CIF CLIMATE INVESTMENT FUNDS

CTF – DPSP (V-FUTURES)

PROJECT TITLE: SOLAR ROOFTOPS FOR HOUSEHOLDS

COUNTRY: INDIA

MDB: IBRD

Cover Note for CTF Project/Program Approval Request[a] Dedicated Private Sector Programs (DPSP V-FUTURES)			
Country/Region	India/SAR	**CIF Project ID#**	**Auto Generated by CCH**
For Regional/Global (country classification) Please list all applicable **sub-countries** under **Regional/Global** country tagging (separated by semicolon ";")	India		
Tier[1]	☐ Tier 1 ☐ Tier 2 ☒ Tier 3		
Type of CIF Investment:	☒ Public ☐ Private		
Project/Program Title	***Solar Rooftops for Households Program***		
Sector/Pillar **(Please select all that apply)**	☐ Enabling Environment ☐ Energy Efficiency ☐ Energy Storage ☐ Renewable Energy ☒ Renewable Energy/ Energy Efficiency ☐ Transport ☐ Other (_____)		
Technology/Area **(Please select all that apply)**	☒ End Use ☐ District Heating ☐ Smart Grid ☒ Capacity Building ☐ Multiple ☐ Batteries ☐ Hydro ☐ Green Hydrogen ☐ Geothermal ☐ Wind ☒ Solar ☐Hydropower ☐ Cookstoves ☐ Waste to Energy ☐ Bioenergy ☐ Mixed RE ☐ Green Fuels ☐ Modal Shift ☐ Vehicle Technologies ☐ Mass Transit ☐Electric Vehicles ☐ Other (_____)		
Project Lifetime (MDB Board/Management) approval to project closure) (in years)	3 years (2025-2028)		
Is this a private sector program composed of sub-projects?	☐ Yes ☒ No		
Financial Products, Terms and Amounts			
		USD (million)	**EUR** (million)[b]
PPG (Project Preparation Grant)			
Grant			
MDB Project Implementation and Supervision Services (MPIS)[2]			
First loss guarantee			
Second loss guarantee			
Equity			
Senior loan		**60**	
Senior loan in local currency hedged			
Senior loan in local currency unhedged **(EXCEPTIONAL REQUEST)**			

[1] Country Tier definition as Per FY25 approved Pricing policy (page 8,9,19-25)
[2] MPIS - CIF Operational Modalities For New Strategic Programs here

Subordinated debt/loan/ mezzanine instrument with income participation		
Subordinated debt/loan / mezzanine instrument with income participation local currency unhedged **(EXCEPTIONAL REQUEST)**		
Subordinated debt/loan /mezzanine instrument with convertible features		
'Convertible/contingent recovery' grant/loan/guarantee (loans convertible to grants or vice versa)		
Convertible Loans (convertible to equity only)		
For loans and guarantees – is this a revolving structure? [3] ☐ Yes ☐ No		
Specify local currency type here		
Other (please specify) IBRD		
Total	**60**	

Co-financing		
	Please specify as appropriate	**Amount (in million USD)**
MDB 1	World Bank	940
MDB 2 (if any)	(tbc)	(tbc)
Government	Government of India	7,910
Private Sector	Commercial Loans	3,800
Bilateral		
Others (please specify)	ESMAP (grant)	5
Total Co-financing		**12,655**
CIF Funding		**60**
Total Financing (Co-financing + CIF Funding)		**12,715**
Proportion of Total Financing for Adaptation		**0**
Proportion of Total Financing for Mitigation[e]		**12,715**

CIF Financial Terms and Conditions Policy	Link Is this request in accordance with the CIF Financial Terms and Conditions Policy? ☒Yes ☐No (if no, please specify detailed information under the justification section)

Justification (exceptional request) [c][d]
Not Applicable

[3] With a revolving structure, after the loan or guarantee matures, instead of returning the funds to the Trustee, the funds are redeployed as a new loan or guarantee.

Implementing MDB(s) *(please enter full name, job title and email address)*	
MDB Headquarters-Focal Point:	**Frank van der Vleuten** fvandervleuten@worldbank.org
MDB Task Team Leader (TTL)	**Moez Cherif** mcherif@worldbank.org
National Implementing Agency *(please enter full name, job title and email address)*	
Country Focal Point/s	Prashant Kumar Singh Secretary Ministry of New and Renewable Energy (MNRE) secy-mnre@nic.in
Brief Description of Project/Program (including objectives and expected outcomes) [c][d]	

Sectoral Context: **India's per capita electricity consumption, at 1395kWh (2024, Niti Aayog), is about one-third of the global average,** implying that the demand for electricity is expected to increase exponentially as India targets to become a developed economy by 2047.

India has made considerable progress in scaling up its solar energy sector, ranking fourth globally in annual solar power generation in 2022.[4] This success has primarily been driven by the growth of ground-mounted solar photovoltaics (PV), which account for roughly 80 percent of the country's 90.7 GW of installed solar power capacity as of September 30, 2024.[5] Grid-connected rooftop solar photovoltaics (GRPV) has also experienced rapid growth, with a compound annual growth rate of approximately 50 percent between 2018 and 2024, reaching a capacity of 13.8 GW by August 31, 2024.[6]

The government aims to maximize the adoption of GRPV to leverage its inherent benefits,[7] particularly the use of existing rooftop space in buildings in contrast to large-scale ground-mounted solar panels, which require significant land. Over the past decade, the government has supported GRPV growth by providing an enabling policy framework complemented by financial incentives. In 2014, the Ministry of New and Renewable Energy (MNRE) launched the Grid-Connected Rooftop and Small Solar Power Plants Program (Phase-I) with a 40 GW GRPV installation target by 2022.[8] The program provided capital subsidies to improve financial viability, introduced various business models to encourage private sector participation, and simplified the GRPV approval process to facilitate consumer participation. However, by March 31, 2019, less than 2 GW of GRPV capacity had been installed. Later in 2019, to address the slow pace of GRPV installation and achieve the 40 GW GRPV capacity target, the government approved Phase II of the Grid-Connected Rooftop Solar Program[9] with US$1.4 billion in financial support. It revamped Phase-I by (a) focusing on the residential sector with a dedicated 4 GW GRPV capacity addition target by 2022, supported by capital subsidies,[10] and (b) designating electricity distribution companies (Discoms) as the nodal agencies for implementing the program.

Despite progress, the residential sector faces unique challenges limiting GRPV adoption. As of August 2024, only 25 percent of the total installed GRPV capacity was in the residential sector, compared to an estimated potential of 102 GW.[11] Residential consumers predominantly pay lower electricity tariffs than C&I consumers, reducing the financial incentive to switch to solar rooftops. Additionally, disparities in solar rooftop adoption exist within the residential sector, with limited uptake among low- and middle-income households due to factors such as the inability to cover upfront costs even after subsidies, lack of stable roofs, or both. Some states have a higher penetration of solar rooftops in the residential sector because of better supportive ecosystems and incentives. Moreover, residential consumers often face financial and operational barriers, such as limited or no access to collateral-free, low-interest financing and insufficient information about the benefits, processes, and procedures for installing rooftop solar systems.[12]

To address these challenges, the government launched the PM Surya Ghar: Muft Bijli Yojana[13] ("GRPV program") in August 2024, which aims to incentivize solar rooftop installation for 10 million households by March 2027 and encourage local manufacturing of solar rooftop equipment locally, with a total budget of approximately US$8.9 billion. Through this initiative, the government underscores its commitment to promoting sustainable energy and ensuring affordable energy access for households. The Grid Connected Rooftop Solar Phase II Program initially proposed to be implemented until 2025-26 by MNRE, is now subsumed within the PM Surya Ghar: Muft Bijli Yojana.[14]

The government's program aims to contribute to India's NDCs by installing 30 GW of rooftop solar capacity through 10 million residential installations by March 31, 2027. The key objectives of the government's GRPV scheme are: a) achieving 10 million rooftop solar installations in the residential sector, resulting in b) self-

[4] IRENA, Country Rankings, 2022, https://www.irena.org/Data/View-data-by-topic/Capacity-and-Generation/Country-Rankings (accessed November 4, 2024).
[5] Physical Achievements, MNRE, GoI, https://mnre.gov.in/physical-progress/ (accessed November 4, 2024)
[6] World Bank's calculation based on actual solar rooftop installation reported by MNRE (GoI): https://mnre.gov.in/year-wise-achievement/
[7] The benefits of GRPV to distribution companies include a reduction of transmission losses as electricity is generated near the demand centers, lowering the power purchase cost during daytime peak hours, and deferring their network augmentation expenditure, among others.
[8] MNRE, GoI, 2014. Available here, https://smartnet.niua.org/sites/default/files/resources/Scheme-Grid-Connected-Rooftop-%26-small-solar-power-plants.pdf (accessed on November 4, 2024).
[9] The government changed the program name by dropping the following words: "small power plants."
[10] Operational Guidelines for Implementation of Phase-II of Grid-Connected Rooftop Solar Programme, MNRE, GoI.
[11] Council on Energy, Environment and Water, 2023, Mapping India's Residential Rooftop Solar Potential.
[12] World Resources Institute, Asia, December 2018, *Here Comes the Sun: Residential Consumers' Experience with Rooftop Solar PV in Five Indian Cities*.
[13] Translated in English: Prime Minister's Solar Home: Free Electricity Program.
[14] PM Surya Ghar: Muft Bijli Yojana - Redefining Solar Power and Energy Access, PIB, GoI, August 12, 2024.

generated electricity of up to 300 kilowatt-hours (kWh) per month per installation, which is equivalent to c) a total of 1,000 TWh (billion kWh) of renewable electricity from the installed capacity, that will result in a reduction of 720 million tons of CO2e emissions during the 25-year lifetime of the rooftop solar projects. To achieve that, the government will need to develop an enabling ecosystem for rooftop solar projects, including regulatory support, manufacturing facilities, supply chain, vendor network, and operation and maintenance facilities in the country. The program is also expected to boost the local economy by creating 1.7 Mn direct jobs in manufacturing, logistics, supply chain, sales, installation, operation and maintenance (O&M) and driving private sector investment across the value chain. It will be a catalyst in boosting investment in the local manufacturing of GRPV equipment and its installation by Discoms and other renewable energy service companies (RESCOs), thus enhancing energy security.

The program introduces several measures to facilitate the adoption of GRPV by residential consumers. It provides subsidies of up to 60 percent for 2 kW solar systems and 40 percent for systems between 2 and 3 kW, significantly lowering upfront investment costs. The program also includes provisions for collateral-free loans and features a streamlined online portal, empowering Urban Local Bodies and village councils (Panchayats) to lead the transition to sustainable energy, thus strengthening energy security and reducing household electricity bills. REC Ltd. (formerly Rural Electrification Company) has been nominated as the national-level implementation agency. Further, the Government of India has approved amendments to the Electricity (Rights of Consumers) Rules, 2020, to facilitate faster installation and enhance the ease of setting up Rooftop Solar PV systems at consumers' premises. Exemption has been given for the technical feasibility study requirements for systems up to a capacity of 10 kilowatt (kW). Previously, in 2021, the Ministry of Power amended these Rules to allow net and gross metering for up to 500kW or the sanctioned load of the consumer, whichever is lower. Most state regulators have amended their regulations to reflect these provisions.

Program Description: To support India's GRPV program of US$9 billion with an aim to deepen GRPV in the residential sector, especially in low-income households, the Government of India has requested the World Bank to extend US$1 billion of funding through the proposed engagement (P4R). The activities are structured as lending and technical assistance. The financing will support results towards innovative business models and the GRPV systems installed by households. Through technical assistance, training programs will be conducted for several stakeholders (such as regulators (center, state), DISCOMs, and State Nodal Agencies), public and stakeholder awareness campaigns will be designed and implemented, and analytical support on other market development activities such as development of the business models, real-time monitoring, etc., will be provided. This will help raise consumer awareness of GRPV and its benefits, upskill officials of several agencies to perform their tasks better, facilitate low-income households' access to GRPV and the associated cost-savings on electricity bills, and establish mechanisms critical to the long-term sustainability of the GRPV program. These short-term outcomes will underpin the achievement of PDO outcomes and ultimately support India's energy transition by democratizing the use of solar energy. The critical assumptions in this results chain are as follows: (a) conducive policy and regulatory framework for GRPV installations in India would continue; (b) the Discoms will be willing to support the government's GRPV program; (c) there will be sufficient domestic manufacturing capacity for solar modules and cells along with sufficient installers to install the GRPV systems; and (d) banks and financial institutions willing to offer affordable loans to households for GRPV. The proposed US$1 billion World Bank-CTF Program's expenditure boundaries overlap with the government's US$9 billion GRPV scheme (program).

Program Development Objective (PDO): The PDO is to increase the installed generation capacity of grid-connected rooftop solar photovoltaics (GRPV) by households and strengthen the capacity of relevant institutions to implement GRPV.

Additionality of CTF Funding: The World Bank and CTF financing will leverage commercial financing to support the country's solar rooftop sector, especially with a focus on low-income households. The CTF funding will be focused on those interventions that have demonstration effects, such as model solar villages, innovative projects, capacity building, and consumer awareness – all being components of the GRPV program. The use of CTF concessional financing under the Program is essential to address limited financing that has crippled the deployment of the GRPV market in the residential sector. CTF financing will also help address the issues that are related to the GRPV ecosystem and across various stakeholders that are hampering the wider uptake of GRPV at the residential level. For instance, household owners lack awareness about the benefits that GRPV can bring to them, and state nodal agencies and DISCOMs on how to handle (in terms of deployment, monitoring, reporting, etc., including through real-time monitoring) decentralized renewable energy solutions regulators on inadequate trading and metering regulations and their implementation, lack of innovative and adaptive business models (such as demand aggregation) for deployment of GRPV at the residential level, amongst others. These factors have also led to a timid response from commercial investors to look at it as a promising area of investment. The proposed World Bank CTF Program will target to address all these aspects with a deep technical assistance component alongside the financing of a slice of the Government's investments in GRPV in the residential sector. There is a dedicated result area under the Program focusing on addressing all such aspects and strengthening the GRPV enabling environment through strengthening institutional capacity (of stakeholders, including implementing agency, DISCOMs, regulators, state nodal agencies, etc.) creating an enabling environment (through training, public awareness campaigns, digital interventions like real-time monitoring, streamlining of approval and deployment processes, etc.), supporting market development (through public awareness campaigns, utility-led business models targeting low and middle-income households, incentivizing technical deployment, etc.), promoting local manufacturing of solar rooftop equipment by incentivizing innovative private-sector projects and fostering sustainability of the GRPV program. Further, the GRPV Scheme promotes the installation of the model solar village that will have a demonstration effect for other villages/districts also to adopt GRPV.

The above interventions shall enable the mitigation of risks—both real and perceived—by commercial sector players, including financial institutions and RESCO players, and foster a conducive environment for commercial investors to unlock the renewable energy potential through GRPV.

The proposed World Bank-CTF Program will track the achievement of MW of solar rooftop capacity addition in the households. This is expected to result in the development of a fully integrated domestic solar module manufacturing of roughly 3 GW, which is majorly privately financed and will receive government/public incentives under the government's Production Linked Incentive scheme. It is estimated that the value of private investment of about US$583 million in new privately financed solar module manufacturing capacity will happen. It assumes an investment of about US$195m per GW (net of government incentives) for a fully integrated solar PV model manufacturing plant. In addition, the private installers will install these solar rooftop systems and borrow working capital loans of about US$2.1 billion annually, assuming 10 GW of capacity addition takes place per year for the next three years to meet government targets. We have assumed 30 percent of the solar rooftop system costs (US$714/kW) for 10 GW capacity per annum. A total private capital mobilization (PCM) of US$3.6 billion in the form of commercial loans for about 40 percent of the total solar rooftop systems (10 million or 30 GW) installed targeted under the government program. On average, based on the current information with MNRE, 40 percent of the households are expected to opt for commercial loans for 80 percent of the system costs net of government incentives

Further, it is estimated to create around 1.7 million direct jobs in manufacturing, logistics, supply chain, sales, installation, operation and maintenance (O&M), and other services and drive private sector investment across the value chain of solar rooftops. Also, DISCOMs will benefit from lower electricity losses and less needed subsidies to relevant households, which implies better financial health for the DISCOMs. This, in turn, will support more private-sector investment in the sector.
Consistency with CTF investment criteria (please refer to design document)[15][c][d]

[15] Link to Future Window Design Document here

a. Potential for transformational change.

- *Relevance (strategic alignment)* – Given India's NDC targets by 2030 and Net Zero Emission targets by 2070, a huge potential in GRPV segment needs to be unlocked through the government interventions that need push for investments in this space, especially in residential consumers and within that in low-income households. The Program will support India in unlocking renewable energy potential in this sector and create conducive environment for commercial investments to support it. The scheme is projected to add 30 GW of solar capacity through rooftop installations in the residential sector, significantly contributing to India's renewable energy goals. The key objectives of the government's GRPV scheme are: a) achieving 10 million rooftop solar installations in the residential sector, resulting in b) self-generated electricity of up to 300 kilowatt-hours (kWh) per month per installation, which is equivalent to c) a total of 1,000 TWh (billion kWh) of renewable electricity from the installed capacity, that will result in a reduction of 720 million tons of CO2e emissions during the 25-year lifetime of the rooftop solar projects.

- *Systemic change:* The government's program aims to contribute to India's NDCs by installing 30 GW of rooftop solar capacity through 10 million residential installations by March 31, 2027. To achieve that, the government will need to develop an enabling ecosystem for rooftop solar projects, including regulatory support, manufacturing facilities, supply chain, vendor network, and operation and maintenance facilities in the country. The program is also expected to boost the local economy and generate employment, by encouraging investment in the local manufacturing of GRPV equipment and its installation by Discoms and other renewable energy service companies (RESCOs), along with enhancing energy security. The proposed World Bank-CTF financing will partner with India on bringing such changes.

- *Speed*[16]*:* Grid-connected rooftop solar photovoltaics (GRPV) has also experienced rapid growth, with a compound annual growth rate of approximately 50 percent between 2018 and 2024, reaching a capacity of 13.8 GW by August 31, 2024. Despite progress, the residential sector faces unique challenges limiting GRPV adoption. As of August 2024, only 25 percent of the total installed GRPV capacity was in the residential sector, compared to an estimated potential of 102 GW. To address these challenges, the government launched the PM Surya Ghar: Muft Bijli Yojana[17] ("GRPV program") in August 2024, which aims to incentivize solar rooftop installation for 10 million households by March 2027 and encourage local manufacturing of solar rooftop equipment locally, with a budget of approximately US$8.9 billion. The proposed World Bank-CTF Program thus supports India's efforts to achieve these targets in a timely manner to allow the country to meet its climate change targets.

- *Scale:* The Program supports the activities that are needed to enhance the scaling-up of GRPV in the residential sector and reduce GHG emissions. The activities are structured as lending and technical assistance. The operation would finance results to accelerate the deployment of solar rooftops for households and contribute towards achieving the Government's program's objectives by providing complementary TA[23] to MNRE, with special focus on incentivizing distribution companies to support the program and promoting local manufacturing of solar equipment across the value chain.

- *Adaptive sustainability*[18]*:* Through technical assistance, training programs will be conducted for several stakeholders, awareness campaigns will be designed and implemented, and analytical support on cross-cutting topics will be provided. This will help raise consumer awareness of GRPV and its

[16] The speed dimension refers to the need to accelerate or decelerate outcomes and impacts to achieve the appropriate speed of change. The speed dimension was added in 2021 to emphasize the closing window of opportunity for making the transformations needed to avert the catastrophic impacts of climate change while simultaneously ensuring a just transition.

[17] Translated in English: Prime Minister's Solar Home: Free Electricity Program.

[18] Adaptive sustainability refers to transformational changes that are robust, resilient, and long-lasting, as well as adaptive to evolving contexts and able to balance social, economic, and environmental factors.

benefits, upskill officials of several agencies to perform their tasks better, facilitate low-income households' access to GRPV and the associated cost-savings on electricity bills, and establish mechanisms critical to the long-term sustainability of the GRPV program. These short-term outcomes will underpin the achievement of PDO outcomes and ultimately support India's energy transition by democratizing the use of solar energy. The beneficiary stakeholders under this Program span across regulators (state, central), DISCOMs, State Nodal Agencies, and households. In addition, climate hazards are expected to have a low material impact on the Program, with risks mainly from extreme weather events such as storms and roof flooding. These risks will be managed by introducing resilient GRPV system design and operational criteria, Including: mounting structures with a minimum 1.5 safety factor for high wind speeds, and adequate protective measures for roof flooding, such as inverter/power conditioning systems with islanding protection, as well as fire-protection systems.

- Creating an enabling environment for GRPV growth in households through (i) providing regulatory support at the federal and/or state level and (ii) streamlining the processes (application, subsidy disbursal, etc.) through digital interventions as required at the federal and state levels

b. *Potential for GHG emissions reduction/avoidance*: The Program promotes solar rooftop capacity addition, which replaces thermal power in the country's energy mix. The Program actively contributes to decarbonization, which is consistent with the pathways aligned with the mitigation goals of the Paris Agreement and its long-term temperature goal, through well-established technology of GRPV, which, however, has a slow deployment in residential sector. Over the 25-year lifetime of these rooftop systems, it is estimated that the scheme will generate 1000 BUs of electricity while reducing CO2 emissions by 720 million tons, making a substantial positive impact on the environment

c. *Potential to significantly contribute to the principles of just transition:* The direct Program beneficiaries are the households that will get lower-cost electricity thanks to the solar rooftop systems. Discoms will benefit from lower electricity losses and less needed subsidies to relevant households, which implies better financial health for the Discoms. This, in turn, will support more private-sector investment in the sector. The entire community will benefit from as solar capacity addition avoids new coal-fired thermal power plants to meet the incremental demand for electricity as India aims to become a developed economy by 2047, resulting in lower emissions of pollutants and better air quality. Reduction in GHG emissions will benefit the global community. The program is also expected to boost the local economy by creating 1.7 Mn direct jobs in manufacturing, logistics, supply chain, sales, installation, operation and maintenance (O&M) and driving private sector investment across the value chain. It will be a catalyst in boosting investment in the local manufacturing of GRPV equipment and its installation by Discoms and other renewable energy service companies (RESCOs), thus enhancing energy security.

d. Financial effectiveness

- *Value for Money:* Given the affordability issues of solar rooftops, particularly for middle- and lower-income households, the Government's program will provide about 60 percent of the investment cost as a government subsidy. Solar rooftops for households will reduce the need for grid-based electricity, which relies heavily on thermal sources comprising about 75 percent of the energy mix, essentially coal and gas.[25] GRPV is not only cheaper than thermal power but also minimizes transmission and distribution losses, as the energy is generated closer to the consumer. Program costs and benefits will be quantified as part of the appraisal. All these savings to the energy sector and environmental externalities justify public sector financing and subsidies. The Bank Program, including technical assistance, will help extend the program's benefits to middle- and lower-income households and in less advanced states in terms of solar power deployment. Households will benefit from significant savings on their electricity bills.

Additionally, they will have the opportunity to earn extra income by selling surplus power generated by their rooftop solar systems to DISCOMs. For instance, an average 3-kW system can generate over 300 monthly units, providing a reliable energy source and potential revenue.

- *Mobilization Potential:* The proposed US$1bn World Bank-CTF Program will leverage about US$8 billion from the Government of India and other MDBs together with US$3.8 bn from commercial sources in the form of debt, which 40 percent of the households (of the 10 million targeted under the government program) are expected to opt for commercial loans for 80 percent of the system costs net of government incentives (about US$1,214 for a 3kW solar rooftop system, which an individual household is expected to install). Further, expanding solar rooftops for domestic consumers is not just a standalone intervention; it could be an enabler to increase state-level Discoms' operational efficiency and profitability. Indeed, residential consumer tariffs are subsidized at the state level and cross-subsidized by C&I consumers. As those subsidies are not always sufficient to cover the full cost of electricity to residential customers, Discoms are often financially weakened as a result, and while these subsidies and tariff distortions exist, we will also need to subsidize distributed generation for it to compete. The World Bank, through its extensive TA, will support the development of Discoms capacities aimed at commercializing Discoms to enable them better to incorporate distributed solar into their businesses, which could result in improvements in their financial positions across the board. As Discoms' financial health improves through the program, they will be incentivized to incorporate GRPV for households into their business model and promote it actively. The scheme also provides a component for payment security for renewable energy service company (RESCO) based models.

e. *Implementation potential:* Through technical assistance, training programs will be conducted for several stakeholders, awareness campaigns will be designed and implemented, and analytical support on cross-cutting topics will be provided. This will help raise consumer awareness of GRPV and its benefits, upskill officials of several agencies to perform their tasks better, facilitate low-income households' access to GRPV and the associated cost-savings on electricity bills, and establish mechanisms critical to the long-term sustainability of the GRPV program. Further, DISCOM, or the power department at the state level, will be the implementing agency for several of the government program components. The World Bank will engage with these entities in selected states agreed with MNRE to provide implementation support through the technical assistance program. The National Institute of Solar Energy (NISE) is an implementing agency for one of the core components of the government program on "Innovative Projects." The technical assistance under the proposed Program will also collaborate with NISE to provide implementation support for this component.

f. *Gender equality and social inclusion impact:* The government's GRPV scheme is also expected to create approximately 1.7 Mn direct jobs across various sectors, including manufacturing, logistics, supply chain, sales, installation, operations and maintenance (O&M), and other services, thereby boosting employment and economic growth in the country. The proposed Program is expected to provide equal opportunities to female-headed households to benefit from the opportunities offered. In the ongoing World Bank Additional Financing: Rooftop Solar Program for the Residential Sector (P155007/P171750), with the State Bank of India (SBI), SBI is required to offer discounted loan interest rates for female borrowers (with home ownership). Likewise, to address the financial barriers in the proposed Program the team intends to inform the relevant scheme components to implement similar measures. Other measures to be undertaken through the TA component that will complement the loan could include: (i) gender-focused messages in advertisement campaigns to encourage participation of female-headed households in the Program; and (ii) training and workshops targeted at females (such as handling digital systems for reporting and monitoring; technical training; awareness creation on GRPV handling; etc.). Women will also benefit from increased and low-cost

energy availability. The literature on gender and energy suggests that providing electricity to communities and homes for tasks considered women's work can promote gender equality, women's empowerment, and women's and girls' access to education, health care, and employment. Most gender benefits for non-working females occur when such women are able to carry out their household chores more productively with electricity.

g. *Development impact potential:* The Government's scheme provides households with free electricity (up to 300 units per month) by installing subsidized rooftop solar panels, significantly reducing their energy costs. By promoting the widespread use of solar power, the scheme is expected to save the government an estimated US$9 billion annually in electricity cost due to reduced electricity consumption from the grid (especially given that regulated tariffs in many of the states are not cost reflective). The scheme encourages the adoption of renewable energy sources, contributing to a more sustainable and environmentally friendly energy mix in India. The transition to solar energy under this scheme will help lower carbon emissions, supporting India's commitment to reducing its carbon footprint. It is estimated that the scheme will create around 1.7 million direct jobs in manufacturing, logistics, supply chain, sales, installation, O&M and other services. Further, under the "Model Solar Village" component of the scheme, the focus is on establishing one Model Solar Village per district throughout India. Moreover, within the awareness-raising component of the government scheme, extensive community engagement will take place in collaboration with Discoms, municipalities, and other relevant actors to explain the benefits of adopting solar rooftops in both urban and rural areas and aggregate the demand. This initiative aims to promote solar energy adoption and empower village communities to achieve energy self-reliance. Further, Electricity displaces more expensive, inefficient, and dangerous candles and kerosene lamps, thereby reducing indoor air pollution and fire and burn risks while providing higher-quality light. Lighting and televisions help improve access to information, the ability to study and extend the effective working day. Lighting also improves the productivity of many household activities, has potential benefits for public safety, and helps generate income opportunities, especially for women.

Additional CTF investment criteria for private sector projects/ programs	
a. Financial sustainability	NA - This is a public sector project
b. Effective utilization of concessional finance (including a detailed analysis on how the proposal meets the minimum concessionality principles, and on how it is aligned with the blended concessional finance principles)	NA - This is a public sector project
c. Mitigation of market distortions	NA - This is a public sector project
d. Risks	NA – This is a public sector project

For DPSP projects/programs in non-CTF countries, explain consistency with FIP, PPCR, or SREP Investment Criteria and/or national energy policy and strategy [c][d]

N/A

Social Inclusion and Stakeholder Engagement [c][d]

Regarding social impacts, there will be overall positive impacts with assured and lower-cost electricity for households. There are employment opportunities as part of the installations under the project. However, the risks would relate to (a) social exclusion whereby the vulnerable households may not be able to access the subsidy and the benefits primarily due to the technical requirement for installation of solar panels on their residential rooftops; (b) ensuring compliance with state and national labor welfare measures; (c) gaps in the system to track grievances and feedback from the customers/beneficiaries.

To minimize environmental and social (E&S) risks at the household level, the risks on social exclusion of vulnerable households is mitigated through a focused approach in integrating low-income households under the Program, which will also be monitored through a dedicated indicator.

Further, for each proposed PforR operation, the Bank assesses—at the Program level—the potential E&S effects of the Program (including labor laws); the borrower's capacity to manage those effects; and the identification of gaps and mitigation measures so that the proposed operation achieves its E&S objectives. An Environmental and Social Systems Assessment is being undertaken by the Bank to (a) review the government's existing E&S management rules and procedures and institutional responsibilities that are being used by the program, (b) assess the implementing agency's (REC Ltd.) institutional capacity and performance to date to manage potential adverse E&S issues under the Program; and (c) recommend specific actions for improving the capacity of the REC Ltd., regarding effective management of environmental, health and safety and social issues during implementation. Any E&S actions required because of ESSA will be included in the Program Action Plan (to be developed prior to Appraisal). The evaluation would be based on an analysis of documents and data shared by the implementing agency (REC Ltd.) and comprehensive stakeholder consultations.

Additionally, (i) a strong communication plan would be implemented that would cover dissemination of information, consultation, engagement, and collaboration with the household beneficiaries; and (ii) any investments with high E&S risk such as those involving the acquisition of land will not be supported under the proposed Program and would be specified under an Exclusion list as part of the screening process.

Gender Considerations [c][d]

Gender Analysis (Please insert the text from the project document on the analysis of gaps in access to services, markets, and jobs by women in relation to the project sectors)	Gender gaps in women's access to assets, specifically home ownership and finance, have remained high in India. Lack of adequate collateral limits the ability of women to access formal finance, leaving them to rely on informal sources and constraining their ownership of assets, including homes. India has made significant gains in driving financial inclusion for women over the last couple of decades. However, despite significant policy and programming efforts, persistent gender gaps in women's asset ownership, access to home loans, and home ownership remain. For instance, across states, women own less than a third of the households (India Human Development Survey [IHDS] 2011–12). Additionally, only 14.9 percent had the names of the interviewed women on the house documents in 2004–05, which increased minimally to 16.3 percent in 2011–12 (IHDS). Similarly, on the credit front, the loan rejection rate for women-owned businesses is 2.5 times higher than for men (All India Debt and Investment Survey, 2019, GoI). Lack of collateral, difficult access to a guarantor, weak property rights, and various cultural barriers collectively hinder women borrowers from availing loans for productive purposes, including house ownership. For private providers of financial services, the perceived risk of lending to women is often higher than the actual risk. Additionally, certain cultural norms exclude some women from using formal financial services, including housing loans. It is further noted that the female labor force participation in India's energy sector remains notably low. As per the International Energy Agency (IEA), women constitute approximately 11% of the workforce in the rooftop solar industry, significantly below the global average of 32% for women in renewable energy sectors. Likewise, there are gender disparities in property ownership in India, with only 13% of women having sole ownership of a house or land registered as of 2020-21.

Gender Activities (Please insert the text describing gender-specific activities included in the project)	The proposed Program is expected to provide equal opportunities to female-headed households to benefit from the opportunities offered. In the ongoing World Bank Additional Financing: Rooftop Solar Program for the Residential Sector (P155007/P171750), with the State Bank of India (SBI), SBI is required to offer discounted loan interest rates for female borrowers (with home ownership). Likewise, to address the financial barriers in the proposed Program, the team intends to inform the relevant scheme components to implement similar measures. Other measures to be undertaken through the TA component that will complement the loan could include: (i) gender-focused messages in advertisement campaigns to encourage participation of female-headed households in the Program; and (ii) training and workshops targeted at females (such as handling digital systems for reporting and monitoring; technical training; awareness creation on GRPV handling; etc.). Women will also benefit from increased and low-cost energy availability. The literature on gender and energy suggests that providing electricity to communities and homes for tasks considered women's work can promote gender equality, women's empowerment, and women's and girls' access to education, health care, and employment. Most gender benefits for non-working women occur when such women are able to carry out their household chores more productively with electricity.
Gender Indicators (Please insert the text on selected gender specific indicators, including annual targets. from the Project Log Frame that the project is committing to report on)	(i) Percentage of women staff trained of the total number of people trained in GRPV (baseline: 0, 2028: 10%) (ii) Percentage of female-owned households of the total households connected to GRPV (baseline: 0%; 2028: 5%)
Just Transition [c][d]	

Just Transition Activities	The direct Program beneficiaries are the households that will get lower-cost electricity due to the solar rooftop systems. DISCOMs will benefit from lower electricity losses and less needed subsidies to relevant households, which implies better financial health for the Discoms. This, in turn, will support more private-sector investment in the sector. The entire community will benefit from as solar capacity addition avoids new coal-fired thermal power plants to meet the incremental demand for electricity as India aims to become a developed economy by 2047, resulting in lower emissions of pollutants and better air quality. Reduction in GHG emissions will benefit the global community through climate change mitigation. For low-income households, the Discoms have a database and geographical mapping of such households. Utility-led aggregation models, among other innovative business models, will largely tap these households. The World Bank Program will help Discoms and state governments design and implement utility-led aggregation models. This would entail handholding states in developing enabling regulations for these business models and providing implementation support through competitive bid-process management for selecting solar developers. In addition, the P4R will also support the states where virtual net-metering regulations have been introduced for offsite installations specifically to cater to low-income households, given the technical constraints of installing these systems on their roofs. The program is also expected to boost the local economy by creating 1.7 Mn direct jobs in manufacturing, logistics, supply chain, sales, installation, operation and maintenance (O&M) and driving private sector investment across the value chain. It will be a catalyst in boosting investment in the local manufacturing of GRPV equipment and its installation by Discoms and other renewable energy service companies (RESCOs), thus enhancing energy security.

Just Transition Indicators	(i) Number of people trained in relevant institutions through the Program (baseline: 0; 2028: 100,000) – *this shall focus on re-skilling/upskilling of the various stakeholders including the local communities / population and deepening the job market* (ii) Number of solarized villages (baseline: 0; 2028: 800) – *Solarization of the villages will involve extensive community engagement* (iii) Number of low-income households connected to GRPV (baseline: 0; 2028: 100,000) – *this shall monitor the outreach of the Scheme to the low-income households*

For projects/programs with activities in countries assessed as being at moderate or high risk of debt distress, macro-economic analysis to evaluate the potential for the CTF project or program to impact the country's debt sustainability [c][d]

NA

For public sector projects/programs, analysis of how the project/program facilitates private sector investment [c][d]

The Program will mobilize private capital through commercial debt provided by commercial banks financing GRPV in the residential sector and private equity contributed by Renewable Energy Service Company (RESCO) players and households, as per the business model. The Program will also increase local solar equipment manufacturing capacity, particularly module and cell capacities, which are currently insufficient to meet the burgeoning need for domestically manufactured solar modules across the government's different schemes, including the GRPV Scheme.[19] The substantial capacity addition of 30 GW of GRPV envisaged under the government's program will be led by private sector installers and require significant scaling up of maintenance service providers, which will also be predominantly private sector driven. Moreover, by reducing costs of electricity consumption for participating households, the Program will lay a foundation for sustaining the sector with lower government subsidies, thereby facilitating private sector investment in the power sector.

Expected Results (M&R)

Project/Program Timeline	
Expected MDB Board Approval date[d]	May 1, 2025
Expected project closure date[d]	June 2028
Expected lifetime of project results in years (for estimating lifetime targets)	25
CTF Core Indicators	**Project-Defined Indicators/Targets**
Please identify which of the indicators below are relevant to the project proposal, list the corresponding project-defined indicator(s), and report all targets, including disaggregated targets. *(See the CTF Monitoring and Reporting Toolkit for additional guidance.)*	

[19] Current availability of domestic modules: 21 GW (after accounting for exports) per annum. Current demand: 30GW per annum until 2030 for all government schemes with a domestic mandate, Gap: 9 GW(Source: Indian Solar PV exports surging, IEEFA, November 2024)

CTF 1: GHG emissions reduced or avoided (mt CO_2 eq) [21]	720 million
Annual	28 million[20]
Cumulative Lifetime	720 million
CTF 2: Volume of direct finance leveraged through CTF funding ($)	*Indicator calculated from the co-financing section below*
CTF 3: Installed capacity of RE as a result of CTF interventions (MW)	30,000
Wind	NA
Solar	30,000
Hydro	NA
Geothermal	NA
Other/Mixed	NA
TOTAL	30,000
CTF 4: Number of additional passengers per day using low-carbon transport	NA
Female	
Male	
TOTAL	
CTF 5: Energy savings as a result of CTF interventions (GWh)	NA
Annual	
Cumulative Lifetime	

Please also submit the full project results framework to the CIF Secretariat upon MDB Board approval of the project.

CTF Co-Benefit Indicators	**Project-Defined Indicators/Targets**
Please identify one or more expected co-benefit indicators–i.e., other social, economic, environmental benefits beyond the CTF core indicators–that the project will track and report.	
CTF Co-Benefit *(e.g., Gender, employment, energy access, social inclusion, health and safety, fuel savings, competitiveness and industrial development, SDGs):*	(i) Percentage of women staff trained of the total number of people trained in GRPV (baseline: 0, 2028: 10%) (ii) Percentage of female-owned households of the total households connected to GRPV (baseline: 0%; 2028: 5%) (iii) Number of GRPV installed in low-income households (baseline: 0, 2028: 100,000)

Expected Date of MDB Approval
May 1, 2025

[20] The total GHG emission reduction for the government program (30GW) is 720 MMT for a lifetime of 25 years; divide that by 25 years to arrive at 28MMT/annum for 30 GW solar rooftop capacity.

[21] The Program is expected to add GW 2027 of solar rooftop capacity by generating 1000 BU over the systems' 25-year lifespan. Considering the Central Electricity Authority's Grid emission factor of 0.716 tCO2/MWh, the total GHG emissions over the lifetime are 716 million tons of CO2. The World Bank's program DLI 1 to 3 disburses funds against the results of MW solar rooftop capacity installed. The annual GHG emissions reductions linked to the commissioned solar rooftop capacity will be monitored and reported as part of the Program's results framework.

Version: October 2024

Link to Documents Management – here

CCH – here

CIF Website – here

CIF Pipeline Management and Cancellation Policy - here

CIF Financial Terms and Conditions Policy updated for FY24 - here

CIF Operational Modalities For New Strategic Programs - here

CTF (DPSP V-FUTURES) Futures Window Design Document here

CTF M&R Toolkit – here

FY25 Pricing Policy - here