiovascular problems. The diesel generators account for more than 90,000 tons of CO_2 emissions annually by consuming ~33.55 million litres of diesel. These diesel gensets are often unreliable with frequent breakdowns in the extreme heat of summer months, leaving vulnerable population without electricity for days. The majority of the diesel gensets operate with an 8-hour-per-day limit, restricting access to basic amenities to one-third of the day for the elderly, women, and children. Table 1 indicates the operational details of diesel generators across the ten settlements selected for pilots in the proposed project. The cost of power generation by diesel is well recognized by the Government as reflected in their policies and recently passed the Law of Turkmenistan 'On Renewable Energy Sources' (2021).

Solar energy in the form of mini grids will be the most effective intervention for these remote settlements in the desert region, as land is abundant and there is minimal O&M cost in the lifetime of solar PV.

Table 1- Settlement-wise data on diesel genset consumption and cost structure[28][28]

Settlement	No. of diesel gensets	Capacity of diesel gen	Cost of diesel gen	Total Capex	O&M costs		Service cost		Opex	Service life of genset	Distance from Oil depot	Diesel Consumption (Actual) (2024)	Diesel Fuel Cost (2024)	Fuel transportation cost per litre	Total fuel consumption cost
	Number	kVA	USD	USD	TMT	USD	TMT	USD	USD	Hours	km	Litres per year	USD per year	USD	USD
Kirpili village, Ahal	2	400	15,890	31,780	115,000	32,890	87,000	24,882	57,772	16,000	255	451,112	129,018	217,075	346,093
Atabek village, Ahal	1	250	9,671	9,671	102,000	29,172	85,000	24,310	53,482	12,500	330	147,511	42,188	82,260	124,448
Ataguiy village, Ahal	1	250	9,671	9,671	102,000	29,172	85,000	24,310	53,482	12,500	300	154,780	44,267	89,115	133,382
Bukri village, Ahal	1	125	7,458	7,458	97,000	27,742	87,000	24,882	52,624	9,450	250	171,812	49,138	79,975	129,113
	1	65	5,643	5,643											
Chur-Churi village, Ahal	1	700	23,856	23,856	157,000	44,902	87,000	24,882	69,784	23,400	170	374,357	107,066	109,680	216,746
Garagalin-Dinlisi village, Ahal	1	182	10,130	10,130	117,000	33,462	87,000	24,882	58,344	111,600	154	162,349	46,431	47,985	94,416
	1	100	5,892	5,892											
Akmolla village, Ahal	1	200	8,321	8,321	108,000	30,888	87,000	24,882	55,770	8,200	708	163,489	46,757	223,930	270,687

Murzachyrla village,Akhal	1	160	8,123	8,123	96,000	27,456	87,000	24,882	52,338	9,200	709	107,456	30,732	159,950	190,682
Yalkym village,	1	330	12,500	12,500											
Balkan	1	100	5,892	5,892	115,000	32,890	87,000	24,882	57,772	6,500	324	167,592	47,931	95,970	143,901
Damla village, Dashoguz	1	330	13,750	13,750	127,000	36,322	87,000	24,882	61,204	14,600	380	216,435	61,900	164,520	226,420

B. PROJECT DESCRIPTION

This section asks for a theory of change as part of a joined-up description of the project as a whole. The project description is expected to cover the key elements of good project design in an integrated way. It is also expected to meet the GEF's policy requirements on gender, stakeholders, private sector, and knowledge management and learning (see section D). This section should be a narrative that reads like a joined-up story and not independent elements that answer the guiding questions contained in the guidance document. (Approximately 3-5 pages) see guidance here

Describe any changes in alignment with the project design with the original PIF

The project design remains largely consistent with the original PIF, with major changes made only to Outcome 4. PIF included monitoring system and institutional knowledge sharing on tracking GHG emissions but lacked project level monitoring & evaluation and knowledge management components. Outcome 4 has been restructured at PPG stage to include project M&E and KM. Monitoring system and institutional knowledge sharing on tracking GHG emission (Outcome 4 at PIF stage) has been added and consolidated under Outcome 2 at PPG stage (Output 2.4: A Developed monitoring system for tracking GHG emissions). Further details on updates and changes from the PIF are listed in the table below.

Table 6 - Changes in project design

PIF	Changes made at PPG stage
Outcome 4: Monitoring system and institutional knowledge sharing on tracking GHG emission and related avoided air pollutants built Output 4.1: A developed monitoring system for tracking GHG emissions and avoided diesel power-generator-related air pollutants. Output 4.2: A developed methodological manual "User's Guide for Greenhouse Gas (GHG) monitoring" to perform calculations of avoided GHG emission reductions for projects where diesel-powered off-grid systems are replaced with solar PV distributed mini-grid systems with battery storage Output 4.3: Introduction of "User's Guide for Greenhouse Gas (GHG) monitoring" manual into a	Component 4. Knowledge management Output 4.1: Knowledge management frameworks developed to collate data/lessons learned and foster peer to peer learning Component 5. Monitoring and Evaluation Output 5.1: Monitoring and evaluation framework to assess project performance The scope of this outcome was updated - from monitoring system of GHG emissions to developing a comprehensive M&E framework for the entire project. Also, knowledge management systems were not included in the PIF stage. This part has been added into this outcome.

mandatory university program at the State Energy Institute of Turkmenistan	
Addition of Output to Outcome 2 - Output 2.4: A Developed monitoring system for tracking GHG emissions	Output 2.4: A Developed monitoring system for tracking GHG emissions Activity 2.4.1: Design and operationalization of GHG emission monitoring, verification and reporting system Activity 2.4.2: Develop a methodological manual "User's Guide for Greenhouse Gas (GHG) monitoring" Activity 2.4.3: Equip air quality monitoring teams of Ministry of Environmental Protection (MoEP) with mobile air quality testing hardware and software tool Output 2.5: Pilot small-scale solar PV systems deployed in remote settlements (Output 2.4 at PIF) Output for GHG emissions monitoring system and institutional knowledge sharing on GHG emissions (Outcome 4 at PIF) has been included in outcome 2 at PPG stage (Output 2.4). Output 2.4 from PIF has been shifted to Output 2.5
Core Indicators: 6. Greenhouse Gas Emissions Mitigated (metric tons of CO_2e): 1,811, 834 tonnes direct 42,790 tonnes indirect 11. People benefiting from GEF-financed investments disaggregated by sex (count): 147,050 direct beneficiaries (50% women)	**Core Indicators[1][29]:** 6. Greenhouse Gas Emissions Mitigated (metric tons of CO_2e): 75,853 tonnes direct 51,660 tonnes indirect

17,377 indirect beneficiaries (50% women)	11. People benefiting from GEF-financed investments disaggregated by sex (count): 147,170 direct beneficiaries (73,573 women)

Distribution of funding per outcome at the PIF and PPG stage has been reflected in Table 7.

GEF funds allocation to each outcome has been slightly modified at the PPG stage. Budget for outcome 4 has been increased compared to the PIF stage, to accommodate the addition of project level M&E and KM. Budget from Outcome 3 has been reduced and added to Outcome 2, as the budget for pilots (Outcome 2) PIF stage was underestimated.

Table 7 - Budget Allocation

Outcome	Total cost (USD) (PPG stage)	Total cost (USD) (PIF stage)	Difference (USD)
Outcome 1	547,350	559,886	-12,536
Outcome 2	2,916,225	2,275,000	641,225
Outcome 3	312,567	1,000,000	-687,433
Outcome 4	198,744	140,000	58,744

Theory of Change

The objective of this project is to facilitate renewable energy development, particularly solar deployment in Turkmenistan. This is achieved through the various components proposed under this project[2][30] – (i) creating an enabling policy environment for on and off-grid RE deployment in the country; (ii) piloting distributed solar PV systems in 10 remote settlements for demonstration effect; (iii) providing assistance for scale-up of distributed solar PV systems and further accelerate the uptake of RE solutions; and (iv) facilitating knowledge management and M&E. The theory of change of the project is presented in Figure 2. This diagram summarises the various barriers to the deployment of RE in Turkmenistan, with project activities and outputs designed to eliminate these barriers. The project aims to achieve its stated objectives via the following outcomes that are grouped in 4 project components and by releasing a number of outputs under each outcome.

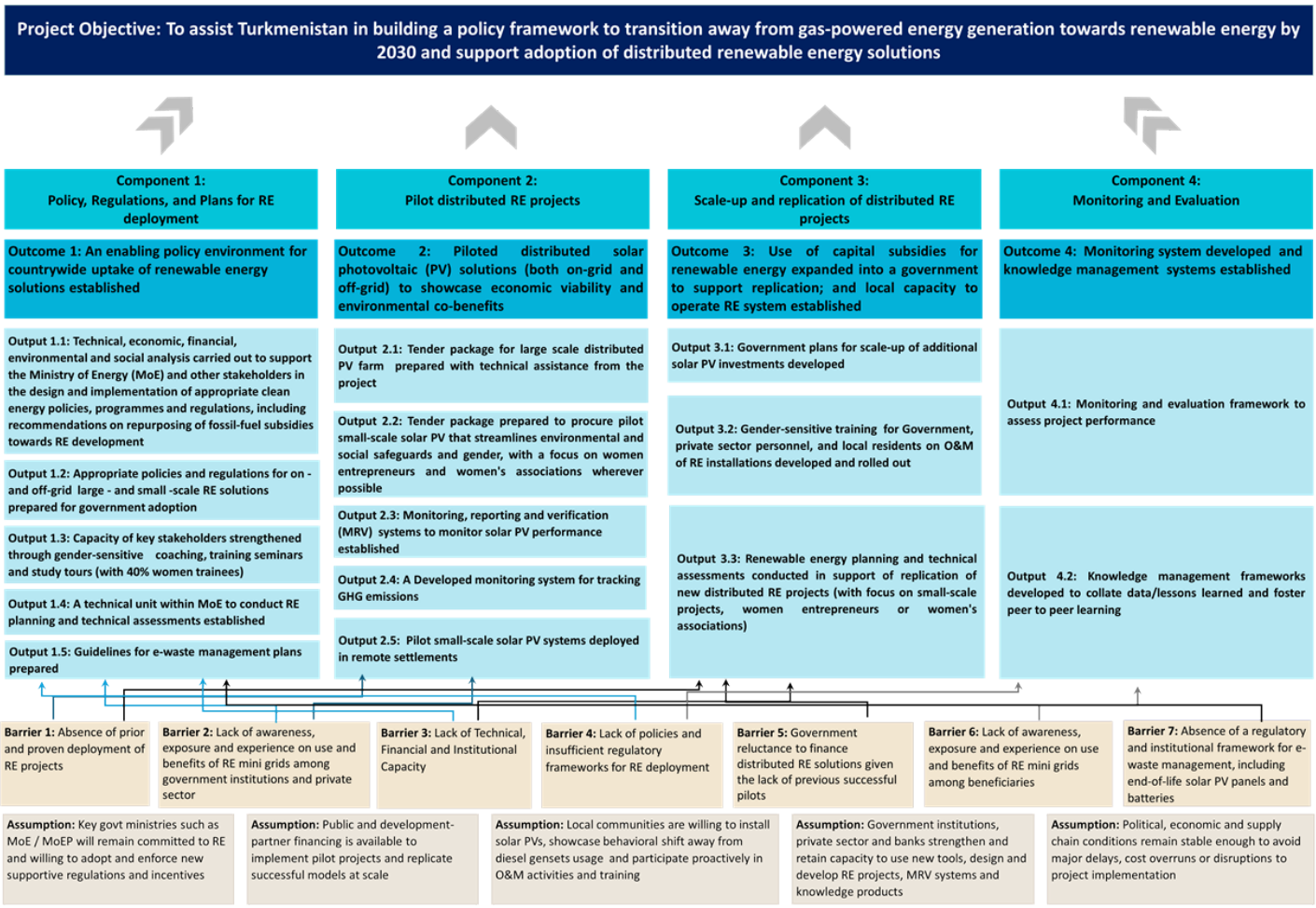

Figure 2: Theory of Change

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[1]Please refer to core indicator section for calculation methodology

[2] *For the purpose of this document, following definitions will apply -*

- *Solar mini-grid is defined as a solar PV installation with an installed capacity of up to 2 MW On-Grid Energy Systems: These are systems, either centralized or distributed, that are connected to the main national power grid.*

- *Off-Grid Energy Systems are the systems that are not connected to the national grid; they operate autonomously in 'island mode' and meet electricity demand through local power generation and distribution.*

- *Large-Scale On-Grid Projects typically involve substantial power generation facilities connected to the main electrical grid. Examples include large solar farms. The capacity of such projects can vary widely, often ranging from tens to hundreds of megawatts.*

- *Large-Scale Off-Grid Projects refer to significant power generation systems that operate independently of the main grid, often serving large facilities or communities. An example is a sizable solar mini-grid designed to supply electricity to an entire village. Capacities can range from several hundred kilowatts to multiple megawatts, depending on the demand.*

- *Small-Scale On-Grid Projects are smaller installations connected to the grid, such as rooftop solar panels. Capacities for these projects are generally lower, often below 1 MW.*

- *Small-Scale Off-Grid Projects involve individual or community-based systems not connected to the main grid, such as solar home systems. Capacities are typically in the range of a few watts to several kilowatts*

- *Distributed Renewable Energy (DRE) systems, also known as Distributed Energy Resources (DER), refer to decentralized energy generation units located close to the point of consumption. These systems can operate independently or in conjunction with the main power grid. The classification into 'small-scale' and 'large-scale' varies across regions, often based on capacity and application. Small scale typically encompasses energy generation units with capacities up to 100 kilowatts (kW). Large scale refers to energy generation units with capacities exceeding 100 kW, potentially reaching several megawatts (MW).*

Component 1 will address the lack of a RE ecosystem, institutional capacity and awareness about RE amongst government/private stakeholders, and the inadequate policy architecture for introducing RE. It will focus on providing assistance to develop necessary regulations/guidelines and update existing laws/regulations to facilitate the adoption of RE, particularly solar deployment in the country. This component also targets capacity building by establishing a dedicated technical unit, which will prioritize RE deployment. It will also focus on conducting training programmes for various stakeholders to build local capacity and ensure stakeholder buy-in for RE deployment, with a focus on solar energy. Multi-channel public awareness raising campaigns will be conducted to sensitize the public on the benefits of RE deployment. Country delegations will be taken on international study tours to adopt global best practices. The interventions under this component focus on laying down the institutional and regulatory mechanisms needed for RE deployment. In addition, Component 1 will address the emerging need for environmentally sound management of end-of-life solar panels, batteries, and other electronic equipment associated with renewable energy systems and old inefficient appliances.

Component 2, with the broader aim of addressing the lack of RE ecosystem and institutional capacity, focuses on operationalizing solar mini-grid pilots in 10 settlements. This is done through a range of activities including – provision of support to develop tender packages for large-scale and small-scale solar plants, developing detailed project reports for pilot sites, establishing MRV systems for the performance of solar plants and tracking GHG emissions and the deployment of solar pilots in the targeted settlements. The development of tender packages will involve the preparation of standardized templates for feasibility assessments, tender mechanisms for contracting/procurement of services/equipment essential to the deployment of solar energy. Furthermore, support will be provided to government stakeholders to issue these tender documents and award the tender to the successful applicants. This will provide the necessary contracting and operational assistance needed for the operationalization of the pilot solar projects. Establishing MRV systems is crucial for assessing the efficiency of the solar deployment as it enables measuring performance as well as tracking the impact of solar deployment on GHG emissions. This component aims to provide a successful proof of concept by operationalising 10 pilots. This will further lead to a demonstration effect where such deployments can be replicated across the country.

Component 3 addresses the lack of finance for RE deployment and building economies of scale. It focuses on scaling up and replication of distributed RE projects. This is done through activities that help in scaling up the solar deployment, which has been achieved through component 2. Support will be provided for tendering installation and operationalization of distributed solar projects in 120 settlements and - facilitating technical/financial assistance to expand capital expenditure subsidy for these projects. Training programmes are held for various stakeholders to ensure easier replication and scaling up of solar deployment. There will also be feasibility assessments to explore other use cases of solar energy deployment, such as solar water pumps, desalination and rooftop solar.

All of these activities will be supported by **Component 4 and 5**, which focuses on knowledge management, monitoring, evaluation, and reporting on project results and lessons learned. Activities under this Component will establish a baseline for project activities at the beginning of the project and develop knowledge and Monitoring and Evaluation (M&E) reports on project data, outcomes achieved, lessons learned, best practices and information/strategic insights disseminated among project stakeholders.

Renewable energy remains at an early stage of development in Turkmenistan, with no operational large-scale renewable energy projects currently in place. In this context, the project will deploy solar mini-grids to demonstrate technical and economic viability, thereby building investor confidence and strengthening

stakeholder trust in renewable energy solutions. For a fossil fuel–dependent country with significant solar potential, this initiative represents a practical step toward advancing a gradual green transition.

The project will leverage advanced technologies to enhance efficiency and sustainability. Smart meters and IoT-enabled mini-grids will generate real-time performance data to support monitoring and evaluation, while operations and maintenance will incorporate modern digital solutions, including automated and drone-assisted systems. Solar panel cleaning will utilise water-efficient robotic technologies—such as electrostatic systems and microfiber-based methods—to minimise water consumption in arid environments.

This project will also carry out interventions (Component 3) focused on scaling up. It will provide assistance for 120 feasibility assessments for remote settlements to deploy solar mini grids. It also facilitates tender package development for these sites. Training will be provided for various stakeholders to build local capacity. Providing the necessary preparatory activities will enable easier scaling up and replication of solar deployment. Furthermore, the project provides support to exploring various other use cases for solar deployment such as desalination, solar water pumps and rooftop solar which can be transformative in the local context, particularly for far-flung remote desert settlements.

Sustainability has been woven into project design through its various components. The project focuses on operationalising ten pilot mini-grids across remote settlements, which will provide a proof of concept of solar deployment in the country. It also provides the necessary assistance to develop a regulatory and institutional framework, which is critical for RE deployment. Training programmes are conducted for RE stakeholders to build local capacity. Awareness programmes focused on the benefits of RE will be conducted. The interventions provide all the necessary requisites for the country's RE transition. Furthermore, the Government has expressed interest in exporting energy generated through RE, reflecting strong buy-in for RE transition which is the overarching objective of this project. All of this ensures that the outcomes achieved by the project will be sustainable and the benefits will outlast the project tenure. The project will also promote sustainable methods such as waterless cleaning of solar panels for maintenance as a means of ensuring that water is used judiciously in a water-scarce region.

The following part discusses each component in more detail:

Component 1. Policy, Regulations and Plans for RE deployment

<u>Outcome 1</u>: An enabling policy environment for countrywide uptake of renewable energy solutions established

This outcome will focus on providing support to develop necessary regulations/guidelines and update existing laws to facilitate the adoption of RE systems. This component also targets capacity building by establishing a dedicated technical unit, conducting training programmes for various stakeholders, multi-channel public awareness raising campaigns, and arranging international. Overall, the interventions under this component focus on establishing the institutional and regulatory architecture needed for wide-scale solar / RE deployment in Turkmenistan.

Output 1.1: Technical, economic, financial, environmental and social analysis carried out to support the Ministry of Energy (MoE) and other stakeholders in the design and implementation of appropriate clean energy policies, programmes and regulations, including recommendations on repurposing of fossil-fuel subsidies towards RE development.

This output focuses on laying the foundational frameworks and aiding in building a regulatory/institutional ecosystem which facilitates RE development. Given below are the activities envisaged under the output.

Activity 1.1.1: Conduct baseline assessment of the RE ecosystem in Turkmenistan

Under this activity, there will be a thorough baseline analysis conducted, which will enable the identification of the main challenges to be addressed in the development of RE, specifically the solar energy ecosystem in the country. A detailed gap analysis laying out the technical, financial, regulatory, socio-cultural barriers impeding RE and solar adoption in the country will be conducted. A review of existing technical standards and assessment of complementary standards for deployment of RE will also be conducted. There will also be a mapping of potential players (investors, developers, manufacturers, utility companies, contractors, suppliers, etc.) who can help with catalysing RE adoption in the country. It will also provide detailed recommendations on short-term and long-term interventions that could be implemented to help in strengthening the solar energy sector in the country.

Activity 1.1.2: Define and develop technical standards and guidelines for design & deployment of RE

Technical standards create a common understanding and basis of expectations among developers, operators, regulators and consumers on the various levels of acceptable service delivery including technical, performance standards, safety, environmental, cost and reliability issues**.** These standards and guidelines are crucial to ensure effective investments in the RE sector. The detailed baseline assessment under activity 1.1.1 will be further built upon to draw the best global standards while adapting them to the Turkmenistan context. Under this activity, a set of technical standards and guidelines for RE will be developed in reference to the available international codes and standards for material choice, system design and service level for generation equipment, distribution grid, and electricity service standards. This will help in providing the necessary support in the operationalization of RE across the country.

Activity 1.1.3: Foster university – industry knowledge collaboration to enhance RE development

There is a critical need to build local knowledge focused on RE in Turkmenistan. National Consultants will be recruited to do a detailed mapping of the current RE university, research, and industry initiatives/capacity in the country. This baseline mapping will help in providing recommendations in incentivizing RE training/research at universities and industry involvement in RE. The focus of this activity is engagement with the industry and research/university actors in Turkmenistan to build synergies amongst them in the RE sector. Local universities with engineering or science programs will be identified to collaborate on adding curriculum on renewable energy and O&M of RE installations. This activity may focus on selected universities, including the State Energy Institute of Turkmenistan (SEIT) in Mary and the Yagshygeldi Kakayev International University of Oil and Gas (IOGU) in Ashgabat. This will help in providing a skilled workforce for the solar PV systems installed as part of the pilot under component 2 of this project. Their collaboration with industry will enable them to better train their students to join the workforce in the RE sector.

Activity 1.1.4: Provide inputs to update Law of Turkmenistan "On Renewable Energy Sources" to accelerate RE market adoption

The Government of Turkmenistan is committed towards a green transition, which is reflected in the *"On Renewable Energy Sources"*. However, the country is in its initial stages of RE adoption and the law reflects the same. There is a crucial need to ensure updating the law to facilitate a favourable regulatory and legislative ecosystem for RE transition in the country. This activity will further build upon the analysis and work done in activity 1.1.1, 1.1.2 and 1.1.3. It will ensure that the legislative and regulatory gaps identified in these activities are filled by necessary updates to the law.

Activity 1.1.5: Conduct sensitivity analysis for electricity prices with and without fossil fuel subsidies.

There will be a detailed sensitivity analysis conducted relating to electricity prices (with and without fuel subsidies). This analysis will further enable the redistribution of fossil fuel subsidies to co-finance and subsidize small-scale RE projects. It will also provide a deeper understanding of the optimum level of

subsidies, which will aid in RE adoption across the country while ensuring that electricity prices are not adversely affected.

Output 1.2: Appropriate policies and regulations for on- and off-grid large and small-scale RE solutions prepared for government adoption.

This output will focus on creating enabling conditions for the concerned stakeholders, largely the government, in solar energy market development. While scope of Output 1.1 is broadly focused on renewable energy market, Output 1.2 focuses mainly on solar energy. This is based on the consultation with the government stakeholders where it was specifically requested to scale and implement solar energy as it has the highest potential among RE technologies in Turkmenistan.

Activity 1.2.1: Develop a national roadmap for solar energy adoption in Turkmenistan

Based on activity in Output 1.1, this roadmap will provide a way forward in the form of actionable recommendations that can be undertaken to help with effective solar adoption across the country. The road map will be a comprehensive document that will lay out the strategy for solar adoption in the country until 2050. It will contain detailed solar energy vision, targets and sub-sector roadmaps for large-scale and small-scale solar development. It will also comprise a stakeholder-wise action plan to scale up solar in the country. It will provide a comprehensive list of various use cases for solar energy adoption, such as electricity generation, clean cooking, water pumps, telecommunication, desalination of water, etc., which could be explored in the country. The roadmap will also list out potential business models which can be considered in the local context for solar adoption – both small-scale and large-scale. There shall be emphasis on ensuring strong local ownership of all the interventions proposed for solar adoption. Communities and local businesses will be at the heart of this road map. Streamlined Social and Environmental Impact Assessment (SESA) as per UNDP SES requirements will be conducted during the roadmap elaboration, and the draft roadmap / strategy will be subject to State Environmental Expertise, if required by national legislation.

Activity 1.2.2: Develop secondary regulation/legislation/policies relating to mini-grids deployment

Technical assistance will be provided to develop necessary regulation/policies to enable mini-grid deployment in the country. There are several sub-laws that Turkmenistan has drafted, as listed in the baseline. This activity aims to conduct a comprehensive review of all the existing regulations and provide assistance in filling regulatory gaps that are hindering mini-grid deployment. Under this activity, policy/regulation development will be facilitated after stakeholder consultation to ensure that there is buy-in amongst key players. These regulations/policies will cover, but are not limited to energy systems (sites, installed capacity, energy demand, connected clients, costs and tariffs), key actors (private sector, associations, government, bankers, finance professionals and relevant CSOs), impacts on beneficiaries (social and productive uses, skills enhancement), and sustainable financing and business models. The following are potential mini-grid secondary legislation that could be developed. These regulations could be developed independently or as part of an umbrella mini-grid regulation, as considered feasible at the implementation stage.

- Regulation defining mini-grids and their classifications – Mini-grids are generally classified by regulators to ensure level of regulation matches the scale and technology of the project. This is crucial in deploying mini grids
- Ownership model regulations – This refers to the various types of mini-grid ownership that are allowed in the country (Utility ownership, Private and community ownership, Hybrid Ownership)
- Licensing and Legal regulations – This refers to the process of licensing a particular developer's exclusive rights to develop a mini-grid in a specific area. The regulation would comprise the different types of licenses, process of application, review of applications, selection of successful applicants, dispute

resolution provisions, tariff negotiation by applicant, rights and obligations of the licensee, quality of service expected from the licensee, transfer of license and award of license.

- Cost recovery and tariffs regulations – This would involve tariff calculation methodology, process for tariff determination, tariff revisions under various licenses, regulatory authority in charge of the tariff, treatment for over-generation, tariff dispute resolution, subsidy or financial incentives provided etc.
- Grid interconnection regulations – These regulations will focus on the options available to the mini-grid developers in the eventuality of the arrival of the national grid.
- Technical quality and standards for mini-grid equipment standards/guidelines– This refers to the standards that are set for mini-grid equipment, as well as quality of service to ensure efficiency of the mini-grid.
- Financial regulations and frameworks – These refer to various means of providing support to mini-grid developers. It can be done either through grants for generation or distribution assets, technology specific grants, location specific grants, capacity building grants, non-grant subsidies etc. These mechanisms will also aid in institutionalisation of capital subsidies in Activity 3.1.3.
- Environmental protection and safety regulations – These regulations will be framed to ensure there is no adverse environmental impact due to the operationalization of mini-grids.
- Templates for power purchase agreements between the Independent Power Producer (IPP) and buyer (Turkmenenergo)
- Specific guidelines for remote settlement electrification – These guidelines could focus on incentivising the electrification of remote settlements by providing special concessions to developers. The rationale behind these guidelines is to provide benefits to developers who help in the electrification of settlements, that are not financially viable.
- Land use regulation for mini-grid deployment

Activity 1.2.3: Develop secondary regulation/legislation/policies relating to large-scale solar and on-site/roof top solar deployment

This activity focuses on facilitating a favorable regulatory environment for large-scale solar development in the country to further its energy export ambitions. Regulations on large-scale solar deployment relate to technical standards and performance regulations, grid infrastructure, land use and environment, financing and payment. These regulations could potentially be developed if considered feasible at the implementation stage. Bankers and finance professionals will be consulted to get inputs regarding financial regulation aspects of the policies. This list is merely suggestive and not prescriptive. These regulations could be developed independently or as part of an umbrella large-scale solar regulation.

- Power Purchase Agreement (PPA) templates between the solar developer and the off taker (buyer) of electricity. This lays down the terms and conditions for the purchase of power between the two parties.
- Cost recovery and Tariffs regulations – This would involve tariff calculation methodology, process for tariff determination, tariff revisions under various licenses, regulatory authority in charge of the tariff, treatment for over-generation, tariff dispute resolution, subsidy or financial incentives provided etc. This activity would explore the viability of net metering and grid-integration regulation for rooftop solar installations.
- Technical standards and performance regulations– These regulations are crucial for large-scale solar deployment as the equipment, tools and services used have a direct impact on the performance of the plant. These regulations will lay down technical standards for components such as modules and inverters to ensure standardisation. It may also contain a list of approved models and manufacturers for various

components. Manufacturing standards for these components could also be laid down to ensure that only high-quality components are used in these solar projects.

- Grid Infrastructure – This regulation governs all interconnection contracts. The primary regulation is the requirement for interconnection agreements with transmission system operators (TSOs) or utility companies to feed companies to the grid. It consists of the detailed process of power transmission from the solar plant to the grid. It will also have provisions that govern extenuating circumstances where there is an infrastructure malfunction or lower power generation.
- Land use and environment regulation – This regulation will describe the detailed process of land acquisition for large-scale solar deployment. It will also provide the necessary permits required and the authorities that will issue them to the solar developer. It will also contain the details relating to environmental impact assessments and social impact assessments to ensure that the solar development does not cause adverse impacts.
- Financial regulations/bye laws – This refers to all sub-regulations/bye laws relating to financial incentives such as tax credits, feed-in tariffs, and grants for large scale solar plants. Furthermore, regulations for market instruments such as Renewable Purchase Obligations (RPOs) for distribution licensees and Renewable Energy Certificates (RECs) capital subsidies for solar developers can also be institutionalised, through government decrees

The financial regulations prepared under activities 1.2.2 and 1.2.3 will establish the principles and mechanisms for supporting renewable energy investments, including provisions related to incentives, subsidies, and public financing mechanisms. These regulatory provisions will provide the policy foundation for the subsidy scheme envisaged under Output 3.1. In particular, the work under Component 1 will assess existing fossil-fuel subsidies and develop recommendations for repurposing or complementing them with targeted financial support mechanisms for renewable energy. Based on this framework, Output 3.1.1 will support the Government in designing practical plans to operationalize capital subsidies for renewable energy investments, including distributed solar PV systems in remote settlements.

Output 1.3: Capacity of key stakeholders strengthened through gender-sensitive coaching, training seminars and study tours (with 40% women trainees).

This output focuses on strengthening RE capacity amongst various stakeholders in Turkmenistan. This output focuses on conducting capacity building through activities such as training sessions, coaching, and study tours

Activity 1.3.1: Conduct capacity needs assessment of national/local government entities to adopt RE

A detailed capacity needs assessment of various local and national stakeholders will be conducted. This will provide a baseline assessment of the gaps in technical, managerial, and planning capacity in the current institutional framework, which is hindering RE transition. This assessment will inform subsequent capacity building activities under this output.

Activity 1.3.2: Conduct training programmes for various stakeholders on RE adoption

Based on the capacity gap assessment conducted under activity 1.3.1, training programmes will be conducted under this activity. These trainees will be government staff members, public and private sector personnel. Private sector personnel will consist of bankers, individuals working in solar energy-related sectors, technicians working in the power sector, and construction developers. The three training programmes proposed under this intervention are presented below. A total of 80 trainees are expected to be trained,

including 30 government officials, 15 from the private sector, 15 from the banking sector, and 20 train-the-trainer participants.

- **Government personnel** – Their training will be focused on the policy (2 weeks), financial (1 week), technical, and operational aspects (2 weeks) of solar energy deployment. The trainers will expose them to best practices across the world, particularly regulatory practices and policy implementation. There will also be a week-long financial training to strengthen the participants' capacity to conduct financial analysis of RE/solar projects. Participants will be selected by the Department for the Development of Renewable Energy Sources of the Ministry of Energy.
- **Private sector participants** (Solar energy-related sectors, technicians working in the power sector and construction developers) – This training is targeted at individuals who will help in setting up the solar plants in the country. Their training will focus on financial, policy, technical, and operational (1 week) aspects of solar deployment in the country. The training will focus on providing inputs based on global best practices. The participants will be selected by the Ministry of Construction and Architecture, the Ministry of Energy and the Union of Industrialists and Entrepreneurs of Turkmenistan (UIET).
- **Bankers/Finance professionals** – Financing RE and solar energy projects are new to the banking sector in Turkmenistan. This training will help in acclimatising finance professionals from banks/financial institutions in Turkmenistan to solar projects. It will focus on finance (1 week), Tech and operational, and policy (1 week) aspects of solar deployment. The focus will be on building the trainees confident about financing solar projects. The training program will be designed to help them understand the nature of the projects, capital required, ROI, ROE, and risks generally associated with solar. It will also introduce them to the best financial practices from across the world on financing solar projects. The participants of this workshop will be selected by the Department for the Development of Renewable Energy Sources, the Ministry of Energy and the Ministry of Finance and Economy of Turkmenistan.
- **Train the Trainers** – Develop a cohort of 20 local trainers who will be part of an intensive 5-week course on solar deployment. The participants of this course will be selected by the Ministry of Energy. This course will cover the various financial, technical, policy, and operational aspects of solar projects. This course will enable the local trainers to learn the best global practices and be equipped with technical skills to facilitate further local capacity building in the country. At the end of the course, after an assessment of their learning, they will be certified as trainers. These trainers can further be in charge of conducting subsequent training sessions for various stakeholders.

Activity 1.3.3: Organize international study tours to catalyze RE development

As a part of capacity building activities, international study tours will be organized to countries which have successfully operationalized RE, particularly solar projects. A delegation of 10 individuals selected by the Ministry of Energy comprising the team that will lead the deployment of solar projects in Turkmenistan (i.e. including from the technical unit supported under Output 1.4) will be sent on these tours. Countries such as Oman or Uzbekistan could be considered. The country for the study tours will be decided at the implementation stage. In-person study tours are essential to enable direct exposure to operational renewable energy facilities, grid integration practices, storage solutions, O&M procedures, and regulatory implementation mechanisms that cannot be fully understood through desk-based learning or virtual exchanges. Face-to-face engagement with host institutions, utilities, regulators, and private developers will facilitate practical knowledge transfer, peer-to-peer technical dialogue, and institutional partnerships critical for building confidence and implementation capacity.

Activity 1.3.4: Conduct awareness raising campaigns on renewable energy for wider public

Public awareness is important for RE transition. Awareness campaigns will be conducted to educate the public about renewable energy and ensure community buy in for RE projects. There will be 3 multi-channel public awareness campaigns conducted between the 2nd and 4th year of the project. This will be carried out through videos, TV, radio etc. 10 targeted promotional events between the 2nd and 4th year of the project will be conducted with a focus on solar power and energy efficiency for the pilot settlements. 2 targeted promotional events with a focus on solar power and energy efficiency will be conducted between the 2nd and 4th year for urban households, commercial/industrial enterprises. These awareness programmes can be conducted in collaboration with a local NGO/CSO. The awareness raising campaigns will be led by a media company and local NGOs.

Output 1.4: A technical unit within MoE to conduct RE planning and technical assessments established.

Under this Output, a technical unit will be set up and operationalized within the Ministry of Energy to accelerate the uptake of RE projects by conducting technical and feasibility studies for planned RE investments.

Activity 1.4.1: Establish a technical unit under the Ministry of Energy to drive and scale RE projects

In collaboration with the Ministry of Energy, a technical unit focused on RE deployment will be set up. This unit will lead all institutional efforts to deploy RE projects across the country and help coordinate among various stakeholders to ensure that there are concerted efforts in RE transition in the country. Under this activity, a framework will be developed for the effective and transparent governance of the technical unit, including structure, roles & responsibilities, clear policies and procedures, operational budget. This will be developed through a consultative process by involving representatives from the Ministry of Energy, Turkmenenergo, the Ministry of Environmental Protection and the Ministry of Construction. The mandate of this unit will align with national laws and policies relating to RE. The unit will be staffed with members from the Ministry of Energy, Turkmenenergo, Ministry of Environmental Protection and Ministry of Construction. This will ensure buy-in from all the ministries. This will also address the potential challenge of a lack of communication between government stakeholders on an issue such as the deployment of RE which is cross-cutting across ministries. The technical unit will help in aiding RE developers, investors, manufacturers, etc. to enter the Turkmenistan RE market. It will also foster relationships between industry, research and the government to ensure that the most innovative and high standards of technology is adopted in Turkmenistan. GEF funding will not be used to hire government staff.

Activity 1.4.2: Provide capacity building and technical advisory services to the MoE technical unit on RE project feasibility preparation

Capacity building assistance will be provided to the technical unit to undertake technical and feasibility assessments for distributed small-scale RE projects. The unit is envisioned to become a national certification body for any RE feasibility studies done prior to public or private investment into RE within the country. Coordination among institutions involved in electricity generation, distribution and application are vital to harness Turkmenistan's RE potential. The technical unit will ensure collaboration amongst Ministry of Energy, Turkmenenergo, Ministry of Environmental Protection and Ministry of Construction and synchronized RE development. This output will prioritize gender mainstreaming by ensuring active involvement and representation of women in the technical unit. National SES experts will be involved in setting up the technical unit. He / she shall ensure the team is trained on potential SE risks and their mainstreaming in technical and feasibility studies it will review.

(Activity 1.4.2 differs from Activity 1.3.2 in scope, depth, and institutional focus. While Activity 1.3.2 provides broader capacity-building and training programs for government personnel to raise general awareness and technical understanding of renewable energy policies, technologies, and best practices, Activity 1.4.2 delivers targeted, hands-on technical advisory support to the dedicated MoE technical unit. The latter focuses specifically on building institutional capability to conduct, review, and certify RE feasibility studies, including financial, technical, and safeguards assessments, thereby establishing a permanent in-house center of expertise. In essence, Activity 1.3.2 strengthens individual knowledge across government institutions, whereas Activity 1.4.2 builds sustained institutional capacity and operational functionality within a specialized technical unit responsible for guiding and quality-assuring RE project development nationwide.)

Output 1.5: Guidelines for e-waste management plans prepared.

Activity 1.5.1: Review the international best practices for e-waste management

A thorough review of international practices for e-waste management will be conducted under this activity to identify the best practices for e-waste management in Turkmenistan. The following factors will be considered for the study, including but not limited to - Extended Producer Responsibility (EPR) feature, Producer Responsibility Organisation (PRO)/Compliance Scheme, sustainable product design, legal rules and responsibilities, collection system, reporting system, monitoring system and transboundary movement of used electrical and electronic equipment.

Activity 1.5.2: Prepare the draft e-waste management guidelines and guidelines on the management of end-of-life batteries and solar panels

In order to protect the environment and human health from adverse effects of inefficient e-waste disposal, this activity aims to provide the necessary framework by developing guidelines/regulations for e-waste management. Draft guidelines will be developed for disposal/management of hazardous waste/chemicals of end-of-life batteries and solar panels. The following factors must be taken into consideration while developing the guidelines:

- International best practices
- Extended producer responsibility
- Role of authorities
- Collection, recycling and recovery targets considering environmentally safe and sound management of end-of-life batteries and their residues
- Collection points and consolidation centres
- Cooperation among stakeholders
- Monitoring system
- Transboundary movement
- Sustainable financial mechanisms

Activity 1.5.3: Develop disposal plans/approaches for e-waste – collection, dismantling and recycling/export of e-waste

Building a robust management system for e-waste involves addressing all stages of the life cycle, including collection, design, transportation and recycling. E-waste disposal plan/approach will be developed under this activity with specifications on collection, dismantling and export of e-waste. This activity is limited to planning with no physical infrastructure development. Technical assistance will be provided to the Ministry of Environmental Protection (MoEP) and other relevant national stakeholders to plan for mobilizing government or private sector partners, sensitize stakeholders on different options of collection, dismantling and disposing/export (export to countries with existing e-waste processing facilities) of the e-waste form the solar PVs, batteries and other related equipment. Feasibility on waste disposal (recycling/export etc) will be evaluated at the implementation stage.

Component 2. Pilot distributed RE projects

<u>Outcome 2</u>: Piloted distributed solar photovoltaic (PV) solutions (both on-grid and off-grid) to showcase economic viability and environmental co-benefits

The focus of this component is to (i) Build capacity of government stakeholders on requirements around procurement and installation of solar grids in 10 remote settlements; (ii) Design MRV systems; and (iii) Pilot 10 solar PV systems in remote settlements. Under this component, the project will pilot mini-grid solutions across remote settlements to serve as proof of concept for further RE deployment in the country.

Output 2.1: Tender package for large-scale distributed PV farm prepared with technical assistance from the project.

Under this output, GEF resources will exclusively support upstream enabling activities required to facilitate future large-scale renewable energy investments, including standardized tender documentation, contractual frameworks, and institutional capacity building. No GEF funds will be used to finance generation assets or capital expenditures. The aim of this output is to create a robust regulatory and procurement environment capable of attracting non-GEF public and/or private investment.

Activity 2.1.1: Technical Assistance to develop standardized templates for feasibility assessments, tender mechanisms for contracting/procurement to deploy large utility-scale and distributed Solar PV projects (including solar for Commercial and Industrial customers)

This activity provides technical assistance for the development of one-set of standardized templates each for the large-scale solar projects and C&I rooftop solar projects. This activity provides technical assistance for the development of standardized templates for the tendering and contracting processes of large-scale solar projects. This will include development of tender processes/packages for the implementation of large-scale distributed PV systems, preparation of standard contracts such as a bankable Power Purchase Agreement (PPA), technical specifications, and permitting applications, for use in this project and future replications. The rationale is to build in-house capacity of the government for procurement and installation of large-scale solar PV projects. This activity will also provide technical assistance for signing large-scale distributed solar PV agreements, such as commercial and industrial (C&I) rooftop solar. The tender package will include the private sector due diligence assessment, and the requirement for the contractor to conduct an Environmental Impact Assessment in compliance with the national legislation.

Activity 2.1.2: Organise training programs to national stakeholders on mechanisms and contracts developed under Activity 2.1.1.

Large-scale solar projects are a novelty in the country. National stakeholders, particularly government stakeholders are not aware of the mechanisms and contracts which are generally used for the

operationalisation of large-scale solar projects and C&I rooftop solar projects. Under this activity, training programs will be conducted to educate stakeholders on the standardised templates and processes developed under Activity 2.1.1. The training will include a detailed explanation of the tendering process, means of assessing tender applications, dispute resolution mechanisms, selection mechanisms, awarding of tender process etc. It will also expose the trainees to the best practices which are employed across the world for tendering and deployment of large-scale solar PV and C&I rooftop solar projects. Furthermore, it will help in building local capacity and strengthen implementation of RE related regulation in the country which is imperative for RE deployment. These training programmes will be conducted for 20 participants (at least 40 percent women) who will be selected by the Department for the Development of Renewable Energy Sources, Ministry of Energy. Week-long programmes will be conducted in two batches (10 participants each batch).

(While Activity 1.3.2 focuses on broad-based awareness raising and general capacity building on renewable energy policies, technologies, and enabling frameworks across government institutions, and Activity 1.4.2 provides hands-on technical advisory support to a dedicated MoE technical unit for preparing and reviewing RE feasibility studies, Activity 2.1.2 is specifically targeted at procurement and contractual readiness for large-scale solar projects and C&I rooftop solar projects. Activity 2.1.2 concentrates on practical application of standardized tendering documents, power purchase agreement (PPA) structures, risk allocation mechanisms, evaluation procedures, and dispute resolution frameworks. Activity 2.1.2 builds transaction-level capacity for structuring and implementing large-scale solar investments and C&I rooftop solar projects.)

Output 2.2: Tender package prepared to procure pilot small-scale solar PV that streamlines environmental and social safeguards and gender, with a focus on women entrepreneurs and women's associations wherever possible

This output aims to strengthen the capacity of the government to procure and implement small-scale solar PV solutions in the country

Activity 2.2.1: Technical Assistance to develop standardized templates for feasibility assessments, tender mechanisms for contracting/procurement to deploy small-scale solar mini grids for remote settlements and small-scale rooftop/on-site systems for MSMEs

Standard contracts, technical specifications and permitting templates will be developed with technical assistance from the project. Technical feasibility assessments in the remote settlements will be conducted to identify the best-suited solar PV solutions to ensure the solution is appropriate and sustainable for on-ground realities. For instance, rooftop solar PV systems can be implemented in villages where the standards of the roofs are sufficient to support solar PV panels, and small ground-mounted solar PV systems on individual lots where the quality of roofs in small villages is poor, prohibiting the placement of solar PV panels on roofs. A detailed invitation to bid or request for proposals will be developed and issued as the basis for the tendering process. It will thoroughly deliberate upon the various requirements from the bidders and provide detailed information that has to be stated as part of the technical and financial proposal. It will provide the details of bid evaluation, project description and scope of work. The technical proposal should include detailed technical standards, specifications and quality certifications must be provided as per the scope of services and engineering/design requirements as prescribed in the invitation to bid. The financial proposal will include pricing of all the items offered. Assistance will also be provided in the assessment, selection and awarding of tenders to successful applicants. The tender package will include the private sector due diligence assessment, and the requirement for the contractor to conduct an Environmental Impact Assessment in compliance with the national legislation. Technical assistance will also be provided to identify income-generating activities (Productive Use of Energy or PUE) to improve energy efficiency and offset O&M expenses, such as powering small enterprises or agricultural ventures (greenhouses) by solar PV installations.

RE installations will be subsequently transferred to the balance sheet of the MoE for O&M and amortization. There will be a focus on identifying these income-generating activities for women entrepreneurs.

Activity 2.2.2: Organise training programs to national stakeholders on mechanisms and contracts developed under Activity 2.2.1

Training programs will be organised for national stakeholders, particularly government stakeholders who will ensure implementation of all processes, mechanisms and contracts developed under Activity 2.2.1. This will help in building the local capacity necessary for the deployment of small-scale solar mini-grids for remote settlements and small-scale rooftop/on-site systems for MSMEs. The programmes will be designed to acquaint the participants with an understanding of small-scale solar mini-grids for remote settlements and small-scale rooftop/on-site systems for MSMEs and best global regulatory practices. Training will also include a detailed explanation of the tendering process, means of assessing tender applications, dispute resolution mechanisms, selection mechanisms, awarding of tender process etc. These training programmes will be conducted for a minimum of 20 participants (at least 40 percent women), who will be selected by the Department for the Development of Renewable Energy Sources, Ministry of Energy. Week-long programmes will be conducted in two batches (10 participants each batch). (Activity 1.3.2 provides broad-based training and awareness-raising for private sector representatives on renewable energy technologies, policy developments, market opportunities, and general regulatory frameworks. Its objective is to build foundational knowledge, stimulate interest, and improve overall understanding of the renewable energy ecosystem. In contrast, Activity 2.2.2 is more specialized and implementation oriented. It focuses on equipping private sector participants with practical, transaction-level skills required to participate in RE deployment—such as preparing bankable project proposals, responding to tenders, understanding standardized contracts, complying with technical and environmental requirements, and accessing financing mechanisms.)

Output 2.3: Monitoring, reporting and verification (MRV) systems to monitor solar PV performance established

This output will develop MRV systems to monitor and evaluate the performance of solar PV systems installed. This includes formulation of technical and institutional arrangements for the MRV system by reviewing current best practices from international MRV systems in large- and small-scale renewable energy projects. The objective of this output is to develop an MRV system for renewable energy sector, particularly to measure the impact of pilot mini-grids deployed under the project interventions (Output 2.5). This will demonstrate the efficiency of solar deployment in the rural settlements of Turkmenistan, acting as a proof of concept for government to scale it across the country. Ministry of Energy, Turkmenenergo and local communities will be the key stakeholders involved to implement the MRV systems envisaged under this output.

Activity 2.3.1: Design and implement MRV system as per international standards

Conduct baseline studies and review of current practices of international MRV systems in large- and small-scale renewable energy projects. Propose appropriate financial and institutional arrangements for the MRV system for large- and small-scale renewable sector in Turkmenistan. The KPIs for this process will be based on energy generation, availability, efficiency losses, downtime, and emissions reduction[1], as well as environmental performance (e.g. water use and waste generated). Establish an MRV system that meets international standards for regular measurement, reporting, and verification of relevant indicators for the renewable energy sector. This will also involve the implementation of MRV systems in the ten pilot sites (Output 2.5).

Activity 2.3.2: Design and deliver training materials to support operation of the MRV system

Develop training materials and deliver hands-on training for operators and other stakeholders that covers system architecture, KPI interpretation, fault detection, data validation, and reporting. The local communities

will be the key stakeholders to receive training under this activity. Provide quick-reference SOPs, troubleshooting guides, and a helpdesk/escalation process to ensure sustained operation and institutional memory. This activity will focus on training to support MRV systems installed in the ten pilots.

Activity 2.3.3: Prepare MRV report on learnings and best practices

Prepare periodic MRV reports synthesising learnings and best practices, including site-level dashboards, trend analyses, reviews of underperformance, and evidence of emissions reductions and air-quality impacts. Document standard templates, best brands, design and equipment, data dictionaries, and case studies to enable replication and inform policy and O&M improvements.

Output 2.4: A *developed monitoring system for tracking GHG emissions*

This output is focused on developing a robust monitoring system to track GHG emissions and other air pollutants. The output aims to quantify the avoided emissions and pollutants in pilot sites (Output 2.5) and to measure emission reductions achieved through renewable-based mini-grids. The output is designed as a decision-support instrument to demonstrate the climate and public health impacts of diesel generators and to provide evidence for scaling up decentralized solar solutions. GHG emissions tracking system will be developed and implemented together with Ministry of Environmental Protection, along with the local communities as the key stakeholders, and this tracking system will be utilised beyond the scope of the project (only through government grants) to measure the impact of climate mitigation projects implemented across the country.

Activity 2.4.1: Design and operationalization of GHG emission monitoring, verification and reporting system.

Provide technical assistance to develop GHG emissions monitoring systems for pilot sites implemented under output 2.5. A methodology will be developed to monitor, verify and report changes in GHG emissions. This reporting framework has potential to create a strong case for adoption of decentralized solar mini grids during feasibility and scale-up stages. Since technical personnel in Turkmenistan lack the requisite skill for installation and maintenance of solar-powered systems[2], local communities in these 10 remote settlements will be trained byorganizing training sessions to measure and report GHG emissions changes. Best practices and case studies relating to establishment of GHG/emissions monitoring systems will be published. This will help create an ecosystem for sustained use of solar mini grids in remote settlements in Turkmenistan. This methodology will be replicated at national level at the scaling up stage. This activity will be performed in the second and third year of the project.

Activity 2.4.2: Develop a methodological manual "User's Guide for Greenhouse Gas (GHG) monitoring"

Technical assistance will be provided for the development of a methodological manual titled "User's Guide for Greenhouse Gas (GHG) Monitoring." The manual will serve as a standardized tool for performing calculations of avoided GHG emissions in solar PV distributed mini-grid projects complemented by battery storage. The activity will include the provision of technical expertise to design and prepare the manual, ensuring that the methodology aligns with internationally recognized standards and is adapted to the specific circumstances of Turkmenistan. In addition, a series of capacity-building activities and training sessions will be conducted for relevant government institutions, local communities, and private sector representatives to ensure effective understanding and implementation of the manual's procedures. To ensure institutionalization and sustainability, the finalized manual will be incorporated into relevant national regulatory and policy frameworks, thereby strengthening the country's technical capacity to monitor, report, and verify GHG emission reductions resulting from renewable energy interventions. This manual will be integrated into a mandatory university program at the State Energy Institute of Turkmenistan. This initiative aims to build a

sustained national capacity for GHG monitoring and emission reduction analysis in the renewable energy sector through formal academic education and applied learning.

Activity 2.4.3: Equip air quality monitoring teams of MoEP with mobile air quality testing hardware and software tool

Air quality monitoring teams of the Ministry of Environmental Protection will be equipped with and trained to operate mobile air quality testing hardware and software tools to present an objective picture to the government regarding the pre- and post-RE installation environmental conditions to create additional leverage during the scale-up phase. Remote settlements are often underrepresented in air quality and pollution data. Monitoring black carbon and short-lived carbon pollutants (SLCPs) in these regions contributes valuable information to scientific and policy discussions on pollution and impacts of renewable energy installations on air quality. The data generated will function as a concept validation for both the government and remote communities. By providing real-time, localized air quality data, the equipment demonstrates immediate and measurable improvements, fostering trust in renewable energy systems. As these households observe the direct benefits, they are more likely to become advocates for renewable energy, encouraging wider adoption within their community and beyond. This will accelerate the process of replacing diesel generators with RE technology in remote settlements.

Output 2.5: Pilot small-scale solar PV systems deployed in remote settlements

This Output will focus on deploying small-scale solar PV systems at the selected 10 pilot sites for remote settlements of Turkmenistan. Site selection for these pilots was conducted during the PIF stage in close consultation with the MoE and local authorities. This output will be responsible for the end-to-end implementation of 10 pilot projects, including procurement, installation, and operationalization of small-scale solar PV systems. Relevant stakeholders, including national and local government authorities responsible for energy supply and rural service provision, will be consulted during project design and implementation to ensure alignment with national policies and operational practices.

Activity 2.5.1: Conduct feasibility studies and prepare detailed project reports for the implementation of 10 distributed small-scale solar PV systems

This activity involves conducting comprehensive technical, economic, and site-specific feasibility studies, along with detailed project reports, for implementing 10 distributed small-scale solar PV systems[3][31] in remote Turkmenistan settlements. A feasibility study would consist of the following parameters:

- **Technical feasibility**[4]: Solar resource availability (irradiation data), energy demand profiles of consumers (households, productive loads), optimal system sizing (PV capacity, battery storage, inverters), network design (distribution layout, load balancing), and integration with existing appliances or future grid extension.
- **Economic and Financial Analysis**: Calculates levelized cost of energy (LCOE), capital expenditure (CAPEX), operational expenditure (OPEX), payback period, net present value (NPV), and internal rate of return (IRR). It models revenues from tariffs, productive uses, subsidies, and financing options while evaluating payment capacity and business models (e.g., pay-as-you-go, community ownership).
- **Site Specific Assessment**: Gender-disaggregated mapping of target customers (households, public institutions), current energy expenditures, and productive use potential (e.g., irrigation, refrigeration). This includes load forecasting and anchor load identification to ensure revenue stability.

A detailed project report (DPR) will be prepared consolidating findings from the feasibility study into an actionable blueprint for implementation, covering engineering designs, cost estimates, procurement strategies, and timelines.

Please see a summary of the pre-feasibility study (annex E) results on the capital requirements for the village level solar electrification in Table 8.

Table 8 - Settlement-wise capital requirement for solar electrification[5][32]

Settlement	Number of households	Baseline Consumption per day (in kWh)	Estimated Capex for solar minigrid ($)	Estimated Capacity installed (kWp)
Kirpili village, Ahal	180	3,376	178,965	191
Atabek village, Ahal	84	1,586	83,526	89
Ataguiy village, Ahal	258	4,829	255,671	273
Bukri village, Ahal	244	4,554	239,773	256
Chur-Churi village, Ahal	260	4,868	253,497	271
Garagalin-Dinlisi village, Ahal	116	2,188	113,569	121
Akmolla village, Ahal	78	1,419	75,390	81
Murzachyrla village, Akhal, Babadaikhan	76	1,383	491,711	318
Yalkym village, Balkan	72	1,357	479,751	316
Damla village, Dashoguz	110	2,064	107,885	115
Total	**1,478**	**27,623**	**2,279,939**	**2,033**

This activity will be conducted in year 2 of the project.

Activity 2.5.2: Conduct an Environmental and Social Impact Assessment (ESIA) and prepare an Environmental and Social Management Plan (ESMP) for each settlement

This activity requires performing thorough ESIAs and developing ESMPs for each selected settlement to identify and mitigate potential ecological, land-use, community health, gender, and livelihood impacts associated with small-scale solar deployment. Compliant with Turkmenistan's environmental regulations and international standards, the process will incorporate participatory stakeholder consultations, including with the local communities, biodiversity screening, and monitoring protocols to promote sustainable and equitable project implementation.

Activity 2.5.3: Distribution of LED lamps to improve energy efficiency

This activity entails distributing energy-efficient LED lamps[6][33] (funded by GEF grants) to households, schools, and health centers in target settlements to lower baseline energy demand. Currently, remote settlements use lighting that is extremely inefficient due to its high electricity consumption. For instance, most settlements were seen to be using 60 W lamps during the field visits. LED lamps (7 W) are a better and more

efficient alternative to their current lighting. Distribution of lamps will also incentivize a behavioural shift towards energy efficient lighting, with an aim to lower the baseline energy demand in the remote settlements. It will allow enhanced solar PV system capacity utilization and deliver immediate benefits, like improved lighting quality, reduced fuel costs (for existing diesel pumps), and enhanced safety. Table 9 reflects the number of bulbs/lamps currently used in the settlements.

Table 9 - Settlement-wise lamp usage[7][34]

Settlement	Number of households	Total No. of lights/ lamps currently
Kirpili village, Ahal	180	956
Atabek village, Ahal	84	467
Ataguiy village, Ahal	258	1349
Bukri village, Ahal	244	1248
Chur-Churi village, Ahal	260	1361
Garagalin-Dinlisi village, Ahal	116	641
Akmolla village, Ahal	78	322
Murzachyrla village, Akhal, Babadaikhan	76	314
Yalkym village, Balkan	72	396
Damla village, Dashoguz	110	585
Total	**1,478**	**7639**

Activity 2.5.4: Provide technical support for the issuance of tender, evaluation and selection of preferred bidders to deploy small-scale solar PV systems for the 10 pilot sites

This activity provides end-to-end technical support for the tendering process to procure and deploy small-scale solar systems for 10 pilot sites. This will encompass preparation of tender, pre-bid clarification, technical specifications, evaluation criteria, shortlisting, negotiations and compliance checklists aligned with Turkmenistan's public procurement laws and renewable energy regulations. It will build capacity of the Ministry of Energy and Turkmenenergo. The tender package will include the private sector due diligence assessment, and the requirement to use technologies and approached based on the best international practices, with the aim to eliminate water use and minimize the risk of soil or water contamination. (See the Annex on ESMF, for more details). This activity will be conducted in the second year.

Activity 2.5.5: Installation, operationalization and maintenance of pilot solar PV systems in remote settlements

This activity will oversee the full lifecycle of pilot solar PV system deployment—from site preparation and installation through commissioning, operationalization, and initial maintenance—in 10 remote settlements of Turkmenistan. The solar PV systems in settlements – Yalkym and Murzachyrla[8] will be equipped with a battery to store energy and utilise it during nighttime. Ministry of Energy and Turkmenenergo, along with the local community, aided by a civil society organisation[9], will be engaged for the operation and maintenance of the 10 settlement installations. End-of-life solar panels and energy storing batteries will be disposed of (once needed) following the e-waste management, recycling, disposal plans and guidelines, to be developed within Output 1.5. This activity will be conducted in year 2 and 3 of the project.

Electricity tariffs for the residential sector in Turkmenistan are highly subsidized and therefore remain very low. Consistent with national policy, tariffs for the proposed mini-grids are also expected to be subsidized by the Government. The project will follow the existing national tariff framework; any potential tariff adjustments would be determined by the Government in accordance with national regulations and policies.

Component 3. Scale-up and replication of distributed RE projects

Outcome 3: Use of capital subsidies for renewable energy expanded into a government to support replication; and local capacity to operate RE system established

This outcome focuses on scaling up and replication of distributed RE projects. The interventions of this outcome will provide support for tendering installation and operationalization of distributed solar projects in 120 settlements and - facilitating technical/financial assistance to expand capital expenditure subsidy for these projects. Training programmes are held for various stakeholders to ensure easier replication and scaling up of solar deployment. There will also be feasibility assessments to explore other use cases of solar energy deployment such as solar water pumps, desalination and rooftop solar.

Output 3.1: Government plans for scale-up of additional solar PV investments developed.

Activity 3.1.1: Provide technical and financial advisory services for the scale-up of small-scale solar projects

This activity focuses on provision of technical/financial advisory services for scaling up government led RE plans/projects. MoE with support from a contractual services company will design and roll out plans and technical studiesfor replicating small-scale solar PV projects across the remaining 120 settlements. These studies may focus on solar resource and site suitability assessments, electricity demand and load analysis, optimal system design and sizing, financial and economic feasibility, and environmental and social considerations to support the scalable deployment of solar PV systems across the targeted settlements.

Activity 3.1.2: Provide support to tendering, installation and operationalization of distributed solar projects in 120 settlements

Under this activity, MoE will be provided with end-to-end technical and administrative/procurement support to ensure successful implementation of small-scale solar systems in the remaining 120 settlements. This assistance is aimed to enhance the administrative processes, ensuring quality control and long-term sustainability of the solar PV installations. NGO/CSO will also be involved to support the operationalization and maintenance of solar mini grids[10]. Capital expenditures for installations of these distributed solar PV systems will be done by MoE co-finance, while technical assistance will be provided under this project. The support will include:

- Tendering/Procurement support: Tender floating, pre-bid clarification meeting, bid evaluation (technical and financial evaluation), shortlisting, negotiations, contract finalization and award. Tendering mechanism will be updated on need basis, informed by pilot project experience.
- Installation support: Collaboration between vendors and national/local stakeholders, quality assessment and commissioning of solar PV systems.
- Operationalization support: Handover processes, monitoring systems, maintenance contract negotiations.

Activity 3.1.3: Technical assistance to evaluate and expand capital expenditure subsidy for additional small-scale distributed solar projects

Technical assistance will be provided to the Government to support the institutionalization and expansion of capital expenditure subsidies for small-scale distributed solar PV systems. Building on lessons learned from pilot projects implemented under Component 2, the project will assist the Ministry of Energy (MoE) and other relevant government stakeholders in developing a structured subsidy framework to support replication and scale-up of distributed renewable energy systems across the country.

The support will include analysis of pilot project results and consultations with key stakeholders—including the Ministry of Energy, Ministry of Finance, financial institutions, bankers, and other relevant actors—to design an appropriate subsidy structure, define eligibility criteria, and establish transparent procedures for subsidy allocation and monitoring. The activity will also support the integration of the subsidy mechanism into relevant government policies, regulatory frameworks, and budgetary processes to ensure long-term sustainability beyond the lifetime of the project.

Through these efforts, the project will help establish a government-led program that uses capital subsidies as a policy instrument to catalyze investment in distributed solar PV and enable large-scale replication. Consultations will also be carried out with the government stakeholders, including Ministry of Energy, Ministry of Finance, as well as bankers, finance professionals to design incentives and modify financial regulations.

This activity will be implemented during the third and fourth years of the project and will incorporate inputs from Activity 1.2.2 as well as lessons learned from the pilot projects under Component 2. The financial regulations developed under Activities 1.2.2 and 1.2.3 will create the enabling policy environment, while Output 3.1.1 will focus on the implementation and scaling of the subsidy mechanism to support replication of renewable energy projects.

Output 3.2: Gender-sensitive training for government, private sector personnel, and local residents on O&M of RE installations developed and rolled out.

Activity 3.2.1: Design and implement effective operation and maintenance strategies for RE installations

Under this activity, the project will implement effective O&M strategies for RE installations. This will optimize RE system performance, maximise energy output, reduce risks, reduce ongoing costs, and ensure durability of the system & equipment. Data-driven and tech-enabled approaches will be taken to design the O&M strategies, such as IoT-enabled remote monitoring systems, drone and thermal imagery-based inspections and advanced data analytics to optimise efficiency. Dust accumulation on solar panels blocks sunlight, which reduces power output and efficiency. To combat this challenge, waterless cleaning of panels must be implemented, considering the existing water shortages in the remote desert region. Technologies will be selected based on the best international practices, like drone-based downwash or electrostatic repulsion, which eliminates water usage.

To prevent battery damage or explosion, due to extreme weather conditions in the desert, the goal of the project is to use modern LFP battery technology that has been field tested to operate even in very high temperature settings. This activity will be implemented in Year 2 and 3 of the project.

Activity 3.2.2: Conduct training programmes on O&M of RE installations to government and private sector personnel

Government stakeholders, private sector personnel and residents/beneficiaries currently lack the capacity to operate and maintain RE installations. Government authorities responsible for public energy supply will be trained to efficiently operate and maintain the solar-based facilities and solar PV mini grids. In this training, the

stakeholders from MoE, MoEP, Turkmenenergo and other relevant national entities will be provided gender-mainstreaming sensitivity training. This will address gender stereotypes in the energy sector and sensitize on gender dimensions of increasing renewable energy shares. Training will be conducted in Year 3 and Year 4 of project implementation.

Activity 3.2.3: Training remote settlement stakeholders/ local residents in monitoring the condition of the RE installations

This activity is intended to empower local communities to take an active role in the oversight of RE installations. Prioritizing local communities will ensure long-term sustainability of the systems and generate local employment. This training will develop the capacity of local communities to monitor, record and report the condition of RE installations. Regular monitoring will reduce inefficiencies and maintenance costs, along with building a sense of ownership among residents/beneficiaries. Trainings will be conducted in Year 3 and Year 4 of project implementation.

Output 3.3: Renewable energy planning and technical assessments conducted in support of replication of new distributed RE projects (with focus on small-scale projects, women entrepreneurs or women's associations).

Activity 3.3.1: Support the technical unit under MoE to conduct technical assessments for scale-up of RE investments based on the pilot experience

This activity will focus on expanding the RE investments based on pilot experience under component 2. Advisory services will be provided to the technical unit setup under MoE to conduct several technical assessments to support scale-up of RE investments. Technical assessments will include site selection for scale-up, technology selection based on pilot experience, capital expenditure estimation, business models and subsidies. Preference will be given for women entrepreneurs and associations at both assessment and implementation stage. This activity will be implemented in Year 4 of project implementation.

Activity 3.3.2: Conduct feasibility assessments for a solar powered water desalination plant, solar water pumps and rooftop solar

Technical assistance under this activity will support feasibility assessments for multi-use solar powered solutions like desalination plants, water pumps and solar rooftop for commercial and industrial use. To begin with, feasibility assessment will be conducted for construction of solar powered water desalination unit in the Caspian Sea region, where desalination plant is currently diesel powered. Furthermore, technical assessments will be conducted for the possible use of renewable energy in agriculture, industrial and commercial sectors, such as:

- Desalination Solar Plant
- Solar water pumping for agriculture
- Rooftop solar for industrial and commercial use

This activity will be implemented in Year 4 & 5 of project implementation.

Component 4. Knowledge management

Outcome 4: Knowledge management systems established

Output 4.1: Knowledge management frameworks developed to collate data/lessons learned and foster peer to peer learning

The aim of this output will be to develop knowledge management plan to systematically collate project data, lessons learned, and best practices from solar mini-grid deployment in Turkmenistan, creating accessible repositories for sustained use beyond the project lifecycle. It will foster peer-to-peer learning among national and regional stakeholders through structured platforms, enabling replication of successful renewable energy approaches and institutionalizing knowledge within government and private sectors.

Activity 4.1.1: Disseminate knowledge through regular gender-inclusive information exchange events, conferences, workshops and seminars on renewable energy sources and institutionalise the knowledge to ensure future use

Organisation of regular gender-inclusive information exchange events, conferences, workshops, and seminars on renewable energy sources to disseminate project insights and facilitate interactive learning among diverse participants will be done. It will institutionalize knowledge through digital repositories, policy briefs, and guidelines to ensure long-term accessibility and application for Turkmenistan's RE sector. This activity will also facilitate active participation of national and local stakeholders, including Ministry of Energy officials, Turkmenenergo, private developers, and community representatives, in project-related trainings, conferences, and events to build capacity and networks. This activity will be conducted from year 2 of the project till its termination.

Activity 4.1.2: Publish at least 2 knowledge reports on challenges, best practices and project experience

This activity will produce and publish at least two high-quality knowledge reports documenting challenges, best practices, and project experience in policy, technical, financial, and gender aspects of solar mini-grid deployment. These reports will be shared via online platforms and events to support evidence-based decision-making and inform future RE initiatives in Turkmenistan. This will be executed in year 4 & 5 of the project.

Component 5. Monitoring and Evaluation

Outcome 5: Monitoring system developed

Under this component, the focus will be to monitor and report changes seen through deployment of solar mini grids in remote settlements. It will include developing a robust M&E framework, preparation of annual GEF report and draft knowledge management frameworks for recording best practices.

Output 5.1: Monitoring and evaluation framework to assess project performance

This output focuses on establishing a comprehensive monitoring and evaluation framework to be setup to assess the overall performance of this project. This output will systematically track project implementation and results, ensuring that progress towards outcomes is measured using clear indicators, baselines and targets aligned with GEF requirements. This will allow timely evidence on performance, risks and lessons learned, enabling informed decisions by the project team and national stakeholders throughout the project cycle.

Activity 5.1.1: Conduct inception workshop, collect data, develop baseline report, and establish project baseline

This activity will conduct an inception workshop to validate the results framework and indicators, collect initial data and prepare a baseline report, thereby establishing the project's baseline in Year 1. It will clarify roles, data sources and reporting responsibilities for all stakeholders.

Activity 5.1.2: Continuous monitoring of progress and risks

This activity will ensure continuous monitoring of progress and risks through regular data collection, indicator tracking and documentation of implementation challenges. It will use tools such as progress reports, risk logs and adaptive management discussions to keep the project on track and responsive to emerging issues.

This activity will be performed continually on a yearly basis (1-5).

Activity 5.1.3: Prepare annual GEF Project Implementation Reports (PIRs)

This activity will compile and submit annual GEF Project Implementation Reports (PIRs), summarizing progress against indicators, implementation status, co-financing, and key risks and mitigation measures. The PIRs will feed into GEF's results-based management system and provide a structured basis for dialogue with the Implementing Agency and government counterparts. The activity will be conducted annually from years 1-5 of the project.

Activity 5.1.4: Mid-term review report on progress (Year 3) and terminal evaluation report (Year 5) including project outcomes achieved, lessons learned on policy/regulatory, technical, financial and gender aspects of RE deployment in Turkmenistan

This activity will produce a mid-term review report in Year 3 and a terminal evaluation report in Year 5, assessing progress and final performance against planned outcomes, as well as the project's contributions to policy/regulatory, technical, financial and gender-related aspects of renewable energy deployment in Turkmenistan. These evaluations will document lessons learned and recommendations to inform scaling up and replication of successful approaches beyond the project's lifetime. This activity will be executed by UNDP, in collaboration with international and national consultants (separate consultants for MTR and TE).

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[1] SolarPower Europe – O&M Best Practices Guidelines (https://solarbestpractices.com/src/Frontend/Files/MediaLibrary/11/o-and-m-best-practice-guidelines-v-5-0-a07c44238b.pdf)

[2] Stakeholder consultation with NGO Yas Tebigatcy

[3] During the project timeline, the existing gensets will be kept as hybrid solution to compliment the solar mini-grids. Diesel gensets could be replaced by the government, once the benefits of solar mini-grids are established through project pilot initiatives. This will be subject to investments from the government for scale-up of solar projects.

[4] Solar Energy Potential and Feasibility Study of a 10MW Grid-connected Solar Plant in Libya (https://etasr.com/index.php/ETASR/article/download/3607/2295)

[5] Refer Additional Annex

[6] LED lamps will be distributed for free across the 10 settlements to ensure their adoption.

[7] See Additional Annex

[8] Due to availability of limited funds for setting up the solar mini grids under this project, solar mini grids with battery storage cannot be set up in all sites. Thus, in this project, only two settlements, Yalkym and Murzachyrla, with the lowest number of households and electrical consumption, have been selected to have a solar mini grid with battery storage that will fulfil the total electricity demand of the settlements. In the rest of the settlements, a solar mini grid of smaller capacity without battery storage will be commissioned and set up, to be later expanded with the availability of funds.

[9] This could be the organisation Yas Tebigatchy (Young Naturalist) consulted at PPG stage.

[10] This could be the organisation Yas Tebigatchy (Young Naturalist) consulted at PPG stage.

Institutional Arrangement and Coordination with Ongoing Initiatives and Project.

Please describe the Institutional Arrangements for the execution of this project, including financial management and procurement. If possible, please summarize the flow of funds (diagram), accountabilities for project management and financial reporting (organogram), including audit, and staffing plans. (max. 500 words, approximately 1 page)

General roles and responsibilities in the projects' governance mechanism

The project will be implemented through the UN agency implementation modality. The executing partner/entity (GEF terminology)[1]35 for this project is the United Nations Office for Project Services (UNOPS) in close collaboration with the Ministry of Environmental Protection.

UNOPS is the Executing Agency (GEF terminology), responsible for project execution. Specific tasks include:

- Project planning, coordination, management, monitoring, evaluation, and reporting. This includes providing all administrative support for implementation, as well as required information and data necessary for timely, comprehensive, and evidence-based project reporting, including results and financial data, as necessary. The Executing Agency (GEF terminology) will strive to ensure project-level M&E is undertaken by national institutes and is aligned with national systems so that the data used and generated by the project supports national systems.
- Overseeing the management of project risks as included in this project document and new risks that may emerge during project implementation.
- Procurement of goods and services, including human resources.
- Financial management, including overseeing financial expenditures against project budgets.
- Approving and signing the multiyear workplan.
- Approving and signing the combined delivery report at the end of the year; and,
- Signing the financial report or the funding authorization and certificate of expenditures.

The Ministry of Environmental Protection will assist the executing partner at the national level. In this capacity, MEP will provide strategic guidance and technical oversight for the identification, assessment, and monitoring of local and global environmental benefits generated by the deployment of solar mini-grid solutions in remote settlements. The Ministry will ensure that environmental considerations and safeguards are fully integrated into project planning and execution, in line with national priorities and GEF requirements. In addition, MEP will facilitate effective coordination and information exchange with other GEF-supported initiatives in Turkmenistan to promote synergy, avoid duplication of efforts, and maximize cumulative environmental and development impacts. The Ministry will guide the integration of the requirements, terms of reference, and authorization of the products provided by the consultants hired by UNOPS.

UNDP will ensure that M&E at the project level is aligned with national systems so that data used and generated by the project supports national systems.

UNDP is accountable to the GEF for the implementation of this project. This includes overseeing project execution undertaken by the Executing Agency to ensure that the project is being carried out in accordance with UNDP and GEF policies and procedures and the standards and provisions outlined in the Delegation of Authority (DOA) letter for this project. UNDP is responsible for delivering GEF project cycle management services comprising project approval and start-up, project supervision and oversight, and project completion and evaluation. UNDP is responsible for the Project Assurance function in the project governance structure and presents to the Project Board and attends Project Board meetings as a non-voting member.

The Executing Agency (GEF terminology), UNOPS[2], is the entity to which the UNDP Administrator has entrusted the implementation of the UNDP assistance specified in the signed project document together with the assumption of full responsibility and accountability for the effective use of UNDP resources and delivery of products, as established in the work plans approved by the Project Board.

The Project will have a Project Board (also called Project Steering Committee), which will be the highest-level body, and will provide support and guidance for the implementation of the project and will ensure that its findings are disseminated and validated by all relevant stakeholders in Turkmenistan. The Board will be made up of representatives from the Ministry of Environmental Protection, Ministry of Energy, Ministry of Finance, Ministry of Construction and Architecture, Ahal Province Municipality, Mejlis (Parliament), Turkmenenergo, the State Concern "Turkmengaz", Union of Industrialists Entrepreneurs of Turkmenistan, UNOPS, UNDP (as a non-voting member) and representatives of communities, NGOs and CSOs. The Project Board will be responsible for the supervision and selection of the project coordinator, who will be responsible for the management unit. UNOPS will provide administrative services to hire the Project team.

In the event that consensus cannot be reached within the Board, the UNDP Resident Representative (or their designate) will mediate to find consensus and, if this cannot be found, will take the final decision to ensure project implementation is not unduly delayed.

Specific responsibilities of the Project Board include:

- Provide overall guidance and direction to the project, ensuring it remains within any specified constraints;
- Address project issues as raised by the project manager;
- Provide guidance on new project risks, and agree on possible mitigation and management actions to address specific risks;
- Agree on project manager's tolerances as required, within the parameters set by UNDP-GEF, and provide direction and advice for exceptional situations when the project manager's tolerances are exceeded;
- Advise on major and minor amendments to the project within the parameters set by UNDP-GEF;
- Ensure coordination between various donor and government-funded projects and programmes;
- Ensure coordination with various government agencies and their participation in project activities;
- Track and monitor co-financing for this project;
- Review the project progress, assess performance, and appraise the Annual Work Plan for the following year;
- Appraise the annual reporting in NC/BUR survey, including the quality assessment rating report;

- Ensure commitment of human resources to support project implementation, arbitrating any issues within the project;
- Review combined delivery reports prior to certification by the Executing Agency (GEF terminology)7;
- Provide direction and recommendations to ensure that the agreed deliverables are produced satisfactorily according to plans;
- Address project-level grievances;
- Approve the project Inception Report and End of project Report corresponding lessons learned;
- Review the final project report package during an end-of-project review meeting to discuss lesson learned and opportunities for scaling up;
- Ensure highest levels of transparency and take all measures to avoid any real or perceived conflicts of interest.

Table 10 - Structure of the Project Management Unit (PMU)

PROJECT MANAGEMENT UNIT (PMU)		
Project Manager	Ashgabat	Overall project management responsibility
Project Assistant	Ashgabat	Overall project administrative and financial management responsibility
TECHNICAL ADVISORS		
Chief Technical Advisor	International	For renewable energy technical support
Project Environmental and Social Safeguards / Gender Officer	Ashgabat	Key responsible officer for projects E&S safeguards and gender mainstreaming activities and outcomes

Project governance structure

The UNDP Resident Representative assumes full responsibility and accountability for oversight and quality assurance of this Project and ensures its timely implementation in compliance with the GEF-specific requirements and UNDP's Program and Operations Policies and Procedures (POPP), its Financial Regulations and Rules and Internal Control Framework. A representative of the UNDP Country Office will assume the assurance role and will present assurance findings to the Project Board and therefore attend Project Board meetings as a non-voting member. Given below is the proposed project organization structure.

- a Project Board and a wider Stakeholder Working Group to allow the engagement of all relevant national and sub-national institutions in the project and their representation in the Project Board, ensuring full national coverage of all project activities and results. The government's leadership will be provided by the MEP, acting as the national focal point, with the involvement of other ministries. MEP will define, assess, and monitor project outputs towards country-level outcomes.

- As the Implementing agency, UNOPS will be responsible for hiring the Project Manager, who will be responsible for facilitating successful implementation of project. The Project Management Team will consist of a full-time Project Manager and a Project Assistant responsible for the overall and day-to-day management of the project, and particularly for engagement with the Government and national stakeholders, policy, and dissemination-related

activities of the project. UNOPS will also ensure that there is efficient and effective use of programme resources.

- The UNDP Country Office is responsible for support, oversight, and quality assurance of the project implementation. Project Assurance will be delivered by the Resilience, Environment and Energy Programme Analyst and the Monitoring and Evaluation Associate under the guidance of the UNDP Resident Representative and Deputy Resident Representative. Higher level of quality assurance and oversight will be provided by RBEC Regional Bureau, RBEC CO desk officer for Turkmenistan; BPPS, Regional Technical Leader (RTL), Regional Technical Advisor (RTA), and Regional Programme Associate (RPA). HQ/NCE team - BPPS, Vertical Funds Team, Principal Technical Advisor (PTA), and Global Programme Associate (Global PA), Result-Based Management, and Evaluation Team.
- To ensure the independence of the mid-term and terminal evaluation processes, a team of independent evaluators comprising international and national experts will be hired by the UNDP.

The project Governance arrangement is presented in the graph below:

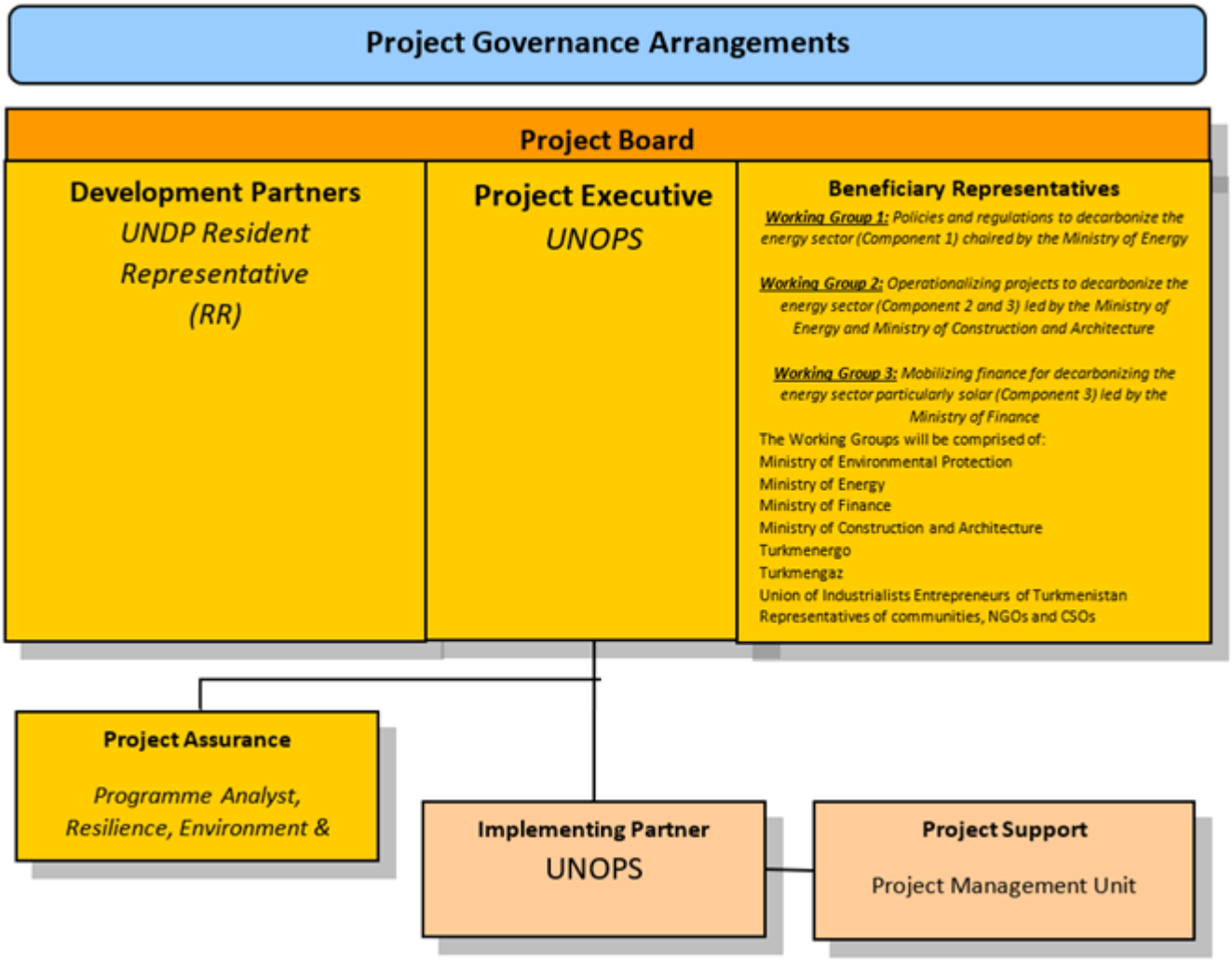

Figure 3: Project governance arrangements

Second line of defence:

- Regional Bureau oversees RR and Country Office compliance at portfolio level.
- BPPS RTA oversees technical quality assurance and GEF compliance. BPPS PTA oversees RTA function.
- UNDP GEF Executive Coordinator and Regional Bureau Deputy Director can revoke DOA/cancel/suspend project or provide enhanced oversight.

Roles and Responsibilities of the Project Organization Structure

a) Project Board: All UNDP projects must be governed by a multi-stakeholder board or committee established to review performance based on monitoring and evaluation, and implementation issues to ensure quality delivery of results. The Project Board (also called the Project Steering Committee) is the most senior, dedicated oversight body for a project.

The two main (mandatory) roles of the project board are as follows:

1) **High-level oversight of the execution of the project by the Implementing Partner** (as explained in the "Provide Oversight" section of the POPP). This is the primary function of the project board and includes annual (and as-needed) assessments of any major risks to the project, and decisions/agreements on any management actions or remedial measures to address them effectively. The Project Board reviews evidence of project performance based on monitoring, evaluation and reporting, including progress reports, evaluations, risk logs and the combined delivery report. The Project Board is responsible for taking corrective action as needed to ensure the project achieves the desired results.

2) **Approval of strategic project execution decisions of the Implementing Partner** with a view to assess and manage risks, monitor and ensure the overall achievement of projected results and impacts and ensure long term sustainability of project execution decisions of the Implementing Partner (as explained in the "Manage Change" section of the POPP).

Requirements to serve on the Project Board:

✓ Agree to the Terms of Reference of the Board and the rules on protocols, quorum and minuting.

✓ Meet annually; at least once.

✓ Disclose any conflict of interest in performing the functions of a Project Board member and take all measures to avoid any real or perceived conflicts of interest. This disclosure must be documented and kept on record by UNDP.

✓ Discharge the functions of the Project Board in accordance with UNDP policies and procedures.

✓ Ensure highest levels of transparency and ensure Project Board meeting minutes are recorded and shared with project stakeholders.

Responsibilities of the Project Board:

✓ Consensus decision making:

- The project board provides overall guidance and direction to the project, ensuring it remains within any specified constraints, and providing overall oversight of the project implementation.
- Review project performance based on monitoring, evaluation and reporting, including progress reports, risk logs and the combined delivery report;
- The project board is responsible for making management decisions by consensus.
- In order to ensure UNDP's ultimate accountability, Project Board decisions should be made in accordance with standards that shall ensure management for development results, best value money, fairness, integrity, transparency and effective international competition.
- In case consensus cannot be reached within the Board, the UNDP representative on the board will mediate to find consensus and, if this cannot be found, will take the final decision to ensure project implementation is not unduly delayed.

✓ Oversee project execution:

- Agree on project manager's tolerances as required, within the parameters outlined in the project document, and provide direction and advice for exceptional situations when the project manager's tolerances are exceeded.
- Appraise annual work plans prepared by the Implementing Partner for the Project; review combined delivery reports prior to certification by the implementing partner.
- Address any high-level project issues as raised by the project manager and project assurance;
- Advise on major and minor amendments to the project within the parameters set by UNDP and the donor and refer such proposed major and minor amendments to the UNDP BPPS Nature, Climate and Energy Executive Coordinator (and the GEF, as required by GEF policies);
- Provide high-level direction and recommendations to the project management unit to ensure that the agreed deliverables are produced satisfactorily and according to plans.
- Track and monitor co-financed activities and realisation of co-financing amounts of this project.
- Approve the Inception Report, GEF annual project implementation reports, mid-term review and terminal evaluation reports.
- Ensure commitment of human resources to support project implementation, arbitrating any issues within the project.

✓ Risk Management:

- Provide guidance on evolving or materialized project risks and agree on possible mitigation and management actions to address specific risks.
- Review and update the project risk register and associated management plans based on the information prepared by the Implementing Partner. This includes risks related that can be directly managed by this project, as well as contextual risks that may affect project delivery or continued

UNDP compliance and reputation but are outside of the control of the project. For example, social and environmental risks associated with co-financed activities or activities taking place in the project's area of influence that have implications for the project.

- Address project-level grievances.

✓ Coordination:

- Ensure coordination between various donor and government-funded projects and programmes.
- Ensure coordination with various government agencies and their participation in project activities.

Composition of the Project Board: The composition of the Project Board must include individuals assigned to the following three roles:

1. **Project Executive:** This is an individual who represents ownership of the project and chairs (or co-chairs) the Project Board. In exceptional cases, two individuals from different entities can co-share this role and/or co-chair the Project Board. If the project executive co-chairs the project board with representatives of another category, it typically does so with a development partner representative.
2. **Beneficiary Representative(s):** Individuals or groups representing the interests of those groups of stakeholders who will ultimately benefit from the project. Their primary function within the board is to ensure the realization of project results from the perspective of project beneficiaries. Often representatives from civil society, industry associations, or other government entities benefiting from the project can fulfil this role. There can be multiple beneficiary representatives in a Project Board. The Beneficiary representative (s) are:

- Chairperson of Working Group 1: Policies and regulations to decarbonize the energy sector (Component 1) chaired by the Ministry of Energy
- Chairperson of Working Group 2: Operationalizing projects to decarbonize the energy sector (Component 2 and 3) led by the Ministry of Energy and Ministry of Construction and Architecture
- Chairperson of Working Group 3: Mobilizing finance for decarbonizing the energy sector particularly solar (Component 3) led by the Ministry of Finance

The Working Groups will be comprised of:

- Ministry of Environmental Protection
- Ministry of Energy
- Ministry of Finance
- Ministry of Construction and Architecture
- Turkmenergo
- Turkmengaz
- Union of Industrialists Entrepreneurs of Turkmenistan

- Representatives of communities, NGOs and CSOs.

3. **Development Partner(s):** Individuals or groups representing the interests of the parties concerned that provide funding, strategic guidance and/or technical expertise to the project. The Development Partner(s) is/are UNDP Resident Representative.

b) **Project Assurance:** Project assurance is the responsibility of each project board member; however, UNDP has a distinct assurance role for all UNDP projects in carrying out objective and independent project oversight and monitoring functions. UNDP performs quality assurance and supports the Project Board (and Project Management Unit) by carrying out objective and independent project oversight and monitoring functions, including compliance with the risk management and social and environmental standards of UNDP. The Project Board cannot delegate any of its quality assurance responsibilities to the Project Manager or Assistant. Project assurance is totally independent of project execution.

A designated representative of UNDP playing the project assurance role is expected to attend all board meetings and support board processes as a non-voting representative. It should be noted that while in certain cases UNDP's project assurance role across the project may encompass activities happening at several levels (e.g. global, regional), at least one UNDP representative playing that function must, as part of their duties, specifically attend board meetings and provide board members with the required documentation required to perform their duties. The UNDP representatives playing the main project assurance function is Programme Analyst - Resilience, Environment & Energy at UNDP.

c) **Project Management – Execution of the Project:** The Project Manager (PM) (also called project coordinator) is the senior most representative of the Project Management Unit (PMU) and is responsible for the overall day-to-day management of the project on behalf of the Implementing Partner, including the mobilization of all project inputs, supervision over project staff, responsible parties, consultants and sub-contractors. The project manager typically presents key deliverables and documents to the board for their review and approval, including progress reports, annual work plans, adjustments to tolerance levels and risk registers.

Roles and responsibilities of the PMU members have been designated in Annex L (Terms of Reference), and the PMU will be under the IP (UNOPS). A designated representative of the PMU is expected to attend all board meetings and support board processes as a non-voting representative.

The primary PMU representative attending board meetings is **Project Manager.**

In addition to UNDP and UNOPS, the Project Board will comprise the following organizations/institutions:

- Ministry of Environmental Protection – Project Steering Committee Chair
- Ministry of Energy
- Ministry of Finance
- Ministry of Construction and Architecture
- Turkmenergo
- Turkmengaz
- Union of Industrialists Entrepreneurs of Turkmenistan
- Representatives of communities, NGOs and CSOs.

The project board will function through the working groups as follows:

- Working Group 1: Policies and regulations to decarbonise the energy sector (Component 1) chaired by the Ministry of Energy

- Working Group 2: Operationalising projects to decarbonise the energy sector (Components 2 and 3) led by the Ministry of Energy and the Ministry of Construction and Architecture
- Working Group 3: Mobilising finance for decarbonising the energy sector, particularly solar (Component 3) led by the Ministry of Finance

[1] Implementing Partner in UNDP terminology.

[2] UNDP and UNOPS are two different entities of the UN system. Established 30 years apart - UNDP in 1965 and UNOPS as a separate entity in 1995 - they are both governed by the UNDP/UNFPA/UNOPS Executive Board. The two organizations have separate General Assembly (GA) mandates and roles, and different operating models and organizational cultures for consideration in the assessment. UNDP is GEF accredited entity, UNOPS is not.

Will the GEF Agency play an execution role on this project?

If so, please describe that role here and the justification.

Also, please add a short explanation to describe cooperation with ongoing initiatives and projects, including potential for co-location and/or sharing of expertise/staffing (max. 500 words, approximately 1 page)

Refer to Table 3 in Project Rationale section.

Core Indicators

Indicate expected results in each relevant indicator using methodologies indicated in the GEF-8 Results Measurement Framework Guidelines. There is no need to complete this table for climate adaptation projects financed solely through LDCF and SCCF.

Indicator 6 Greenhouse Gas Emissions Mitigated

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)	1811834	75853	0	0
Expected metric tons of CO_2e (indirect)	42790	51660	0	0

Indicator 6.1 Carbon Sequestered or Emissions Avoided in the AFOLU (Agriculture, Forestry and Other Land Use) sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)				
Expected metric tons of CO_2e (indirect)				
Anticipated start year of accounting				
Duration of accounting				

Indicator 6.2 Emissions Avoided Outside AFOLU (Agriculture, Forestry and Other Land Use) Sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)	1,811,834	75,853		
Expected metric tons of CO_2e (indirect)	42,790	51,660		

Anticipated start year of accounting	2026	2026		
Duration of accounting	20	15		

Indicator 6.3 Energy Saved (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Total Target Benefit	Energy (MJ) (At PIF)	Energy (MJ) (At CEO Endorsement)	Energy (MJ) (Achieved at MTR)	Energy (MJ) (Achieved at TE)
Target Energy Saved (MJ)		12,767,886		

Indicator 6.4 Increase in Installed Renewable Energy Capacity per Technology (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Technology	Capacity (MW) (Expected at PIF)	Capacity (MW) (Expected at CEO Endorsement)	Capacity (MW) (Achieved at MTR)	Capacity (MW) (Achieved at TE)
Solar Photovoltaic	13.00	2.00		

Indicator 11 People benefiting from GEF-financed investments

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Female	73,525	73,573		
Male	73,525	73,597		
Total	**147,050**	**147,170**	0	**0**

Explain the methodological approach and underlying logic to justify target levels for Core and Sub-Indicators (max. 250 words, approximately 1/2 page)

Core Indicator 6.2: Direct GHG emissions calculation methodology for non-AFOLU – estimation of GHG emissions avoided is based on UNFCCC methodology AMS-III.BB: Electrification of Communities through grid extension or construction of new mini-grids. The 10-pilot mini-grid models simulate a custom-sized solar mini-grid compared to a notional diesel mini-grid. Using emission factors thus, the difference between emissions from the diesel mini-grid and solar mini-grid gives the emission avoided values. The annual carbon emission reduction from these mini grids is estimated at 3,300 tCO2e. The estimated lifetime (20-year) carbon emission reduction is 66,005 tCO2e. The project also includes the replacement of all light bulbs (60W) to LED bulbs (7W) that are more energy efficient. The resulting energy savings and emission reduction from replacing 7,639 bulbs is 985 tCO2e per annum and lifetime savings of 9,848 tCO2e (10 years) calculated by multiplying kWh of energy saved with grid emission factor of 0.833 for Turkmenistan*. The total emission reduction during the project implementation period is 7,051 tCO2e (at the end of 5 years). The total direct emission reduction from the project is emission reduction from 10 mini grids 66,005 tCO2e + distribution of LED bulbs 9,848 tCO2e = 75,853 tCO2e over the lifetime of the assets.

Indirect emission reduction potential from the feasibility of solar mini grids in further 120 settlements have also been estimated based on their historical diesel consumption for diesel generator-based electricity. From the data received for total diesel consumption in 58 settlements, each settlement consumes an average of 87,500 litres of diesel per annum. This, multiplied by 120 (number of settlements) and the emission factor of diesel, that is, 2.46 kgCO2e/litre, gives 25.83kgCO2e per annum of emission reduction. With a causality factor of 10% attributable to the project, total indirect emissions are 51,660 tCO2e over the lifetime of the assets. The total direct and indirect emission reduction potential from the project is 127,513 tCO2e**.

Core Indicator 11: People benefiting from GEF-financed investments disaggregated by sex (count)

The total beneficiaries benefiting from GEF-financed investments have been computed by adding the population of 130 settlements (147,050 community members) and 120 trainees, which will result in 147,170 direct beneficiaries. The community members benefit from the distribution of bulbs, awareness programmes, operationalisation of mini-grids, training programmes

and feasibility assessments for RE deployment (120 settlements). The 120 trainees refer to the individuals who benefit from the training received on the technical, operational, financial and policy training on RE deployment.

* Latest available version: IFI Default Grid Factors 2021 v3.1 (https://unfccc.int/documents/437880)

** Kindly refer to the annex – '9811_Add Annex_B_Electricity_Demand_v3_Mar2026'

Key Risks

	Rating	Explanation of risk and mitigation measures
CONTEXT		
Climate	Moderate	Risk: Potential outcomes of the Project could be sensitive or vulnerable to potential impacts of climate change. Risk Assessment: This project's target areas are susceptible to climate change impacts such as rise in temperature and frequent desert storms. Rise in temperature will adversely affect the performance of the solar panels and other equipment. Water scarcity in the targeted regions will further be exacerbated by climate change affecting operations and maintenance of the solar instalments. Mitigation Measures: Selection of climate resilient solar and battery technologies/specifications which can operate efficiently in high temperatures. Deploying waterless cleaning for maintenance of solar instalments.
Environmental and Social	Substantial	Risk 1: Accumulation batteries, exposed to extreme heats in summer may result in explosion Risk Assessment: There is an evident fire hazard due to the over-heating of batteries. This is a safety hazard for the local communities and workers involved in the project Mitigation Measures: Project will use modern LFP battery technology that has been field tested to operate even in very high temperature settings: but also, potentially house battery packs in a small indoor casing to reduce impact of temperate and dust on these batteries. Risk 2: E-waste generation related risk due to improper disposal of solar panels, batteries etc Risk Assessment: Improper end-of-life solar panels and batteries transport, storage or disposal of may lead to accidental release into the environment and risk community and worker health, in addition to impacts on natural habitats Mitigation Measures: Project plans to use latest LFP battery technologies, there is no risk of any chemical / hazardous substance leakage (older lead acid batteries used to pose significant chemical leakage risks, but they are not proposed to be used in this project). The project includes an output (Output 1.5) where e-waste management, recycling, disposal plans and guidelines for end-of-life batteries and solar panels will be developed. This concerns both batteries and solar panels. Risk 3: The project might fail to promote sustainable management and use of

		already scarce water resources Risk Assessment: There is a risk related to water scarcity typical for arid climate in the country, relates with need for water for systems batteries' cooling and solar panels' cleaning (from sand)
Political and Governance	Moderate	Risk: There is a risk that government commitment will waver relating to RE deployment. Risk Assessment: This project focuses on developing a regulatory/institutional framework which promotes RE deployment and operationalizing pilot mini grids across remote settlements. The project also has interventions focusing on awareness campaigns, training courses and comprehensive technical assistance for RE deployment. In the absence of government commitment, successful implementation of these interventions will be improbable. Mitigation Measures: Consistent dialogue with government stakeholders
INNOVATION		
Institutional and Policy	Moderate	Risk: Risk of resistance and friction towards setting-up and operationalization of technical unit under Ministry of Energy and implementation of National Solar Roadmap Risk Assessment: Successful operationalization of technical unit under MoE is vital for accelerating the uptake of renewable energy projects in the country. There is a need for buy-in from the government for effective implementation of National Solar Roadmap for energy adoption. In the absence of such involvement, achievement of outcomes will be difficult. Mitigation Measures: Objective and responsibility of the technical unit is clearly stated at the initiation stage to avoid any possible conflict with the other departments of MoE. Regular coordination and engagement with the existing government departments to ensure smooth implementation. Stakeholder consultations and validation workshops to be conducted while designing the National Solar Roadmap.
Technological	Low	Risk: Technological maturity risks relating to solar mini-grids and lack of local knowledge, installation / operations / management skills Risk Assessment: Mini-grid technologies proposed to be deployed under this project have been previously used across the region and globally. Mitigation Measures: Significant training and capacity building activities, including for women, have been included across the project design to ensure that the risk is mitigated. Procurement specifications will require durable solar panels that meet recognized international technical standards and certification requirements. Technical due diligence will include review of manufacturer qualifications, warranty terms, and evidence of third-party testing. Quality assurance will include inspection on delivery, verification against specifications, and commissioning tests before acceptance.
Financial and Business Model	Substantial	Risk 1: There is a risk that there won't be cost recovery for the pilot projects because of negative NPV for the proposed pilot projects Risk Assessment: This will impact on the financial viability of solar projects in remote settlements and further disincentivize any future investment for scaling up/replication as it is not viable Mitigation Measures: The ten pilots will be funded by GEF grants. The other 120 settlements will receive financing from the Government for solar deployment. Project interventions will foster the solar ecosystem to enable commercial viability. Risk 2: Limited implementation and fiduciary management capacities of project's key

		government partners. Micro-HACT and PCAT assessments of the national public financial management were rated high. Risk Assessment: Limited implementation and fiduciary management capacity of implementation partner increases the risk of project delivery and achievement of intended project outcomes. Mitigation Measures: The project is proposed to be supported by NIM project implementation modality. UNDP will provide oversight and support as necessary to minimize project delivery risks.
EXECUTION		
Capacity	Substantial	Risk 1: The lack of capacity of the relevant stakeholders for RE deployment poses a significant risk. Risk Assessment: The alignment and coordination of various stakeholders is critical to the successful implementation of this project. There is a risk that the project will not be able to reach its replication and scaling up goals as a result of lack of capacity. Mitigation Measures: Conducting capacity assessments and training programs for all stakeholders involved to provide a broader picture of the project as well as ensure alignment of goals. Risk 2: There is a risk that the government is unable to execute the project as a result of low capacity Risk Assessment: As a result of low capacity. Turkmenistan does not have any operational solar deployment. The Government lacks the regulatory, operational and technical capacity to execute a solar deployment project. Mitigation Measures: Conduct capacity building programmes for government stakeholders, demonstration effect by operationalizing 10 pilots on solar deployment and providing support to government for solar deployment by developing tender packages and conducting feasibility studies.
Fiduciary	Substantial	Risk: Monitoring and oversight is a challenge in the implementation of this project due to the nature of this project. The Government of Turkmenistan does not have the necessary capacity for efficient monitoring and oversight of this project. Risk Assessment: Monitoring and oversight is critical for any project. Being able to validate the progress of the project is important to make necessary changes to implementation as well as ensure optimization of project resources. Mitigation Measures: Regular and consistent stakeholder consultations/ dialogue will enable community stakeholders to assist and co-operate with project implementation.
Stakeholder	Moderate	Risk: Stakeholder management is critical to this project. Its implementation consists of engaging with a wide range of stakeholders with competing sets of priorities. Risk Assessment: Conduct regular stakeholder consultations during the implementation phase to iron out concerns. Ensure that beneficiary needs are fully considered. Mitigation Measures: Conduct regular stakeholder consultations during the implementation phase to iron out concerns. Ensure that beneficiary needs are fully taken into account.
Other		
Overall Risk Rating	Substantial	Risk: Most relevant risks are associated with the project developing tender and contracting mechanism for large-scale solar PV systems, in terms of their locations' selection and technologies applied; and with installing solar panels

		and accumulation batteries in the areas – desert, with the extreme climate conditions. Water usually needed for solar panels' cleaning is scarce in the pilot areas, and risk of batteries explosion or damage in the extreme heat or frost is also significant. The project includes adequate risk treatment measures, such as making the Environmental Impact Assessment and integral part of large and small-scale solar PV system planning, and the commitment to use the approaches and technologies for both panels and batteries, that avoid or minimize the impact of extreme climate conditions. Strategic and Social Impact Assessment (SESA) will be applied to elaborating the national road map for solar energy adoption in Turkmenistan, and targeted impact assessments will be included in the project support to the legal and regulatory framework for renewable energy deployment.

C. ALIGNMENT WITH GEF-8 PROGRAMMING STRATEGIES AND COUNTRY/REGIONAL PRIORITIES

Explain how the proposed interventions are aligned with GEF- 8 programming strategies and country and regional priorities, including how these country strategies and plans relate to the multilateral environmental agreements.

For projects aiming to generate biodiversity benefits (regardless of what the source of the resources is - i.e., BD, CC or LD), please identify which of the 23 targets of the Kunming-Montreal Global Biodiversity Framework the project contributes to and explain how.

Confirm if any country policies that might contradict with intended outcomes of the project have been identified, and how the project will address this. (max. 500 words, approximately 1 page)

The project interventions are aligned with GEF-8 programming strategies[1][36]. Under the GEF-8 Climate Change Focal Area Strategy and Associated Programming, the project particularly coheres with – Pillar I: Promote innovation, technology development and transfer, and enabling policies for mitigation options with systemic impacts

- 1.1. Accelerate the efficient use of energy and materials.
- 1.2. Enable the transition to decarbonized power systems.

The project responds to Turkmenistan's Nationally Determined Contribution (NDC) submitted in 2022, which has committed to reduce its greenhouse gas emissions by 20% by 2030 compared to 2010 levels. The NDC focuses on mitigation efforts in key sectors such as energy, transportation, agriculture, industrial processes, and waste, while also emphasizing adaptation priorities including health, water, soil, forestry, and ecosystems.

The project contributes to Target 8 of Global Targets of the Kunming-Montreal Global Biodiversity Framework[2][37]: Minimize the impact of climate change on biodiversity by minimizing negative and fostering positive impacts of climate action, like reduced GHG emissions though mitigation measures.

Additionally, there are several laws and regulations in Turkmenistan which aims to adopt cleaner technologies such as solar and wind energy. The law and policymaking in Turkmenistan have undergone a shift since 2016-17 to incorporate its commitments to climate action at the global level. SDG17 and national law mandate that every household and every settlement in the country must have access to electricity. Turkmenistan's Law on "On Renewable Energy Sources' (2021) lays down provisions for transition to wind and solar energy systems.

It includes provisions such as state subsidies, preferential bank loans, guaranteed purchase of renewable power at fixed tariffs, customs benefit for imported solar equipment, and state-funded programs to stimulate renewable energy adoption. The law 'On the Protection of Atmospheric Air' (2016) encourages the use of renewable energy sources such as solar and wind power to reduce greenhouse gas emissions and mitigate climate change. There is also a Presidential Programme which enables construction of solar PV capacity of 100 MW in the country and transition to green energy in the country by 2052.

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[1] GEF-8 Programming Directions

[2] Kunming-Montreal Global Biodiversity Framework

If the project expects to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment, please indicate in which results area(s) the project is expected to contribute to gender equality:

X closing gender gaps in access to and control over natural resources;

X improving women's participation and decision-making; and/or

X generating socio-economic benefits or services for women.

The project aims to improve equitable access to modern energy services, including renewable energy solutions, in remote settlements where women are among the primary users and beneficiaries of household energy. Improved access to reliable and clean electricity is expected to reduce the burden associated with energy access constraints, which often disproportionately affects women. Women in these rural settlements are dependent on men for firewood and for fetching water from deep wells. Access to reliable electricity will increase their ability to access clean water for cooking and drinking. The provision of reliable supply of electricity will reduce need of firewood for lighting, heating and cooking.

In addition, the project will promote inclusive stakeholder engagement and capacity-building activities that encourage the participation of women in consultations, training programmes, and local decision-making processes related to the deployment and management of renewable energy systems. These measures are intended to help ensure that women benefit from improved access to energy resources and have opportunities to contribute to local energy planning and implementation.

Private Sector

Will there be private sector engagement in the project?

X Yes No

And if so, has its role been described and justified in section B "project description"?

There is limited private sector involvement in Turkmenistan for Solar EPC contractors, O&M service providers and local entrepreneurs. Collaboration with Union of Industrialists Entrepreneurs of Turkmenistan in private sector for training and capacity building activities. Private sector is not allowed to own any energy assets in Turkmenistan.

X Yes No

Environmental and Social Safeguards

We confirm that we have provided information regarding Environmental and Social risks associated with the proposed project or program, including risk screenings/ assessments and, if applicable, management plans or other measures to address identified risks and impacts (this information should be presented in Annex E).

X Yes No (If –and only if— NO is selected, a pop-up field should open for the Agency to provide an explanation)

D. POLICY REQUIREMENTS

Gender Equality and Women's Empowerment

We confirm that gender dimensions relevant to the project have been addressed during Project Preparation as per GEF Policy and are clearly articulated in the Project Description (Section B).

Yes

1) Does the project expect to include any gender-responsive-measures to address gender gaps or promote gender equality and women's empowerment?

Yes

If the project expects to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment, please indicate in which results area(s) the project is expected to contribute to gender equality:

Closing gender gaps in access to and control over natural resources;

Yes

Improving women's participation and decision-making; and/or

Yes

Generating socio-economic benefits or services for women.

Yes

2) Does the project's results framework or logical framework include gender-sensitive indicators?

Yes

Stakeholder Engagement

We confirm that key stakeholders were consulted during Project Preparation as required per GEF policy, their relevant roles to project outcomes has been clearly articulated in the Project Description (Section B) and that a Stakeholder Engagement Plan has been developed before CEO endorsement**.**

Yes

Select what role civil society will play in the Project

Consulted only; Yes

Member of Advisory Body; Contractor;

Co-financier;

Member of project steering committee or equivalent decision-making body ; Yes

Executor or co-executor;

Other (Please explain)

Private Sector

Will there be private sector engagement in the project?

Yes

And if so, has its role been described and justified in section B project description?

Yes

Environmental and Social Safeguards

We confirm that we have provided information regarding Environmental and Social risks associated with the proposed project or program, including risk screenings/ assessments and, if applicable, management plans or other measures to address identified risks and impacts (this information should be presented in Annex E).

Yes

Please provide overall Project/Program Risk Classification

Overall Project/Program Risk Classification

PIF	CEO Endorsement/Approval	MTR	TE
High or Substantial	High or Substantial		

E. OTHER REQUIREMENTS

Knowledge management

We confirm that an approach to Knowledge Management and Learning has been clearly described during Project Preparation in the Project Description and that these activities have been budgeted and an anticipated timeline for delivery of relevant outputs has been provided.

Yes

Socio-economic Benefits

We confirm that the project design has considered socio-economic benefits to be delivered by the project and these have been clearly described in the Project Description and will be monitored and reported on during project implementation (at MTR and TER).

Yes

ANNEX A: FINANCING TABLES

GEF Financing Table

Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	Grant / Non-Grant	GEF Project Grant($)	Agency Fee($)	Total GEF Financing ($)
UNDP	GET	Turkmenistan	Climate Change	CC STAR Allocation: CCM-1-2	Grant	4,173,630.00	396,495.00	4,570,125.00
Total GEF Resources ($)						**4,173,630.00**	**396,495.00**	**4,570,125.00**

Project Preparation Grant (PPG)

Was a Project Preparation Grant requested?

true

PPG Amount ($)

125000

PPG Agency Fee ($)

11875

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	PPG($)	Agency Fee($)	Total PPG Funding($)
UNDP	GET	Turkmenistan	Climate Change	CC STAR Allocation: CCM-1-2	125,000.00	11,875.00	136,875.00
Total PPG Amount ($)					**125,000.00**	**11,875.00**	**136,875.00**

Please provide Justification

Sources of Funds for Country Star Allocation

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Sources of Funds	Total($)
UNDP	GET	Turkmenistan	Climate Change	CC STAR Allocation	2,209,305.00
UNDP	GET	Turkmenistan	Biodiversity	BD STAR Allocation	1,499,055.00
UNDP	GET	Turkmenistan	Land Degradation	LD STAR Allocation	998,640.00
Total GEF Resources					**4,707,000.00**

Focal Area Elements

Programming Directions	Trust Fund	GEF Project Financing($)	Co-financing($)
CCM-1-2	GET	4,173,630.00	29700000
Total Project Cost		**4,173,630.00**	**29,700,000.00**

Confirmed Co-financing for the project, by name and type

Please include evidence for each co-financing source for this project in the tab of the portal

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Recipient Country Government	Ministry of Energy of Turkmenistan	Public Investment	Investment mobilized	23130000
Recipient Country Government	Ministry of Energy of Turkmenistan	In-kind	Recurrent expenditures	6570000
Total Co-financing				**29,700,000.00**

Please describe the investment mobilized portion of the co-financing

Ministry of Energy: Public investment mobilised in the framework of the government's plans to expand electricity generation from renewable sources (Component 3). In-kind co-financing associated to the participation of its staff in activities promoting renewables energy and the preparation of the national renewable energy strategy (Components 1 and 3). Out of US$29.7 million, an estimated US$26.5 million will be national investment into capital expenditures to roll-out 120 solar PV mini-grids. The remaining amount will be in-kind assistance of US$3.2 million.

ANNEX B: ENDORSEMENTS

GEF Agency(ies) Certification

GEF Agency Type	Date	Project Contact Person	Phone	Email
GEF Agency Coordinator	2/27/2026	Nancy Bennet		nancy.bennet@undp.org
Project Coordinator	2/27/2026	Jana Koperniech		jana.koperniech@undp.org

Record of Endorsement of GEF Operational Focal Point (s) on Behalf of the Government(s):

Please attach the Operational Focal Point endorsement letter(s) with this template.

Name of GEF OFP	Position	Ministry	Date (MM/DD/YYYY)
Mr Nury Jumashov	Deputy Minister	Ministry of Environmental Protection of Turkmenistan	2/27/2026

ANNEX C: PROJECT RESULTS FRAMEWORK

Please indicate the page number in the Project Document where the project results and M&E frameworks can be found. Please also paste below the Project Results Framework from the Agency document.

Contribution to the Sustainable Development Goal (s): SDG 7 - affordable and clean energy; SDG 13 - climate action; SDG 11 - sustainable communities; SDG 5 - gender equality

Intended Outcome as stated in the UNSDCF/Country Programme Results and Resource Framework:

Outcome A1[1][38]***.*** *By 2030, the people of Turkmenistan have access to accountable governance system through improved public administration and*

strengthened fiscal capacity, based on commitments to human rights, rule of law and gender equality to ensure achievement of the SDGs

Outcome B1. *By 2030, Turkmenistan will strengthen natural resource management systems, systematically fulfil its climate change commitments, and the population will become more resilient to climate change and disasters*

Outcome C1. *By 2030, all people of Turkmenistan, including vulnerable groups, benefit equitably from quality and inclusive health, education and social protection systems and transformative social norms*

Applicable Output(s) from the UNDP Strategic Plan: *SP IRRF Output(s) A1.1, A2.1, A3.2, A4.1, A4.2, B2.1, B3.1, B3.2, C.1, C.6*

Project title: Supporting Energy Transition for Remote Settlements in Turkmenistan (SET)

Quantum Project Number: TBD

Objective and Outcome Indicators[2]39 (no more than a total of 20 indicators)		Data Source	Baseline[3]40	Mid-term Target[4]41	End of Project Target	Data Collection Methods[5]42	Risks/Assumptions
Project Objective: To assist Turkmenistan in building a policy framework to transition away from gas-powered energy generation towards renewable energy by 2030 and support adoption of distributed renewable energy solutions							
	Project Objective Indicator 1 (GEF Core Indicator 6.4): Increase in installed renewable energy capacity per technology (in MW)	*Project information, Data provided by the Ministry of Energy*	0 MW	*0.5 MW (Installed capacity of 3 pilot mini grids)*	*2 MW (Installed capacity of all 10 pilot mini grids)*	*Project data, feasibility reports and detailed project reports developed under this project. Official data available with the Ministry of Energy*	**ASSUMPTIONS:** The proposed mini grids will be deployed and be operational by the end of the project **RISKS**: Due to various technical, regulatory and financial risks, mini grid deployment is delayed beyond the project tenure
	Project Objective Indicator 2 (GEF Core Indicator 6.2): Greenhouse gas emission mitigated outside AFOLU sector	*Data provided by the Ministry of Environmental Protection,*	*0*	*985 tCO_2e due to the deployment of LED bulbs*	**Direct Emissions avoided outside AFOLU sector by End of Project:** 7,051 *tCO_2e due to the deploym*	*Data generated through the MRV systems implemented as part of the project (final data)*	**ASSUMPTIONS:** Automated system (IoT based systems) will be implemented to estimate number of units (kWh) of electricity generated by the mini grid.

	(direct) (t CO_2e)				*ent of LED bulbs and 10 mini grids* **Direct Emissions avoided outside AFOLU sector by 2049: 75,853** *tCO_2e (This includes 75,853 tCO_2e from LED bulbs and 10 mini grids over the lifetime* of the assets (10 years for bulbs, 20 years for mini grids)) **Indirect Emissions avoided outside AFOLU sector by 2049: 51,660** *tCO_2e (That is*		**RISKS**: Without automated system, data collected by mini-grid operators may not be accurate. Solar mini grids may perform below capacity

					attributable to the project from lifetime reductions due to the deployment of mini grids in 120 settlements for which feasibility is conducted under the project.)		
	Project Objective Indicator 3 (GEF Core Indicator 6.3): Energy saved (MWh)	*Electricity consumption data from the Ministry of Energy*	*0*	*1,182* *This is the energy saved due to the distribution of free LED lamps.*	*3,547*	IOT from solar installations, smart meters from the households.	**ASSUMPTIONS:** Communities in remote settlements will utilise the LED lamps distributed. **RISKS**: Communities do not continue buying LED lamps after the end of the project.
	Project Objective Indicator 4 (GEF Core Indicator 11): Number of direct beneficiaries	*Data from the Ministry of Energy*	*0*	*Total beneficiaries (8,895 community members, 50 percent women +80 trainees, 40 percent women)* ***8,975***	*Total beneficiaries (147,050 community members, 50 percent women*	*MRV system* *Gender disaggregated beneficiary data collection and analysis*	**ASSUMPTIONS:** Community engagement is high. Sufficient interest from mini-grid developers to bid for mini-grid projects

	disaggregated by gender as co-benefit of GEF investment.				*+ 120 trainees, 40 percent women)* ***147,170***		in remote settlements. **RISKS**: Delays due to unforeseen implementation/structural challenges.
Project component 1	*Policy, Regulations and Plans for RE deployment*						
Project Outcome[6]43 1 *An enabling policy environment for country wide uptake of renewable energy solutions established*	*Indicator 5: Development of a national solar road map for Turkmenistan and regulations/sub-laws/guidelines on RE*	*Data from the Ministry of Energy*	No comprehensive solar road map	*First draft of national solar road map submitted to government stakeholders for comments* *At least 1 regulations/subl aws/guidelines on RE*	Completed and approved national solar road map for Turkmenistan *At least 2 regulations/sub-laws/guidelines on RE*	*M&E reporting by Ministry of Energy – Annual*	**ASSUMPTIONS:** Government commitment towards formulating a National Solar Roadmap shall remain consistent throughout the implementation of this project. **RISKS**: Government commitment towards formulating a National Solar Roadmap shall waver and will be a lesser priority during the implementation of this project
	Indicator 6: Number of trainees trained in solar technolog	M&E/Reporting by Ministry of Energy	0 training sessions conducted on RE	Government – 30 Private Sector – 15 Bankers/Financial Professionals – 15	Government - 30 Private Sector - 15	M&E/Reporting by Ministry of Energy Training attendance sheets	**ASSUMPTIONS:** There will be interest and commitment amongst the targeted

	y, O&M, policy/regulations, financial planning and implementation		adoption	Training the Trainers – 20 Total - 80 trainees	Bankers /Finance Professionals - 15 Training the Trainers – 20 O&M community – 20 O&M technicians (universities) - 20 Total - 120 trainees	and feedback forms	trainees to attend and complete the training sessions. **RISKS**: There is lack of interest amongst the trainees to complete the sessions.
Outputs to achieve Outcome 1	*Output 1.1: Technical, economic, financial, environmental and social analysis carried out to support the Ministry of Energy (MoE) and other stakeholders in the design and implementation of appropriate clean energy policies, programmes and regulations, including recommendations on repurposing of fossil-fuel subsidies towards RE development.* *Output 1.2: Appropriate policies and regulations for on- and off-grid large and small-scale RE solutions prepared for government adoption.* *Output 1.3: Capacity of key stakeholders strengthened through gender-sensitive coaching, training seminars and study tours (with 40% women trainees)* *Output 1.4: A technical unit within MoE to conduct RE planning and technical assessments established* *Output 1.5: Guidelines for e-waste management plans prepared*							
Project Component 2	*Pilot distributed RE projects*						
Outcome 2: Piloted distributed solar photovoltaic (PV) solutio	*Indicator 7: Number of mini grids deployed and MRV systems developed in the remote*	*Baseline assessment reports* *Data from the Ministry of Energy*	*Electricity supply to remote settlements is currently powered by diesel*	*Number of mini-grids installed: 3* *MRV systems* *- MRV systems developed as per international*	*Number of mini grids installed : 10* *MRV systems* *- MRV systems*	*M&E reporting by Ministry of Energy* *MRV report* Training attendance sheets	**ASSUMPTIONS –** Mini-Grids and MRV systems will be successfully operationalized in remote settlements.

ns (both on-grid and off-grid) to showcase economic viability and environmental co-benefits	*settlements*		*generators. There are no mini-grids or MRV systems in place.*	*standards for 3 pilot sites* *- Trainings conducted for operation of MRV system*	*developed as per international standards for 10 pilot sites* *- Trainings conducted for operation of MRV system* *- MRV report on learnings and best practices published*	and feedback forms Periodic technical/operation/performance reports generated by MoE	**RISKS**: Due to various technical and operational factors, the MRV system and mini grids are not deployed during the tenure of the project.
	Indicator 8: Number of energy efficient LED bulbs distributed	*Data from Ministry of Energy*	*No energy efficient LED bulbs currently in usage*	*Number of energy efficient LED bulbs distributed: 7,639*	*Number of energy efficient LED bulbs distributed: 7,639*	*M&E reporting by Ministry of Energy – Annual* Periodic technical/operation/performance reports generated by MoE	**ASSUMPTIONS:** Energy efficient LED bulbs will be distributed across 10 pilot settlements by Ministry of Energy **RISKS**: Communities do not continue buying LED lamps after the end of the project.

Outputs to achieve Outcome 2	*Output 2.1: Tender package for large scale distributed PV farm prepared with technical assistance from the project.* *Output 2.2: Tender package prepared to procure pilot small-scale solar PV that streamlines environmental and social safeguards and gender, with a focus on women entrepreneurs and women's associations wherever possible* *Output 2.3: Monitoring, reporting and verification (MRV) systems to monitor solar PV performance established* *Output 2.4: A Developed monitoring system for tracking GHG emissions* *Output 2.5: Pilot small-scale solar PV systems deployed in remote settlements*						
Project component 3	***Scale-up and replication of distributed RE projects***						
Outcome 3: Use of capital subsidies for renewable energy expanded into a government to support replication; and local capacity to operate RE system established	*Indicator 9: Number of feasibility plans/assessments conducted for solar PV deployment in remote settlements*	*M&E reports*	*0 feasibility assessments*	*0 feasibility assessments*	*120 feasibility assessments*	*Project M&E data*	**ASSUMPTIONS:** Feasibility assessments are conducted as the first step to deploy solar energy across remote settlements **RISKS:** There is no commitment/ finance for solar deployment for the sites where feasibility assessment has been conducted.
	Indicator 10: Number of feasibility assessments conducted for a solar powered	Project M&E data	0 feasibility assessments	0 feasibility assessments	3 feasibility assessments	Project M&E data	**ASSUMPTIONS:** The feasibility assessments will be used as the first step to explore various solar use cases

	water desalination plant, solar water pumps and rooftop solar						**RISKS:** There is no interest/commitment to explore various solar use cases which have been deliberated upon in the feasibility assessments.
Outputs to achieve Outcome 3	*Output 3.1: Government plans for scale-up of additional solar PV investments developed* *Output 3.2: Gender-sensitive training for Government, private sector personnel, and local residents on O&M of RE installations developed and rolled out* *Output 3.3: Renewable energy planning and technical assessments conducted in support of replication of new distributed RE projects (with focus on small-scale projects, women entrepreneurs or women's associations)*						
Project Component 4	**Knowledge management**						
Outcome 4: Knowledge management systems established	*Indicator 11: Number of knowledge reports published*	*Project M&E data*	*0*	*1*	*2 (1 Report on lessons learnt and 1 report on successful business models for solar deployment)*	*Project M&E data*	**ASSUMPTIONS:** There will be adequate M&E data and project documentation to publish knowledge reports. **RISKS:** There will not be adequate M&E data and project documentation to publish knowledge reports.
Outputs to achieve Outcome 4	*Output 4.1: Knowledge management frameworks developed to collate data/lessons learned and foster peer to peer learning*						

Project Component 5	**Monitoring and Evaluation**						
Outcome 5: The project is effectively monitored and evaluated (M&E)	*Indicator 12: Approval of evaluation reports*	*Project M&E data*	0	*Mid-term review report approved*	*Terminal evaluation report approved*	*Mid-term review report and Terminal evaluation report uploaded to UNOPS and UNDP platform.*	ASSUMPTION: Sustained stakeholders' engagement during evaluation. RISKS: Insufficient information available.
Outputs to achieve Outcome 5	*Output 5.1: Monitoring and evaluation framework to assess project performance*						

[1] SUSTAINABLE DEVELOPMENT COOPERATION FRAMEWORK between the Government of Turkmenistan and the United Nations 2026-2030

[2] *UNDP publishes its project information (indicators, baselines, targets and results) to meet the International Aid Transparency Initiative (IATI) standards. Make sure that indicators are S.M.A.R.T. (Specific, Measurable, Attainable, Relevant and Time-bound), provide accurate baselines and targets underpinned by reliable evidence and data, and avoid acronyms so that external audience clearly understand the results of the project.*

[3] *Baseline, mid-term and end of project target levels must be expressed in the same neutral unit of analysis as the corresponding indicator. Baseline is the current/original status or condition and needs to be quantified. The baseline can be zero when appropriate given the project has not started. The baseline must be established before the project document is submitted to the GEF for final approval. The baseline values will be used to measure the success of the project through implementation monitoring and evaluation.*

[4] *Target is the change in the baseline value that will be achieved by the mid-term review and then again by the terminal evaluation.*

[5] *Data collection methods should outline specific tools used to collect data and additional information as necessary to support monitoring. The PIR cannot be used as a source of verification.*

[6]*Outcomes are medium term results that the project makes a contribution towards, and that are designed to help achieve the longer-term objective. Achievement of outcomes will be influenced both by project outputs and additional factors that may be outside the direct control of the project.*

ANNEX D: STATUS OF UTILIZATION OF PROJECT PREPARATION GRANT (PPG)

Provide detailed funding amount of the PPG activities financing status in the table below:

Project Preparation Activities Implemented	GETF/LDCF/SCCF Amount ($)		
	Budgeted Amount	Amount Spent To date	Amount Committed
Component A: Preparatory Technical Studies & Reviews Activities Undertaken: • Travel costs for experts to enable project design – Project Development	44,295.00	44,295.00	0.00

Specialist, Technical Consultant, SES and Gender Experts for consultations/discussions, data gathering and site assessments with key partners and stakeholders, such as the Ministry of Energy, Ministry of Environment, Ministry of Agriculture, Ministry of Finance, the private sector, and local NGOs to finalize pilot settlement selections • Engagement of stakeholders to assess institutional capacity, technical needs and regulatory frameworks for solar PV mini grid deployment and identification of gaps for targeted training and improvement.			
Component B: Formulation of technical assessments and plans to integrate into PPG Outputs Activities Undertaken: • Engagement/consultations with local communities to understand local context, needs and priorities, to build awareness and consensus to prepare stakeholders for pilot deployment of solar mini grids and future scale-up. • Procurement planning, technical standards to be followed during implementation, and project documentation integrating environmental, social and gender aspects in line with national and international frameworks' requirements and UNDP policies. • Technical and financial pre-feasibility studies for Solar Mini grids for remote settlements of Turkmenistan were conducted, and pre-feasibility study documents were prepared. This included initial GHG emissions estimations and savings calculations. • Environmental and Social Safeguards risk assessments and management plan was developed after field visits by SES expert. • Gender analysis was conducted and an action plan was developed by the Gender/SES expert. • A stakeholder engagement plan was formulated for engaging with all relevant and essential partners during project implementation period for alignment of their priorities, ensuring local needs are met, and for building partnerships that sustain future scale-up.	66,205.00	49,140.00	17,065.00
Component C: Validation Workshop and Report	14,500.00	7,620.00	6,880.00
Total	**125,000.00**	**101,055.00**	**23,945.00**

ANNEX E: PROJECT MAP AND COORDINATES

Please provide geo-referenced information and map where the project interventions will take place

Location Name	Latitude	Longitude	GeoName ID
Kirpili settlement	39.58666667	57.22777778	161,770

Location Description:

Activity Description:

Location Name	Latitude	Longitude	GeoName ID
Atabek settlement	39.64944444	57.50444444	12,226,677

Location Description:

Activity Description:

Location Name	Latitude	Longitude	GeoName ID
Ataguyy settlement (Derveze)	40.08944444	57.98805556	12,226,664

Location Description:

Activity Description:

Location Name	Latitude	Longitude	GeoName ID
Bukri settlement (Derveze)	39.95388889	58.80277778	162,143

Location Description:

Activity Description:

Location Name	Latitude	Longitude	GeoName ID
Churchuri settlement (Derveze)	38.96250000	59.15416667	

Location Description:

Activity Description:

Location Name	Latitude	Longitude	GeoName ID
Garagalyn dinlisi settlment	38.82888889	58.80750000	161,878

Location Description:

Activity Description:

Location Name	Latitude	Longitude	GeoName ID
Akmolla settlement	39.57888889	59.95388889	12,233,927

Location Description:

Activity Description:

Location Name	Latitude	Longitude	GeoName ID
Murzachyrla settlement	39.58333333	60.04277778	1,218,645

Location Description:

Activity Description:

Location Name	Latitude	Longitude	GeoName ID
Yalkym settlement	39.43361111	57.00138889	410,476

Location Description:

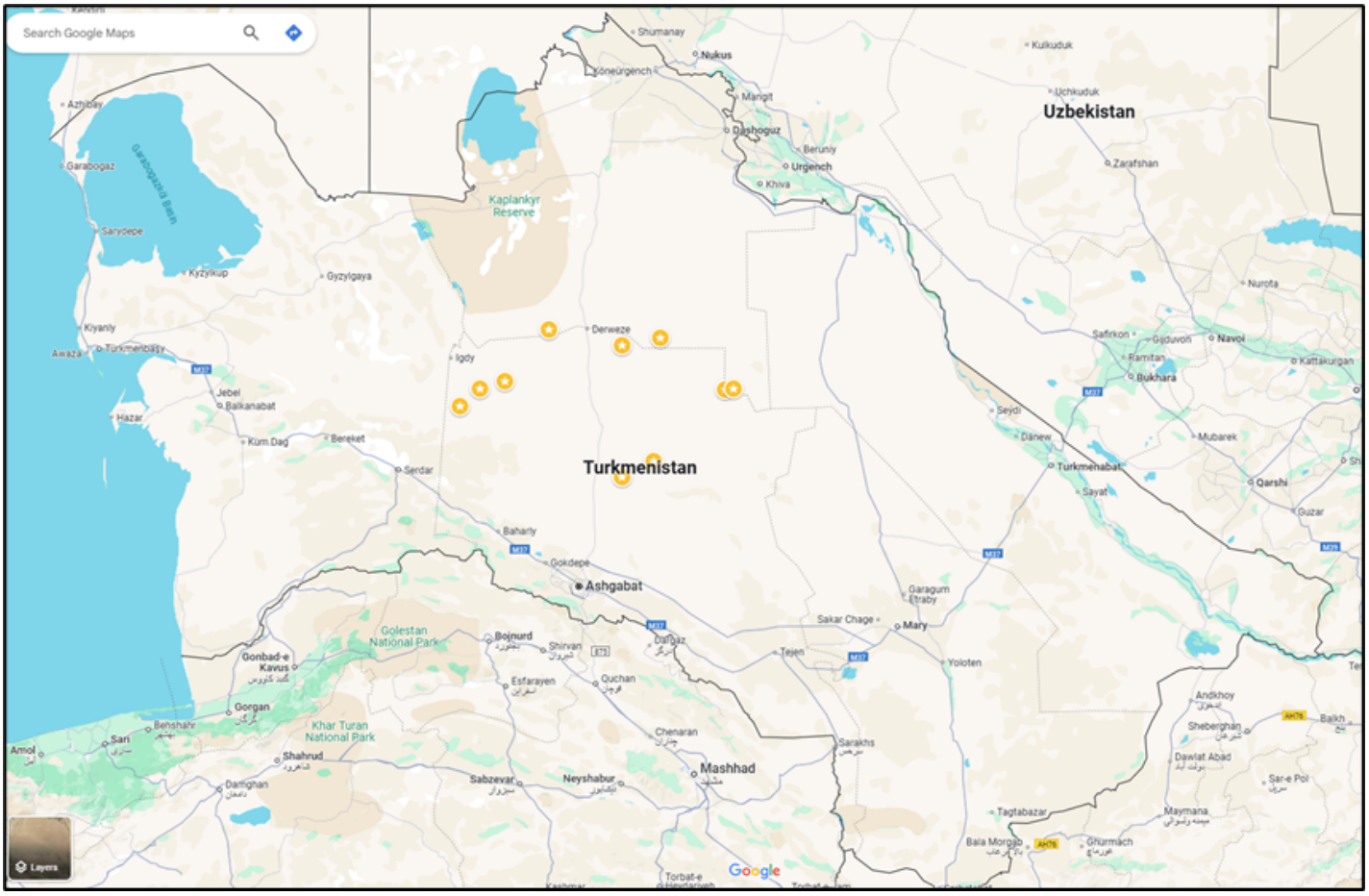
Activity Description:

Location Name	Latitude	Longitude	GeoName ID
Damla Settlement	40.02166667	59.22750000	12,226,665

Location Description:

Activity Description:

Please provide any further geo-referenced information and map where project interventions are taking place as appropriate.



This is the list of the 10 settlements initially discussed with and proposed by the Ministry of Energy, with their GPS coordinates.

Location Name *Required field*	Latitude *Required field*	Longitude *Required field*
Kirpili settlement	39.58666667	57.22777778
Atabek settlement	39.64944444	57.50444444
Ataguyy settlement (Derveze)	40.08944444	57.98805556
Bukri settlement (Derveze)	39.95388889	58.80277778
Churchuri settlement (Derveze)	38.96250000	59.15416667
Garagalyn dinlisi settlment	38.82888889	58.80750000
Akmolla settlement	39.57888889	59.95388889
Murzachyrla settlement	39.58333333	60.04277778
Yalkym settlement	39.43361111	57.00138889
Damla Settlement	40.02166667	59.22750000

ANNEX F: ENVIRONMENTAL AND SOCIAL SAFEGUARDS SCREEN AND RATING

Attach agency safeguard datasheet/assessment report(s), including ratings of risk types and overall project/program risk classification as well as any management plans or measures to address identified risks and impacts (as applicable).

Title

9811_TKM_SET_Annex 8_Streamlined ESMF_4 May 2026

9811_TKM_SET_Annex_4_SESP_4 May 2026_CLEAN

ANNEX G: BUDGET TABLE

Please upload the budget table here.

Expenditure Category	Detailed Description	Component (USDeq.)							Total (USDeq.)	Responsible Entity (Executing Entity receiving funds from the GEF Agency)[1]
		Component 1	*Component 2*	*Component 3*	*Component 4*	*Sub-Total*	*M&E*	*PMC*		
		Outcome 1	*Outcome 2*	*Outcome 3*	*Outcome 4*					

Equipment	**Equipment** procurement and installation costs for mobile air quality testing hardware and software tool in years 2 & 3. Equipment procurement and installation for LED bulbs and solar mini grids under activities 2.5.3 and 2.5.5 in years 2 and 3. (7,639 LED bulbs will be procured and installed in year 2 at USD 5 per bulb; 3 mini grids installed in year 2 and 7 mini grids installed in year 3, each mini grid has different capex value based on their capacities.)	-	2,339,725	-	-	2,339,725	-	-	2,339,725	UNOPS
Sub-total Equipment		-	2,339,725	-	-	2,339,725	-	-	2,339,725	UNOPS
Contractual Services – Individual	This includes costs of **Project Manager** for overseeing and managing smooth implementation of the overall project (cost to PMC) and providing inputs to activities under outputs 1.1 (163 days), output 1.3 (67 days), output 1.4 (52 days), output 1.5 (19 days), output 2.1 (28 days), output 2.2 (39 days), output 2.3 (10 days), output 2.5 (41 days), output 3.1 (101 days), output 3.2 (71 days) and output 3.3 (58 days), output 4.1 (95 days), output 5.1 (41.5 days) and PMC (375 days) at the rate of USD 200 per day. The Project Manager will assist local and international consultants as well as contracted companies to conduct baseline and capacity needs assessments; preparation and updation of laws/guidelines; organising international study tours/training programs, TA and technical advisory services, capacity building for RE adoption; technical and logistical support to tendering, evaluation, installation and operationalisation of MRV system, small scale solar PV systems and their scale-up; organising and conducting inception workshop, collection of baseline information; generation of knowledge reports and dissemination of knowledge through events/conferences.	60,200	23,600	46,000	19,000	148,800	8,300	75,000	232,100	UNOPS
Contractual Services – Individual	This includes costs o**f Project Assistant** under PMC.	-	-	-	-	-	-	109,408	109,408	UNOPS
Sub-total (Contractual Services - Individual)		60,200	23,600	46,000	19,000	148,800	8,300	184,408	341,508	UNOPS

Contractual Services – Company	**"Consultancy Contracts issued to local and international firms" for: Output 1.2 at USD 98,865** to develop a National Roadmap for solar energy adoption in Turkmenistan, and secondary regulation/legislation/ policies relating to mini grid, large scale solar and rooftop deployment. **Output 1.3 at USD 113,500** to organize workshops for conducting training programmes and awareness raising campaigns on RE for various stakeholders. **Output 1.5 at USD 35,710** to review international best practices on e-waste management, prepare draft e-waste management guidelines on management and EoL batteries and solar panels, develop disposal plans/approaches for e-wate disposal, collection, dismantling and export of waste. **"Consultancy Contracts issued to local and international firms" for: Output 2.4 at USD 29,688** for designing and operationalizing GHG emission monitoring, verification and reporting system, developing a methodological manual "User's Guide for Greenhouse Gas (GHG) monitoring", equip air quality monitoring teams of MoEP with mobile air quality testing hardware and software tool. **Output 2.5 at USD 184,358** to conduct feasibility studies and prepare detailed project reports for the implementation of 10 distributed small-scale solar PV systems. **"Consultancy Contracts issued to local and international firms" for: Output 3.1 at USD 91,910** to provide technical and financial advisory services for the scale-up of small-scale solar projects. **Output 3.2 at USD 35,957** to design and implement effective O&M strategies for RE installations, and conduct training programmes on O&M of RE installations to government, private sector personnel and local stakeholders.	248,075	214,046	127,867	-	589,988	-	-	589,988	UNOPS
Sub-Total (Contractual Services - Company)		248,075	214,046	127,867	-	589,988	-	-	589,988	UNOPS
International Consultants	This includes costs of International Consultant - **Chief Technical Advisor (CTA)** for Outputs 1.1, 1.3, 1.4 (51 days), 2.5 (300 days), 3.3 (34 days) and 4.2 (50 days), in total of 435 days @ USD 500 per day. CTA costs will be split across all components (all budgeted under 'International Consultants' costs). Under Component 1, tasks include: providing support to conduct baseline assessment of RE ecosystem in Turkmenistan and define/design technical standards for deployment of RE. Under component 2, tasks include: providing technical support for issuance of tender, evaluation and selection of preferred bidders to	25,500	150,000	17,000	25,000	217,500	-	-	217,500	UNOPS

	deploy small scale solar PV systems for the 10 pilot sites. Under component 3, tasks include: supporting the technical unit under MoE to conduct technical assessments for scale-up of RE investments based on the pilot experience.									
International Consultants	**Contracts issued to international consultants for Outputs 1.1, 1.3 and 1.4 for 125 days @ USD 500 per day.** This includes updating the law on renewable energy sources, conducting sensitivity analysis, local capacity needs assessment for RE adoption and provide capacity building/technical advisory services to MoE technical unit on RE project feasibility preparation. **Contracts issued to international consultants for Outputs 2.1, 2.2 and 2.3 for 145 days @ USD 500 per day.** This includes providing TA to develop standardized templates for feasibility assesments, tender mechanisms for contracting/procurement to deploy small-scale solar mini grids for remote settlements and small-scale rooftop/on-site systems for MSMEs; organise training programs to national stakeholders on mechanisms and contracts developed; and design and implement MRV system as per international standards, design and deliver training materials to support operation of MRV, and prepare MRV report on learnings and best practices of the MRV system. **Contracts issued to international consultants for Outputs 3.1 and 3.3 for 75 days @ USD 500 per day**. This includes providing support for tendering, installation and operationalization of distributed solar projects in 120 settlements; provide technical assistance to evaluate and expand capital expenditure subsidy for additional small-scale distributed solar projects; and conduct feasibility assessments for a solar powered water desalination plant, solar water pumps and rooftop solar.	62,500	72,500	37,500	-	172,500	-	-	172,500	UNOPS
International Consultants	This includes costs of **International consultant for conducting mid-term review** (45 days of effort at USD 500 per day in year 3) **and terminal evaluation** (70 days of effort at USD 500 per day in year 5).	-	-	-	-	-	57,500	-	57,500	UNOPS
Sub-total International Consultants		88,000	222,500	54,500	25,000	390,000	57,500	-	447,500	UNOPS

Local Consultants	**Contract issued to National SES/gender Expert for Outputs 1.1, 1.2, 1.3, 1.4 (55 days) , 2.5 (10 days), 3.3 (25 days), 4.1, 4.2 (79.5 days) and 5.1 (15 days) in total of 184.5 days @ USD 200 per day**. Tasks for this SES/gender expert includes: assist in conducting baseline assessment and provide inputs for updating law; conducting SESA to develop a National Roadmap for solar energy adoption in Turkmenistan; assist in conducting capacity needs assesment of national /local govt on RE adoption; assist in establishing a technical unit under MoE to drive and scale RE; ESIA and ESMP for each of the 10 settlements; support the technical unit to conduct technical assessments for scale-up of RE investments based on the pilot experience; assist in continuous monitoring of progress and risks ; prepare annual GEF Project Implementation Reports (PIRs); and assist in publishing at least 2 knowledge reports on challenges, best practices and project experience.	11,000	2,000	5,000	15,900	33,900	3,000	-	36,900	UNOPS
Local Consultants	**Contracts issued to Local Consultants for outputs 1.2 and 1.3 for 197 days @ USD 200 per day**. This includes policy/regulation assessment and development; conducting training programs and awareness raising campaigns on RE for stakeholders and public. **Contracts issued to Local Consultants for outputs 2.3 and 2.4 for 104 days @ USD 200 per day**. This includes design and implementation of MRV system as per international standards; and design and operationalization of GHG emission monitoring, verification and reporting system. **Contracts issued to two Local Consultants for output 2.5 for 90 days each (total of 180 days) @ USD 200 per day.** This includes conducting technical and economic/financial feasibility studies for pilot deployment of small scale solar PV systems in remote settlements. **Contracts issued to Local Consultants for outputs 3.1 and 3.2 for 175 days @ USD 200 per day.** This includes providing TA, technical and financial advisory services and support for scale-up of additional small scale solar PV investments; and training for Government, private sector personnel, and local residents on O&M of RE installations. **Contract issued to a Local Consultant - Communication expert for implementing communication plan for 72 days @ USD 200 per day.**	39,400	56,800	35,000	14,400	145,600	-	-	145,600	UNOPS
Local Consultants	Contract issued to **national consultant for conducting mid-term review (**40 days of effort at USD 200 per day in year 3) **and terminal evaluation** (50 days of effort at USD 200 per day in year 5).	-	-	-	-	-	18,000	-	18,000	UNOPS

Sub-Total (Local Consultants)		50,400	58,800	40,000	30,300	179,500	21,000	-	200,500	UNOPS
Trainings, Workshops , Meetings	Training and workshops for various stakeholders on RE adoption (Output 1.3) is budgeted at USD 3,000 for 13 events; 1 Workshop at study tour for USD 1,000. Output 1.3 focuses on strengthening capacity of key stakeholders through gender-sensitive coaching, training seminars and study tours (with 40% women trainees). Training programme for national stakeholders under output 2.1 at USD 3,000, output 2.2 at USD 3,000 and output 2.3 at USD 3000 in year 2. Output 2.1 focuses on preparation of Tender package for large-scale distributed PV farm with technical assistance from the project. Output 2.2 targets preparation of Tender package to procure pilot small-scale solar PV and Output 2.3 targets establishment of Monitoring, reporting and verification (MRV) systems to monitor solar PV performance . 3 training programmes under output 3.2 at USD 3,000 per event in years 3 & 4. This includes costs of 1 inception workshop under output 5.1 (at USD 2,183 in year 1) and 4 workshop events under output 4.2 (at USD 1,586 per event for 4 events in years 3, 4 & 5).	40,000	9,000	9,000	6,344	64,344	2,185	-	66,529	UNOPS
Sub-total Trainings, Workshops , Meetings		40,000	9,000	9,000	6,344	64,344	2,185	-	66,529	UNOPS
Travel	Travel expenses for international, local consultants and travel to remote settlements for component 1, 2, 3, 4 and 5(M&E). This includes all domestic and international travel of international/local consultants.	31,425	44,054	30,700	-	106,179	23,341	-	129,520	UNOPS
Sub-total Travel		31,425	44,054	30,700	-	106,179	23,341	-	129,520	UNOPS
Other Operating Costs	Communications, audio visual materials and printing service for trainings and workshops.	29,250	4,500	4,500	3,090	41,340	2,684	-	44,024	UNOPS
Other Operating Costs	Annual financial audit costs	-	-	-	-	-	-	14,336	14,336	UNOPS
Sub-total Other Operating Costs		29,250	4,500	4,500	3,090	41,340	2,684	14,336	58,360	UNOPS
Grand Total		**547,350**	**2,916,225**	**312,567**	**83,734**	**3,859,876**	**115,010**	**198,744**	**4,173,630**	

[1] In exceptional cases where GEF Agency receives funds for execution, Terms of Reference for specific activities are reviewed by GEF Secretariat

Please explain any aspects of the budget as needed here

ANNEX I: RESPONSES TO PROJECT REVIEWS

From GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF.

A3. Enablers, Drivers, supporting policies and stakeholder engagement for the project

The increase in GHG emissions from the power sector in Turkmenistan, as well as across the wider region, is driven by several key factors:

- Increasing use of fossil fuels to satisfy rising energy demand associated with improving living standards and economic growth ambitions, combined with limited awareness and insufficient utilisation of renewable energy potential
- Over-reliance on gas-fired power plants, sustained by the country's vast fossil fuel production, which discourages investment in renewable energy and energy efficiency improvements, despite Turkmenistan having one of the highest per capita energy consumption rates in Central Asia and significant untapped solar potential.
- Long-standing preference in energy investment strategies for non-intermittent fossil-fuel technologies, often without adequately considering the rapidly declining costs of renewable energy generation and energy storage technologies and the continued global decline in the cost of solar photovoltaic technologies.

The project's key enablers include:

- the commitment of the GoT to support renewable energy for electricity generation as stated in key policy documents, the National Strategy of Turkmenistan for the Development of Renewable Energy;
- synergies that can be created with other projects under implementation by different international institutions aiming to support RE market development,
- GoT's plans to further expand electricity generation with renewables, including in the remote settlements,
- ongoing engagement of key public and private stakeholders in the expansion of renewables in Turkmenistan; and
- high openness to co-finance distributed small-scale RE installations at scale as long as RE installations deliver price-parity with natural gas-fuelled energy, which is a realistic and yet untapped possibility (given current rates for RE generation being around US$0.025 per kWh).

How the project addresses the drivers of GHG emission growth in Turkmenistan

Driver 1: Growing deployment of use of fossil fuels to meet the demands for increased living standards coupled with the economic growth spurring more demand for electric energy exports or the ambition for economic

growth without understanding of renewable energy potential and its accelerated deployment. The Project fosters the adoption of low carbon RE solutions (with a focus on solar PV) to mitigate the impact of a growing population and economy in Turkmenistan. Formalizing an institutional coordination framework and a long-term strategy will facilitate the alignment of the decisions made by public and private stakeholders with renewable energy development, including properly sized storage facilities to avoid redundancy and ensure energy rate affordability.

Driver 2: Technological innovations in the solar PV and renewable energy in general, which may lead to lower GHG emissions from the power sector through (clean) electrification. The Project intends to develop technical regulations and standards, as well as an array of incentives and disincentives to support clean renewable energy options that focus on the displacement of fossil fuel power generation. It will also explore the economic and job creation opportunities associated to these policies.

Driver 3: Traditional reliance of regional and national energy sector investment policies on non-intermittent nature of fossil-fuel technology without proper accounting for rapidly decreasing costs of both RE generation assets and of energy storage. The Government has opened to explore investor engagement for especially larger size renewables deployment. Furthering such projects via potential cooperation with MDBs such as Asian Development Bank, European Bank for Reconstruction and Development will make distributed small-scale RE investments more attractive. ADB already has a sizeable portfolio of loans to the Ministry of Energy for construction and modernization of the energy grid, while EBRD is active in the region as a lender to large private enterprises focusing on promoting RE in operations.

Driver 4: Efforts of the government to make distributed small-scale RE generation self-financed through implementing the legal framework in line with best international practices such as RE auctions and Contracts for Difference (CfD).

Driver 5: The need/efforts of the government to ensure environmental and resource management pressures associated with renewable energy scale-up in the context of e-waste and end-of-life management systems for solar PV panels and batteries are managed.

The way in which governments and societies respond to these drivers will shape different possible trajectories for the power sector at national, regional, and global levels:

- **Future Scenario 1 (slow transition):** Rising demand for electricity, including demand from neighbouring countries with limited energy supply, may continue to be met primarily through fossil-fuel-based generation. This is particularly likely in low- and middle-income countries experiencing rapid economic growth, where fossil fuels remain readily available and comparatively affordable. Under a slow transition pathway, insufficient planning for end-of-life management of RE technologies may reinforce institutional caution toward scaling renewables. The Project mitigates this risk by establishing e-waste management guidelines, Extended Producer Responsibility principles, and disposal planning mechanisms, thereby reducing environmental uncertainty and strengthening the regulatory foundation needed for gradual renewable deployment.
- **Future Scenario 2 (accelerated clean electrification):** The deployment of low-carbon technologies and renewable energy solutions in the electricity sector may advance more rapidly, driven by greater adoption of solar PV and other renewable sources. This pathway can support emissions reductions while improving energy access for communities that currently lack reliable

and affordable electricity. Under an accelerated electrification pathway, rapid expansion of solar PV and battery storage would significantly increase future waste streams. The Project ensures that this growth is environmentally sustainable by integrating circular economy principles, end-of-life battery and PV management frameworks, and monitoring systems from the outset, preventing future environmental liabilities and safeguarding public health.

The proposed project will be effective under both scenarios.

- Under a slow transition scenario, the Project provides technical support for regulations to reassure government and potential investors in renewable energy policies, and designing and implementing distributed small-scale renewable energy projects that will provide lower total cost of the renewable energy investment, build local capacities that should guide some of these early adopters in the power sector while supporting the government and private investors in the deployment of the necessary power generation infrastructure (such as solar PV and BESS);
- Under the expedited clean electrification scenario, the Project can provide policy roadmaps to accelerate a transition to renewable energy and environmental regulations and know-how to manage solar PV and batteries at their end of life.
- Under both scenarios, the Project envisages strengthening institutional coordination necessary to cope with any changes in the framework conditions to accelerate transition towards renewable electrification.
- Under both scenarios, the Project strengthens institutional coordination and environmental governance to ensure that renewable energy expansion is aligned with long-term sustainability principles, resource efficiency, and environmental protection standards, thereby reinforcing the resilience and credibility of Turkmenistan's energy transition.

Alignment with National Strategies, Plans, Reports and Assessments

The law and policymaking in Turkmenistan have undergone a shift since 2016-17 to incorporate its commitments to climate action at the global level. The Ministry of Energy is mandated to ensure 'reliable and uninterrupted supply of electricity and heat to consumers in the country'[29][44] as per national strategies as well as SDG 7. Turkmenistan's Law on "On Renewable Energy Sources' (2021) lays down provisions for the transition to wind and solar energy systems. It includes provisions such as state subsidies, preferential bank loans, guaranteed purchase of renewable power at fixed tariffs, customs benefits for imported solar equipment, and state-funded programs to stimulate renewable energy adoption. The law 'On the Protection of Atmospheric Air' (2016) encourages the use of renewable energy sources such as solar and wind power to reduce greenhouse gas emissions and mitigate climate change. There is also a Presidential Programme which enables the construction of solar PV capacity of 100 MW in the country and the transition to green energy in the country by 2052.

In its Nationally Determined Contribution (NDC) submitted in 2022, Turkmenistan has committed to reduce its greenhouse gas emissions by 20% by 2030 compared to 2010 levels. Turkmenistan has recently joined the Global Commitment to Reduce Methane Emissions and has committed to reducing its methane emissions by at least 30% by 2030 compared to 2020 levels[30][45].

Given below are the relevant laws/policies governing climate change related challenges and recent projects in the country.

Table 2 - Relevant laws/policies in Turkmenistan

Nationally Determined Contribution of Turkmenistan under the Paris Agreement[31][46]	The government of Turkmenistan updated its NDC in 2022 to increase its climate objectives in line with the Paris Agreement. Updated in 2022 and reaffirmed in 2023, this NDC document commits to an unconditional 20% reduction in greenhouse gas emissions by 2030 compared to 2010 levels. The NDC focuses on mitigation efforts in key sectors such as energy, transportation, agriculture, industrial processes, and waste, while also emphasizing adaptation priorities including health, water, soil, forestry, and ecosystems. On RE front, it focuses on the introduction of small and medium-sized renewable energy installations in remote and sparsely populated areas in the short term. For the medium and long term, the introduction of Turkmenistan's own production capacities and increasing the share of renewable energy in the country's energy balance is envisaged.
National Strategy of Turkmenistan on Climate Change (new edition, 2019)[32][47]	First adopted in 2012 and revised in 2019, it guides Turkmenistan's response to climate change, reflecting its updated commitments under the Paris Agreement and Sustainable Development Goals. This strategy serves as the foundational document for the nation's climate policy, guiding efforts in emissions reduction, adaptation to climate risks like water scarcity, and integrating climate concerns into national development plans.
National Strategy for the development of renewable energy in Turkmenistan until 2030 (2020)	This Strategy document seeks to expand solar and wind energy, reduce greenhouse gas emissions by 20% from 2010 levels, and modernize infrastructure for a more sustainable energy sector by 2030. The strategy includes creating an enabling policy and regulatory environment, developing technical capacity, and promoting private sector participation to support Turkmenistan's transition to a low-carbon, sustainable energy future.
The Law of Turkmenistan 'On Waste' (2015)	This law is aimed at reducing waste generation and ensuring its rational use in economic and other activities in order to prevent their negative impact on public health and the environment. This law is relevant for managing solar panels achieving end-of-life status and their sound disposal.
The Law of Turkmenistan 'On the Protection of Atmospheric Air' (2016)	It establishes the legal and organizational framework for preserving air quality by preventing harmful emissions from economic and industrial activities, thereby promoting environmental safety and safeguarding public health.

	The Act encourages the use of renewable energy sources such as solar and wind power to reduce greenhouse gas emissions and mitigate climate change, recognizing these technologies as measures that have “minimal harmful physical impact on the atmosphere” and directly contribute to stabilizing pollutant concentrations. Installation of solar panels to replace the diesel powered gensets will reduce carbon emissions in remote settlements, aligning with the aim of this law. Robust monitoring, reporting and verification systems (MRV) will quantify the emission reduction achieved.
The Law of Turkmenistan 'On Environmental Safety' (2017)	This act aims to ensure the sustainable and secure development of the state by protecting the environment, preventing ecological hazards, and balancing economic progress with ecological stability through strict regulation of environmentally hazardous activities. The law mandates economic incentives for businesses that develop and implement environmentally safe technologies, including cleaner and energy-efficient production systems that minimize environmental risks
The Law of Turkmenistan 'On Environmental Audit' (2019)	This law establishes the legal framework for conducting environmental audits to ensure that business and industrial activities comply with national and international environmental protection standards, thereby improving ecological safety and the sustainability of economic development. The law mandates environmental audits for projects that significantly impact the environment including industrial modernization and the operation of environmentally hazardous facilities. By requiring these audits to assess emissions, energy use, and environmental performance, the law indirectly promotes the transition to cleaner technologies.
The Law of Turkmenistan 'On Renewable Energy Sources' (2021)	This law defines the legal, economic, and organizational framework for the production, distribution, and use of renewable energy. Its primary objective is to diversify the national energy system and improve energy security through the efficient use of renewable sources such as solar, wind, and biogas. This act explicitly lays down provisions for state incentives, preferential bank loans, guaranteed purchase of renewable power at fixed tariffs, customs benefits for imported solar equipment, and state-funded programs to stimulate renewable energy adoption (Articles 6,17,18,19).
The Law of Turkmenistan “On Energy Saving and Energy Efficiency” (2024)	This law establishes the legal, economic, and institutional framework for promoting energy saving and improving energy efficiency across the entire fuel and energy chain in Turkmenistan, from extraction and production to transport, distribution, and consumption.

	It defines key concepts such as - energy audit, energy survey, energy passport, energy efficiency indicators, fuel and energy resources. It also sets out who is covered—producers and consumers of fuel and energy, energy audit institutions, and state regulatory bodies—and their roles and responsibilities in using energy efficiently.
Secondary legislations in Turkmenistan relating to RE	➢ Rules of international cooperation in the use of renewable energy sources ➢ Rules for the development, as well as mechanisms for their implementation and supervision of scientific and scientific-technical programs in the field of renewable energy development. ➢ Rules for the introduction of achievements in science and technology in the field of renewable energy development. ➢ Rules for the withdrawal and provision of land plots, as well as the transfer of land to other categories and types for the placement of installations for the use of renewable energy sources; ➢ Rules for taking into account the information contained in the State cadastre (register) of renewable Energy Sources when developing schemes for the integrated territorial organization of administrative-territorial units, master plans, urban development projects of special and detailed planning; ➢ Section VII Rules for the use of electric energy. Guaranteed purchase by state energy supply enterprises of all proposed energy produced from renewable energy sources and supplied by energy producers from renewable energy sources to state energy networks, as well as its payment at established tariffs. ➢ Regulations on the procedure for maintaining the state cadastre of renewable energy Sources and the use of its data, including the rules for identifying and inventory of sites for possible placement of installations for the use of renewable energy sources and the rules for including in the state cadastre of renewable energy sources sites for possible placement of installations for the use of renewable energy sources. ➢ Section VI Rules for the use of electrical energy. Ensuring guaranteed connection to the state energy networks of block stations operating on renewable energy sources ➢ Rules for confirming the origin of energy produced from renewable energy sources, including the issuance of a certificate confirming the origin of energy.

	➢ Rules for the tender selection of research and innovation projects in the field of renewable energy sources financed from the state budget. ➢ Regulations on the form of the certificate confirming the origin of energy from renewable energy sources and the procedure for its issuance.

The baseline projects listed Table 3 represent Turkmenistan's renewable energy pipeline. All the initiatives are currently at the announcement or planning stage and none yet are under active implementation as of late 2025. These efforts align with national priorities under the National Climate Change Strategy, NDC and energy legislations, which emphasize diversification from gas dominance through solar, wind, and efficiency measures. The proposed SET project will build momentum by accelerating project preparation, leveraging lessons from regional ADB/GEF precedents, integrating with ongoing non-GEF investments like Masdar's scale-up potential, and creating a scalable pipeline for RE deployment. Given below are the baseline projects relating to renewable energy and energy efficiency.

Table 3 – Baseline renewable energy related projects in Turkmenistan

Project Name	Funder	Description
Altyn-Asyr city	Ministry of Energy	This is a 10 MW combined solar-wind installation to feed a new settlement on the shore of Altyn Asyr lake, deep in the Karakum desert. The photovoltaic solar station has an installed capacity of 7 MW, generating an average of 1,371,784.12 kWh of electricity per year; a wind farm with an installed capacity of 3 MW at an average wind speed of 7.05 m/s will generate 835 kWh of electricity USD 20 million for the PV station and US$ 17.5 million for transformation, grid, and related transportation infrastructure. The SET project will complement the 10 MW hybrid solar-wind installation at Altyn Asyr lake by strengthening the policy, regulatory, and technical framework required for integrating and scaling similar renewable energy systems nationwide.
Masdar Turkmenistan Solar Plant	Masdar	A 100 MW solar photovoltaic plant is announced with the joint development agreement between Masdar and Turkmenenergo. It is one of the first utility-scale solar power projects in Turkmenistan. The SET project will complement this initiative by strengthening the enabling policy, regulatory, and technical frameworks necessary for large-scale renewable integration.

Integrated Renewable Energy Solutions to Support Green Transformation in Turkmenistan	Asian Development Bank (ADB)	The Asian Development Bank is supporting Turkmenistan's green transformation with technical assistance for 'Integrated Renewable Energy Solutions,' focusing on solar energy development to diversify the economy and reduce emissions. One of the main goals is to develop a detailed roadmap for the implementation of solar energy, including the creation of innovative "smart" and "green" cities such as the new city of Arkadag. As part of the project, assessments and feasibility studies will be conducted, and a pilot solar power plant will be launched in the urban area. The pilot project is expected to generate over 4 GWh of renewable energy annually, which will significantly reduce greenhouse gas emissions by more than 3,000 tons per year. Turkmenistan aims to transition to renewable energy sources, which will open new opportunities for economic diversification, reduce carbon emissions, and develop new export markets, including the creation of "green" energy corridors connecting Central Asia with Europe. The SET project will coordinate with ADB colleagues in terms of distilling lessons learned from their initiative – while focusing more on the non-urban areas.
Developing National Capacity of Turkmenistan through Improving Regulatory Environment towards Energy Efficient and Sustainable Building Sector (TEESB) (2024-2030) (total size of GEF grant and cofinance approx. 45 MUSD)	GEF funded (GEF ID 10996) Implemented by United Nations Development Program (UNDP)	This GEF-funded project aims to (1) Improve the existing regulatory and policy framework targeting the building sector to promote energy efficient and sustainable buildings (2) Demonstrate pilot buildings which incorporate the nearly zero energy concept (NZEB). They aim to achieve this through a range of activities such as modernization of building envelopes, active use of renewable energy sources, and the introduction of advanced digital systems for comprehensive energy monitoring and analysis. The SET project will complement this GEF-funded initiative by aligning renewable energy policy reforms with energy efficiency advancements in the building sector, ensuring coherence between distributed solar deployment and nearly zero energy building (NZEB) standards. While the building project focuses on reducing energy demand through efficiency and smart monitoring, SET will address the clean energy supply side by facilitating distributed solar PV integration and strengthening

		regulatory frameworks. Together, the two projects create a comprehensive demand–supply approach to low-carbon transition in Turkmenistan.

The consultations undertaken for this project were comprehensive in scope. Although this project will primarily be overseen by the Ministry of Environment Protection and the Ministry of Energy, it seeks to involve stakeholders such as other relevant government ministries, NGOs/CSOs, the private sector, and international development agencies.

The following stakeholders were engaged with throughout the development of the project at PPG stage:

Table 4 - Stakeholder Engagement Register

Item No.	Full name meeting participant	Job title	Date and time of the meeting
Ministry of Energy of Turkmenistan			
1.	Gurbanov Erkin Khudaygulyevich	Chief Engineer of the Ministry of Energy	10.27.2025 from 14:30 to 15:50
2.	Allayarov Dovlet Nargulyevich	Head of the Department for the Development of Renewable Energy Sources	10.27.2025 from 14:30 to 15:50
3.	Kakaeva Enejan	Head of the Production and Technical Department of the Ministry of Energy	10.27.2025 from 14:30 to 15:50
4.	Berdiev Vepaly	Head of the Department for the Development of Regulatory, Technical and Regulatory Documents of the Ministry of Energy	10.27.2025 from 14:30 to 15:50
5.	Atlyev Rustam	Deputy Head of the Department for Electricity Export, Ministry of Energy	10.27.2025 from 14:30 to 15:50
Ministry of Environmental Protection of Turkmenistan			
1.	Gadzhar Allanazar	Chief Specialist of the Environmental Protection Department	10.27.2025 from 16:20 to 17:35
2.	Bayramov Meretdurdy	Deputy Head of the Department of Foreign Economic Relations	10.27.2025 from 16:20 to 17:35
3.	Davran Yagmurov	Head of the Environmental Protection Department	10.27.2025 from 16:20 to 17:35
Ministry of Agriculture of Turkmenistan			
1.	Guvanchmurat Mukhymov	Deputy Head of the Land Cadastre of the Ministry of Agriculture	10/28/2025 from 09:30 to 10:50
2.	Ashir Yollabayev	Deputy Director of the Institute for Grain Breeding, Ministry of Agriculture	2 October 8, 2025 from 09:30 to 10:50
3.	Saparmurad Annamukhamedov	Deputy Director of the Institute of Animal Husbandry, Ministry of Agriculture	10/28/2025 from 09:30 to 10:50

Ministry of Finance and Economy of Turkmenistan.			
1.	Kumush Soltanova	Chief Specialist of the International Department of the Ministry of Finance and Economy of Turkmenistan	October 28, 2025 from 11:00 to 12:30
2.	Dzhumaguly Gurbankuliyev	Chief Specialist of the Department of Economy of the Country's Industries, Ministry of Finance and Economy of Turkmenistan	October 28, 2025 from 11:00 to 12:30
3.	Dzhemile Orazova	Head of the Department of Strategic Analysis and Development of the Department of Strategic Forecasting and Planning, Ministry of Finance and Economy of Turkmenistan	October 28, 2025 from 11:00 to 12:30
Ministry of Construction and Architecture			
1.	Leila Kulieva	Chief Specialist of the Department of Foreign Economic Relations of the Ministry of Construction and Architecture	10.27.2025 from 14:30 to 15:50
2.	Gulshirin Dzhumaeva	Head of the Department of Scientific and Technological Innovations	10.27.2025 from 14:30 to 15:50
3.	Bakhbit Orunov	Head of the 5th Department of the Turkmendovlettaslama Design Institute of the Ministry of Construction and Architecture	10.27.2025 from 14:30 to 15:50
State Concern Turkmengaz			
1.	Begmurad Babaev	Chief Specialist for Environmental Protection, Climate and Ecological Projects of the State Concern Turkmengaz	10.28.2025 from 16:20 to 17:15
2.	Rakhim Valiev	Chief Specialist of the Department of Foreign Economic Relations of the State Concern Turkmengaz	10.28.2025 from 16:20 to 17:15
Public organization Yas Tebigatchy			
1.	Leila Shikhmadova	Chairman of the Public Organization 'Young Naturalist'	10/29/2025 from 09:30 to 10:15
2.	Dzhemal Kurbanova	Deputy Chairman of the Public Organization 'Young Naturalist'	10/29/2025 from 09:30 to 10:15
Union of Entrepreneurs and Industrialists of Turkmenistan			
1.	Batyr Gadzharov	Chief Specialist of the Economic Department	October 29, 2025 from 11:00 to 12:50
2.	Danara Gurbanmuradova	Specialist of the Department of Foreign Economic Relations	October 29, 2025 from 11:00 to 12:50
Field visits to Ataguyy			31 October 2025 from 08:30 am to 1:00 pm
Field visits to Bukri			31 October 2025 from 02:00 pm to 4:30 pm
Field visits to Churchule			30 October 2025 from 9:00 am to 2:00 pm

The table below presents the key project stakeholders who will be involved in the implementation of the project and their type, in addition to their roles and the project activities they are expected to participate in.

Table 5 - Project Stakeholders

Stakeholder	Stakeholder Type	Expected Role and responsibility in project implementation	Activities
Ministry of Environmental Protection	Government Ministry	• Project partner	• Provide institutional support to UNOPS in processing the formal letters, review and endorsement of annual work plans. • Support UNOPS, Ministry of Energy, International Consultants in implementing policy related activities under Component 1. • Ensure active participation in capacity building activities of the project, to build in-house RE capacity. • Support UNOPS in the implementation of ESIA and ESMP under all the components of the project. • Support in the development of guidelines for e-waste management plans. • Participate in Project Steering Committee meetings to discuss project delivery progress, project performance and enhancement.
Ministry of Energy	Government Ministry	• Project partner	• Contribute to the implementation of all project activities/outputs. • Support in the implementation of Stakeholder Engagement Plan, Gender Action Plan and Environmental and Social Management Framework • Support the development of a national road map for solar energy adoption in Turkmenistan • Ensure active participation in capacity building activities of the

			project, to build in-house RE capacity. • Participate in Project Steering Committee meetings to discuss project delivery progress, project performance and enhancement. • Any quality concerns flagged during these M&E activities (such as annual GEF PIR quality assessment ratings) must be addressed by the MoE alongside the Project Management Unit.
UNDP	GEF Agency	• Overseeing project execution undertaken by the implementing partner to ensure that the project is being carried out in accordance with UNDP and GEF policies and procedures	• Monitor project progress implementation of overall project, Stakeholder Engagement Plan, Gender Action Plan and Environmental and Social Management Framework • Support key Monitoring and Evaluation (M&E) activities including the annual GEF PIR, the independent mid-term review and the independent terminal evaluation. • Ensure compliance with all UNDP project-level M&E requirements.
UNOPS	Executive Entity (Implementing Partner in UNDP terminology)	• Project execution in close coordination with the Ministry of Environmental Protection, Ministry of Energy and other national partners	• Project planning, coordination, management, monitoring, evaluation and reporting. This includes providing all administrative support for implementation, as well as required information and data necessary for timely, comprehensive, and evidence-based project reporting, including results and financial data, as necessary. The executing entity will strive to ensure project-level M&E is undertaken by national institutes and is aligned with national systems so that the data used and generated by the project supports national systems.

			• Overseeing the management of project risks as included in this project document and new risks that may emerge during project implementation. Consulting UNDP on the project risks on a regular basis. • Procurement of goods and services, including human resources. • Financial management, including overseeing financial expenditures against project budgets. • Preparing and ensuring approval of the multiyear workplan. • Approving and signing the combined delivery report at the end of the year; and, • Signing the financial report or the funding authorization and certificate of expenditures.
Turkmenenergo	Government	• Support UNOPS in project implementation	• Support UNOPS, Ministry of Energy, International Consultants and PMU in implementing policy related activities under Component 1. • Ensure active participation in capacity building activities of the project. • Support the implementation of pilot solar PV systems in remote settlements. • Participate in Project Steering Committee meetings to discuss project delivery progress, project performance and enhancement.
Ministry of Construction and Architecture	Government Ministry	• Support UNOPS in project implementation	• Ensure active participation in capacity building activities of the project, to build in-house RE capacity. • Participate in Project Steering Committee meetings to discuss

			project delivery progress, project performance and enhancement.
Ministry of Finance and Economy	Government Ministry	• Support UNOPS in project implementation	• Ensure active participation in capacity building activities of the project, to build in-house RE capacity. • Participate in Project Steering Committee meetings to discuss project delivery progress, project performance and enhancement. • Identify additional sources to co-finance the scale-up of solar systems. • Identify additional sources to co-finance the scale-up of solar desalination plants, solar water pumps and rooftop solar.
Turkmengaz	Government	• Support UNOPS in project implementation	• Support UNOPS, Ministry of Energy, International Consultants in implementing policy related activities under Component 1. • Support Ministry of Energy, International Consultants and PMU in developing secondary regulation/legislation/policies under Component 1. • Participate in Project Steering Committee meetings to discuss project delivery progress, project performance and enhancement.
Solar EPC contractors, O&M service providers and local entrepreneurs	Private Sector	• Support UNOPS in project implementation • International and national private sector will be engaged as EPC contractors and O&M service providers • Union of Industrialists Entrepreneurs of Turkmenistan in private sector training and capacity building activities	• Participate in training activities and provide assistance in university-industry collaboration under Component 1. • Technical and operational support in deployment of small-scale solar PV systems in pilots as EPC contractors and O&M service providers. • Assist MoE in identifying trainees from the private sector.
Representatives of NGO/CSOs	NGO/CSOs	• Support UNOPS in project implementation	• Support in the implementation of awareness raising campaigns envisioned under Component 1.

			• Provide support for on-ground implementation of the project, such as operation and maintenance of mini-grids envisaged under component 2 & 3
Banking Professionals	Private /Public Sector	• Support UNOPS in project implementation	• Participate in stakeholder workshops/training activities conducted under Component 1 • Provide consultation support for design of financial regulations, subsidy design.
Local communities – Remote settlements	Beneficiaries	• Engage in consultations to provide inputs for interventions	• Participate in training and awareness raising campaigns under Component 1, 2 & 3. • Active engagement in effective implementation of component 2 - LED lamps, solar PV systems and battery energy storage systems.

A4. Barriers

Barrier 1: Absence of prior and proven deployment of RE projects

Turkmenistan is a fossil fuel driven economy with a nascent renewable energy market. Turkmenistan's structural economic reliance on abundant and low-cost domestic natural gas—combined with long-standing institutional, fiscal, and infrastructure linkages to the hydrocarbon sector—reduces the immediate economic incentive and policy urgency to diversify into renewable energy and energy efficiency solutions, thereby slowing the pace of RE market development. There is insufficient implemented proof of concept for renewable energy, particularly solar mini grids with successful O&M. On the solar energy front, there is a 10 MW combined solar-wind installation to feed a new settlement on the shore of Altyn Asyr lake, deep in the Karakum desert under construction. Masdar has proposed a 100 MW solar photovoltaic plant which was announced with a joint development agreement with the Government of Turkmenistan. There is technical assistance being provided by the Asian Development Bank to Turkmenistan for developing solar and distribution projects under the Integrated Renewable Energy Solutions to Support Green Transformation in Turkmenistan project. There is a limited understanding of renewable energy deployment and inadequate demonstration of successful operationalization of renewable energy in the country. There have been no large-scale solar projects – utility/commercial/industrial, neither has there been expansive residential solar projects or solar deployments targeting specific use cases such as water desalination or water pumps.

This also translates into lack of effectively demonstrated business-technology models for investment in rural renewable energy (RE) systems and productive uses of energy (PUE). The lack of renewable energy projects is reflected in the insufficient availability of skilled technicians to install, operate and maintain RE systems. The job market for the renewable energy specialists is also in its nascent stage, as the country institutions have only begun training specialists in the operation and repair of installations for the use of renewable energy sources. Turkmenistan also has immense solar potential across varied use cases such as rooftop solar, large scale solar farms/utility scale solar, solar desalination plants, solar water pumps, solar for telecommunication etc. Unfortunately, there has not been any proof of concept for any of these use cases hence hampering the RE transition in the country. A successful RE project would provide the necessary investor confidence, streamline

regulatory process, build political incentive, bolster institutional capacity and strengthen community buy in for future RE deployment.

Barrier 2: Lack of awareness, exposure and experience on use and benefits of RE mini grids among government institutions and private sector

Renewable Energy is at its incipient stage in the country due to insufficient awareness of RE solutions. Government stakeholders are yet to recognize the full transformative potential of RE and energy efficiency. As a country with significant fossil fuel resources, the government has inadequate awareness, exposure and experience on the use and benefits of RE. The Government has had no experience in RE mini grids, nor are stakeholders aware of the best RE practices used globally. There is a crucial need for stakeholders to be exposed to successful RE mini grid projects in other countries with similar contexts. Furthermore, there is a lack of awareness of the need for energy efficiency as well. In remote settlements, the lights utilised are 60W when more efficient alternatives are available. There is a need for an overall reorientation of government stakeholders in their approach towards renewable energy and energy efficiency.

Barrier 3: Lack of Technical, Financial and Institutional Capacity

The lack of RE-mini grid projects has led to a severe lack of institutional capacity. There is limited technical, financial and institutional capacities to design, engineer, procure, construct, operate and maintain RE mini-grids, business opportunities in different mini-ownership models and absent learning in pilot mini-grids**.** There is a shortage of renewable energy professionals and the lack of readily and centrally available knowledge products that hinder awareness of how to execute distributed small- and larger-scale RE projects. The nascent renewable energy market in the country has also led to a severe crunch in institutional capacity.

Barrier 4: Lack of policies and insufficient regulatory frameworks for RE deployment

There are inadequate policies for the deployment of RE in Turkmenistan. Law of Turkmenistan 'On Renewable Energy Sources' (2021) is the primary legislation on RE in the country which aims to diversify the national energy system and improve energy security through the efficient use of renewable sources such as solar, wind, and biogas. It provides a broad framework for the country's legislation but lacks detailed operational regulation. There are also various sub-laws which have been proposed. However, the current regulatory framework for RE lacks the necessary comprehensive coherence needed for successful deployment for RE. There is a lack of technical standards and guidelines for RE development, regulatory framework for deployment of RE and uncertainty on future grid connection, procurement guidelines and consideration of environmental standards in procurement and safeguards guidelines and consideration of safeguards standards in procurement. There is also an absence of legislation, protocols, and technical know-how for the proper management of end-of-life solar PV panels and batteries. In the case of operationalization of any RE project, there is an absence of standard tender documentation which is crucial for RE developers. Also, successful deployment of RE would require corresponding sub-legislations/regulation on net metering, tariffs (tariff calculation methodology, process for tariff determination, tariff revisions under various licenses, regulatory authority in charge of the tariff, treatment for over-generation, tariff dispute resolution, subsidy or financial incentives provided), power purchase agreements, environmental and land use regulations on RE deployment, Financial regulations/bye laws (tax credits, feed-in tariffs, grants for RE projects, Renewable Purchase Obligations (RPOs) for distribution licensees, Renewable Energy Certificates (RECs) etc).

Barrier 5: Government reluctance to finance distributed RE solutions given the lack of previous successful pilots

Renewable energy projects require significant CAPEX investments. The lack of successful proof of concept RE projects, particularly solar deployment (mini-grids, utility scale, commercial, industrial), has led to government reluctance in financing such projects as they are unsure of the viability of the projects. The Government is reluctant to apply for loans from development banks/multilateral institutions. Commercial banks in the country are unable to provide the much-needed finance for these projects as they have not witnessed the viability of such projects. Economies of scale are a major driver of financial viability particularly in RE projects. The lack of bankability of RE projects can also be traced to the limited economies of scale in the country which makes financial viability difficult to achieve. Historically, the country has hardly had private investment (foreign or domestic) by virtue of its insularity and lack of private sector engagement. Furthermore, the private sector is not allowed to own energy assets in the country. Building confidence amongst private investors to invest in this context will be difficult and time consuming considering RE deployment would need vast amounts of capital.

Barrier 6: **Lack of awareness, exposure and experience on use and benefits of RE mini grids among beneficiaries**

RE is relatively new to Turkmenistan. By virtue of being a fossil-fuel rich country, communities are accustomed to using diesel/natural gas as a source of fuel. In remote settlements, this challenge is even more pronounced as communities use diesel generators and wood for their energy needs. Introducing RE mini grids in these communities would involve the need to spread awareness and emphasize the benefits of these grids not only at the government level but also among communities. There is a need to showcase the value added that these mini grids will provide for the community. Also, the communities are not aware of energy efficiency and the advantages of using energy efficient devices. There is an imminent need to educate these communities about the advantages of energy efficient lighting/devices and electricity generated through RE. This will build community level incentive in ensuring that the outcomes of the project are sustainable as the community will continue to utilize/scale the solar deployments.

Barrier 7: **Absence of a regulatory and institutional framework for e-waste management, including end-of-life solar PV panels and batteries**

Turkmenistan currently lacks a comprehensive legal, regulatory, and institutional framework for the environmentally sound management of electronic waste (e-waste), including end-of-life solar panels and battery storage systems. As renewable energy deployment increases, the absence of clear guidelines on collection, dismantling, recycling, transboundary movement, and disposal of hazardous components poses potential environmental and public health risks. There are no defined roles and responsibilities for producers, importers, or government authorities, nor are there established monitoring, reporting, or compliance systems such as Extended Producer Responsibility (EPR) schemes. This regulatory gap creates uncertainty for investors, limits preparedness for future waste streams from RE technologies, and risks undermining the long-term sustainability and environmental integrity of the renewable energy transition.

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