



**SCALING-UP RENEWABLE ENERGY PROGRAM IN LOW-INCOME
COUNTRIES**

MALI: SEGOU SOLAR PV PROJECT

USD 25 million

August 2016

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ACRONYMS

AfDB	African Development Bank
BOOT	Build-Own-Operate-Transfer
CIF	Climate Investment Funds
DCIF	Danish Climate Investment Fund
DSCR	Debt Service Coverage Ratio
EDM	<i>Énergie du Mali</i>
EPC	Engineering, Procurement and Construction
ESIA	Environmental and Social Impact Assessment
GHG	Greenhouse Gas
GoM	Government of Mali
IFC	International Finance Corporation
IFC IV	International Finance Corporation Infra-ventures
IFU	Investment Fund for Developing Countries
IP	Investment Plan
IPP	Independent Power Producer
ISS	Integrated Safeguards System
NEP	National Energy Policy
O&M	Operations & Maintenance
PPP	Public-Private Partnership
PV	Photovoltaic
SPV	Special Purpose Vehicle
SREP	Scaling-up Renewable Energy Program in Low-Income Countries
WB	World Bank

COVER PAGE - Segou Solar PV Project			
1. Country/Region:	Mali	2. CIF Project ID#:	(Trustee will assign ID)
3. Source of Funding:	<input type="checkbox"/> FIP	<input type="checkbox"/> PPCR	<input checked="" type="checkbox"/> SREP
4. Project/Program Title:	Segou Solar PV Project		
5. Type of CIF Investment:	<input type="checkbox"/> Public	<input checked="" type="checkbox"/> Private	<input type="checkbox"/> Mixed
6. Funding Request in million USD equivalent:	<i>Grant:</i> Not Applicable	<i>Non-Grant:</i> USD 25 million Senior Concessional Loan	
7. Implementing MDB(s):	African Development Bank		
8. National Implementing Agency:	Not Applicable.		
9. MDB Focal Point and Project/Program Task Team Leader (TTL):	<i>Headquarters- Focal Point:</i> Joao Cunha j.cunha@afdb.org / Leandro Azevedo l.azevedo@afdb.org	<i>TTL:</i> Amu Orison (a.orison@afdb.org)	
10. Project/Program Description:			
<p>The project consists of the design, construction and operations of a 33 MW solar photovoltaic (PV) power plant and 2.8 km of a 33kV transmission line and it is located in Segou approximately 240 km north-east of Bamako, Mali. The project's site lies on 90 ha of land that is publicly owned. The project will be implemented by a Special Purpose Vehicle (SPV) under a 25-year Build, Own and Operate & Transfer (BOOT) Concession Agreement with the Government of Mali (GoM) and a 25-year Take-or-Pay Power Purchase Agreement (PPA) with <i>Énergie du Mali</i> (EDM), Mali's national utility.</p>			
11. Consistency with Investment Criteria:			
[Presented in the document].			
12. Stakeholder engagement:			
<p>The Project sponsor has engaged in direct discussions and negotiations with the GoM regarding the PPA and the Concession Agreement. As part of the Environmental and Social Impact Assessment required nationally and by the lenders, the Project Sponsor had undertaken wide consultations with the project's key stakeholders in October and November 2015. These included: (i) direct interviews with local authorities including the mayors of Pélengana and Ségou, Local Chiefs and Elders of the concerned villages, representatives of selected district departments including education, health, and agriculture among others; (ii) public consultations with communities in the project area including Pélengana, Soro, Nioroko and Bougouni in the Ségou district; (iii) discussion groups (focus groups) with women and youth groups in Pélengana and the surrounding villages. The main objectives of the stakeholders consultations were to: (i) present the project and collect secondary data; (ii) seek their views and concerns with regards to the project's impacts; and (iii) identify key activities that could contribute to inform the design of the project. Notwithstanding the fact that concerned communities and authorities showed support to the project, a grievance mechanism is to be set up to appropriately address any complaint that may arise from the project implementation. A community liaison manager will be appointed and shall be responsible for stakeholder engagement, consultations and the grievance mechanism and its respective management.</p>			
13. Gender considerations:			

Analysis of available data and interviews held with active players in the area of gender in Mali revealed some important gender gaps. Women have reduced access to resources (land, employment etc.) and economic autonomy. For example, only 52% of Malian women are part of the country’s labor force whereas Malian men account for 82%. In terms of estimated income, the differences are huge with women generating an estimated 1,121 USD/year while men generate USD 2,335 in the same period. In addition, women are responsible for most of the domestic activities that are not remunerated and include, care of dependents, fetching water, etc reducing their amount of time available for remunerated work. Women also have more difficulty accessing education: the literacy rate is 29% for women and 48% for men, and significant differences are noticed throughout the entire education system where only 4% of women and 10% of men are reaching tertiary education. Women experience significant percentages of gender violence, which is widely tolerated in Malian society as according to surveys in the country 75% of women interviewed declared a man is justified to beat his wife in certain circumstances. They lack access to information and services to ensure reproductive health choice: at least 31.2% of married women have unmet need for family planning with contraceptive prevalence of modern methods being very low, which a rate of approximately 7%. Finally women face laws and practices which are incompatible with gender equality (early marriage, guardianship, FGM, inequality in inheritance etc). Considering the aforementioned gender gaps, the proposed project is being developed with considerations of gender equality and women empowerment in its design and foreseen activities and methodologies. To achieve this objective, the project will: (i) ensure gender expertise and apply a gender perspective in all project activities with a view to reduce disparities in access to resources, decision making, autonomy and voice, including participatory procedures with a gender perspective. The project will include gender indicators in all its activities with a logic of gender mainstreaming and also develop specific actions to advance the position of women. In particular, the project will: (ii) promote equality in employment opportunities and in equal access to income, training and special programs/activities to support women in sectors or areas sector that are traditionally male-dominated, (ii) recognizing the importance of the presence of women in peace building and security the project will promote substantive participation of women's organizations in the implementation of activities, including those ex-ante and ex-post, (iii) The project will empower women also through campaigns of functional literacy, and life skills including access to information and services of reproductive health and prevention of early marriage and gender violence, (iv) women economic empowerment will be promoted with training developing hard, soft and life skills for women for them to develop business and entrepreneurship thanks to increased access to electricity and (v) promote gender equality in all project’s indicators and implement a monitoring and evaluation methodology with a gender perspective.

14. Indicators and Targets (consistent with results framework):

Core Indicators	Target
Annual electricity output in GWh	52.7
Increased public and private investments (in USD)	32,800,000
Number of people with improved access to electricity (men/women)	158,000 / 168,500
GHG emissions avoided in tons CO2 equivalent (annual / lifetime)	8,811 / 220,293

15. Co-Financing:

	Amount (in EUR million):	Type of contribution:
AfDB	8.4	Senior Loan
IFC	8.4	Senior Loan
Shareholders	12.2	Equity
Co-Financing Total:	29.0	

16. Expected Board/MDB Management approval date:

AfDB is expecting Board Approval during October 2016.

GENERAL PROJECT DESCRIPTION

1.1 This project proposal conforms to the Mali's Scaling-up Renewable Energy Program in Low-Income Countries (SREP) Investment Plan (IP), endorsed by the SREP Sub-Committee on March 2012, and to the concept note "*Scatec Solar Mali Segou PV 33 MW*" which was endorsed by the SREP Sub-Committee on October 2013 under the first round of the SREP Competitive Set-aside that followed a review by an Independent Expert Group.

1.2 Mali has optimal conditions for the deployment of Solar Photovoltaic (PV) technologies. The project shall be the first utility-scale on-grid solar PV Independent Power Producer (IPP) in Mali and shall improve the country's energy mix and contribute to reduce the current power deficit in the country while providing benefits to end-users by ensuring a greater energy access and improvement in affordability.

1.3 SREP funds will be essential in providing the much needed funding to a new technology in the country with the ultimate goal of demonstrating the business case for future replication and with strong climate, environmental and social benefits to catalyze market transformation. By supporting the first-mover private sector investment in a utility-scale solar PV plant, the SREP will greatly contribute establish the bankability of solar PV under an emerging regulatory framework and contribute to lowering the overall cost of power generation and stimulate private sector participation in financing renewable energy projects. Additionally, SREP will contribute to the reduction of a burdensome reliance on expensive fossil fuel imports and reduce the burden of fossil fuel subsidies in power generation.

CONTEXT AND MARKET

1.4 The primary energy supply in Mali is largely based on biomass (78%). It is the main energy source for the majority of the population, while fossil fuels contribute to 21% of the energy supply and hydro contributes 1% (excluding electricity trade).

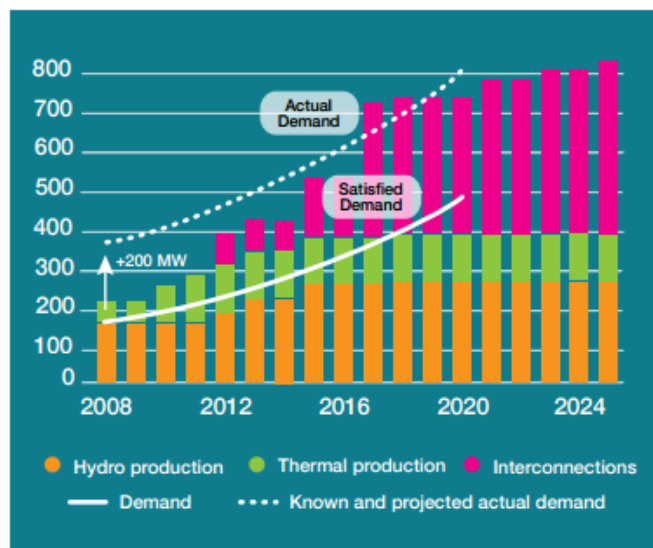
1.5 Mali's oil and gas subsector is characterized by total dependence on petroleum imports, which represented 26% of total imports in 2010. This is exposing the economy as a whole to the volatility of fossil fuel prices. It also puts the economy under foreign reserves pressure, absorbing significant public resources that could be deployed elsewhere in the development of a more sustainable energy sector.

1.6 There is an unsatisfied demand for electricity in Mali, both for domestic users and for large industrial complexes, in particular in the mining sector. In 2012, the installed capacity reached 357 MW for the central grid (but peak capacity is lower, 212 MW) and 68 MW for isolated centers¹. Of this capacity, roughly 60% comes from hydro and 40% from thermal sources. This makes the power sector highly dependent on fossil fuels - whose imports are constantly increasing due to the demands of a fast growing population (doubling every 25 years) and economic growth – and highly exposed to the negative impacts of climate events such as droughts.

¹ Source: EDM SA

1.7 Industries and mines, on the other hand, have an estimated installed capacity of 200 MW to satisfy their own demand. The mining sector alone experienced significant growth passing from 47 MW to 136 MW between 2008 and 2011, exclusively from thermal power plants. The lack of reliable and lower-cost electricity is considered a barrier for further development of the sector². In 2013, the capacity gap to meet demand was estimated at 111 MW, which represents 45% of needs. In 2014, the estimated capacity gap was 32 MW, which represents 13.2% of needs. Keeping up with the increase in demand presents a significant challenge for the sector as presented in Figure 1 below. The GoM’s ongoing energy access program involves expansion of both grid and off-grid renewable and non-renewable energy sources to face the growing national electricity demand. Going forward, increased regional integration could be vital to help Mali meet its energy needs through electricity imports.

Figure 1: Energy Demand & Production Projection in Mali (SREP Mali Investment Plan)



1.8 The nation-wide electrification rate stands at approximately 27%, with rural areas at about 18% and urban centers at 55%. Most households in rural areas satisfy their energy needs by using wood, kerosene and batteries which represents an expensive, unreliable and unhealthy solution. Mali is facing a rapid growth in demand for electricity (estimated at between 10% - 12% per year) that cannot be met due to its limited generation capacity. In 2013 it was estimated that the deficit between installed capacity and capacity required to meet the demand was around 200 MW (see Figure 1 above). This unmet demand is expected to remain until new projects are developed, and/or additional import contracts are signed with Côte d’Ivoire. Since the solar PV projects can be developed and constructed relatively fast, projects as the one being proposed could play a critical role in bridging the electricity gap that currently exists in Mali.

1.9 The main sources of power supply of the country include thermal plants, hydro power plants and two interconnections with Mauritania and Senegal, as well as some off-grid hybrid mini-grids with an estimated total installed capacity of around 300kW. While hydro power plants are under development in Mali, their implementation is substantially longer than solar PV. Interconnections with neighboring countries could provide some stability in the supply but they cannot alone solve the existing electricity

² *Promotion de l’investissement privé au Mali. Opportunités pour les investisseurs dans la filière Energie.*
December 2011

deficit. In addition, thermal power plants are expensive to operate and expose Mali's economy to significant volatility in fuel pricing that can have dire negative impacts in the national budget.

1.10 Energie du Mali (EDM) is under financial pressure as it requires substantial annual subsidies from the GoM. In 2013, the amount of subsidies reached USD 80 million while in 2014 this figure was USD 95 million or a third of its total income.

1.11 Mali has an excellent solar radiation potential estimated at 5-7 kWh/m²/day with sun light for duration of around 7-10 hours per day. The global typical average is well below with a potential of 4-5 kWh/m²/day. Other Solar PV projects are currently under development in the country and include the 50 MW Kita, 50MW Koutiala, and 50MW Sikasso projects. These were the result of a competitive tendering process supported by the African Legal Support Facility, a special fund hosted by the African Development Bank (AfDB).

Policy and Regulatory Framework

1.12 The main policy regulating the sector is the National Energy Policy (NEP), adopted in 2006, whose overall objective is to contribute to the country's sustainable development through the provision of affordable energy services to increase access to electricity and promote socio-economic activities. The specific objectives of the NEP are: (i) meeting energy needs in terms of quality, quantity and cost; (ii) ensuring the protection of persons, property and environment against the risks of inappropriate energy services; (iii) strengthening the capacities of policy, management, monitoring and control of the energy sector; and (iv) strengthening the benefits of international cooperation in the field of energy. The policy's guiding principles are based on decentralization, liberalization, a programmatic and participatory approach, competitiveness and the implementation of Public-Private Partnerships (PPPs).

1.13 In 2009, the GoM issued the National Energy Sector Policy Letter, further specifying energy policy objectives and targets. The letter lists the projects to be developed between 2009 and 2020, including 133 MW of new hydro capacity and 100 MW of thermal capacity, the strengthening of the interconnections with Côte d'Ivoire and Ghana and other investments in the internal transmission and distribution network.

1.14 Renewable energies are addressed in several pieces of legislation, including the NEP (2006) and the aforementioned letter (2009). The most important policy document in this area is the National Strategy for the Development of Renewable Energy, which was adopted in 2006. It is aimed at: (i) promoting the widespread use of renewable technologies and equipment to increase the share of renewables in national electricity generation (up to 10% by 2015); (ii) developing the biofuel sub-sector for various uses (electricity generation, transportation, agricultural motorization, etc.); (iii) creating better conditions to sustain RE services; and (iv) searching for sustainable and suitable financing mechanisms for renewables. So far, the implementation of this national strategy has not been very successful. The strategy is expected to be revised in line with the next revision of the NEP under the SREP technical assistance project entitled "*Promoting the Scaling Up Renewable Energy in Mali*" (PAPERM). To accelerate the implementation of the national strategy, actions may be grouped into four main components: (i) comprehensive inventory of the renewables' potential; (ii) development of renewables and promotion of their technologies; (iii) capacity building and development of cooperative actions; and (iv) impact assessment. The National Strategy for the Development of Biofuel was adopted in June 2008 and it aims, firstly, at enhancing affordable local

energy production through the development of biofuels to meet the country's socio-economic needs. Secondly, it aims to reduce the country's dependency on oil imports. In addition to the strategies mentioned above, the National Adaptation Program of Action, submitted and disseminated in 2007, includes renewables' projects, some of which have been partially implemented. Furthermore, in 2011, the GoM elaborated a National Climate Change Policy and a National Climate Change Strategy that both integrate renewables into their action axes.

1.15 In 2008, the World Bank approved USD 120 million to finance the Mali Energy Support Project. As part of the project, an amount of USD 8 million was allocated to undertake capacity and institutional strengthening of key sector institutions. The energy sector reform experience in the country between 2003 and 2008 underscored the need to strengthen the institutional, legal and regulatory environment and governance to foster an open business environment attractive to private investors and operators.

1.16 The World Bank's component was to assist the GoM in its restructuring efforts of EDM by setting a minimum platform of technical and financial performance targets with monitoring indicators. An urgent need to improve on governance-related issues related to EDM operations as they bear on consequential amount was identified. Detecting and sanctioning electricity theft, enhancing timely issuance of bills and prompt payment collection, improving metering and meter-reading and monitoring physical leakages were among the key reasons behind the country's high levels of technical and non-technical losses.

1.17 This recovery plan for the sector will contribute to a higher liberalization of the sector and is being implemented with the objective of eliminating subsidies by 2018 while accommodating a rapidly growing demand. The implementation of the project is currently ongoing.

1.18 The AfDB SREP funded PAPERM project, approved in October 2014, aims at supporting the country in the improving its policy, strategic, regulatory and legal framework for scaling-up renewable energy investment. Activities under support include capacity building for national stakeholders as well as knowledge management, awareness and advocacy on renewables, setting up a renewables monitoring and evaluation systems.

DETAILED PROJECT DESCRIPTION AND INNOVATION

2.1 The Project consists of the development, financing, construction and operation of a solar PV power plant of 33 MW in Mali under a BOOT scheme, including the construction of a 2.8 kilometers 33 kV transmission line that shall connect the power plant to the nearby substation. The power plant will be located in Ségou in the low part center of the country and will be connected to the national grid.

2.2 The project is being structured as a non-recourse project finance transaction and shall be implemented by an SPV under a 25-year concession agreement with the GoM and a take-or-pay 25-year PPA with EDM.

Figure 2 - Project Location



2.3 Figure 2 above shows the exact location of the project site which lies in the district of the Pélengana Municipality, located approximately 5 km south of Ségou and 240 km north east of Bamako, capital of Mali.

Innovation

2.4 The Project will be one of the first large-scale solar PV power plants in sub-Saharan Africa and the first of its kind in Mali. The development of the project first began in 2010 but due to political turmoil, the development of the project was suspended in March 2012. The advent of peace and return to constitutional rule, the support of international institutions to finance the reconstruction of the country and the key role of electricity in the pacification and economic development, all have led the Ministry of Energy and Scatec Solar (and partners) to quickly resume the development of photovoltaic projects in Mali, signing in 2013 an amendment to the initial Memorandum of Understanding.

2.5 The proposed technology was chosen as a result of long tests done by the sponsor that revealed positive and shall be commercially tested for the first time in Mali. The geographical zone where the project is to be located is characterized by very limited precipitation, high temperatures and extremely dry throughout the year which favors the generation power through the deployment of solar PV technologies.

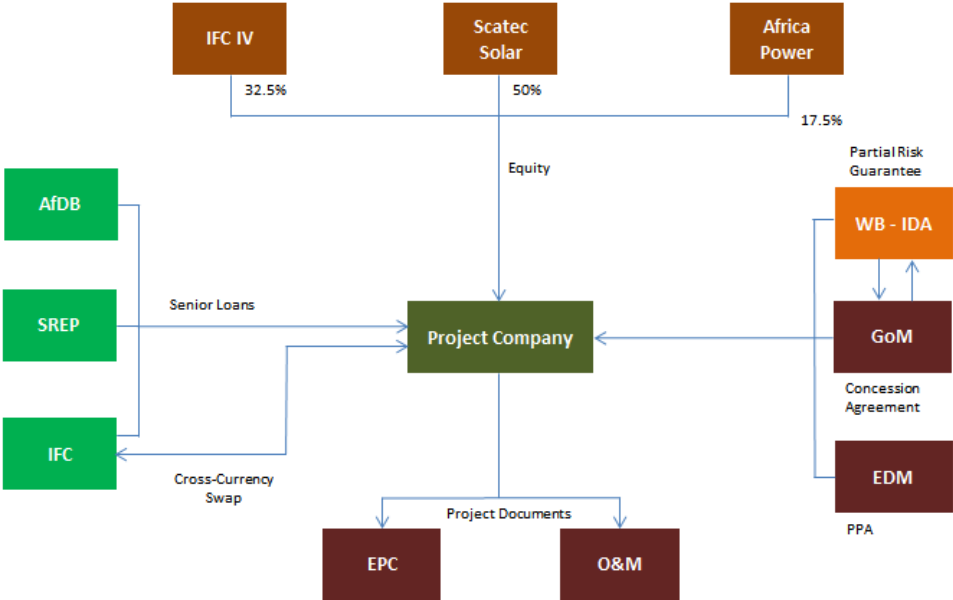
2.6 The financial structure proposed in the project, while common in other Sub-Saharan African countries, is an innovation in Mali as it is the first time it is been implemented. This poses challenges upfront as there is no history of private sector involvement in power generation which contributes to a higher risk perception that tend to exacerbate existing barriers to investment. SREP concessionality will improve the transaction overall risk profile, consequently enhancing private investments. In addition, the SREP loan will be swapped from USD into EUR to fully mitigate the project's exposure to currency exchange risk. Finally, Scatec Solar will play a tripartite role in the transaction as it shall be the main shareholder, as well as the Engineering, Procurement and Construction (EPC) Company and the Operations & Maintenance (O&M) Company of the power plant. The Lenders' Technical Advisor undertook a benchmark exercise on the EPC and the O&M contracts to verify the competitiveness of the proposed prices and to ensure the contracts were negotiated at arms' length.

Technology, Product and/or Business Model

2.7 The project will have the following technical characteristics: (i) fixed system with a total of 129,888 solar polycrystalline 255Wp PV panels positioned at a 16° angle, (ii) 33 inverters of 900 kW AC, and (iii) transformers. The technology is considered proven and relatively simple to assemble, operate and maintain.

2.8 In terms of the business model, Figure 3 below provides a diagram with the detailed structure of the project. In addition to the EPC and Operations & Maintenance (O&M) Contracts as well as the Concession Agreement, the PPA and all loan agreements, the World Bank will provide a Partial Risk Guarantee (PRG) with the objective of backstopping certain payment obligations of: (i) EDM under the PPA, and (ii) GoM under the Concession Agreement. Furthermore, the project will include a cross-currency swap to be undertaken by IFC and the Project Company of the SREP concessional senior loan proceeds. The logic behind this agreement is to ensure that the project is not exposed to currency exchange risk that could potentially arise from the fact that all cash-flows are priced in FCFA (currency pegged to the EUR) and the SREP loan is priced in USD.

Figure 3: Project’s Structure



Increased Supply of Renewable Energy

2.9 The project will add 33MW of solar PV capacity to the national grid. The project is expected to generate up to 52.7 GWh/year, using an availability factor of 18.22% and as indicated in “Common Format for Project/Program Concept Note for Applying Resources from the SREP Competitive Set-Aside”

Commercial Sustainability

2.10 The expected rapid growth in the deployment of solar PV technologies sectors in Africa in general and in Mali in particular presents a significant opportunity. Given that utility-scale solar PV power plans can be deployed in a flexible, scalable and rapid manner, developers continue revealing strong interest in

leveraging investment opportunities. Yet, multiple challenges – especially first-mover high costs and inexistent local finance – prevents private sector investments from flowing into renewables. Project preparation support, concessional support, and technical expertise are examples of the instruments still needed to help demonstrate the bankability of solar PV projects and unlock investments in the market.

2.11 In the long term, the need for concessional resources is expected to diminish for a number of reasons. These include: (i) fall in the perception of risk will fall, prompting greater interest of commercial investors, lowering the cost of capital, and enabling future projects to achieve reasonable returns; and (ii) the domestic market will mature and build capacity in understanding the technology (equipment supply, engineering, advisors etc.), while global markets will continue to grow and equipment costs will continue to fall.

RATIONALE FOR SREP FINANCING

3.1 This funding proposal is fully aligned with the SREP Mali Investment Plan and will help advance its objective by supporting the *“development of renewable energies on a large scale, to effectively contribute to poverty reduction and sustainable development in Mali for the benefit of its population³”*.

3.2 Despite considerable utility-scale potential for solar PV technologies in Africa, developers and investors have entered in only a handful of CIF countries in the region with no utility-scale solar PV IPPs still in operations. While solar PV is increasingly becoming an established and competitive technology, first-movers face significant market barriers, typical to the development of first-in-kind renewables projects as it is the case with the proposed project. Even projects that entered into PPAs are likely to face various challenges in reaching financial closure. The key barriers to the project include:

- (i) High Transaction Costs. Transaction costs associated with solar PV projects in Africa are relatively high, averaging up to USD 2 million per MW of installed capacity. The situation in Mali is no different and was further exacerbated by the political unrest in 2012 that led to significant delays in the development of the project. The high costs reflect: a) investment in time required by Scatec Solar to negotiate a bankable concession agreement and the PPA; b) additional efforts made by the sponsor and financiers in assessing, managing, and mitigating off-take risk, especially in a case where the off-taker (EDM) faces a very weak financial position; c) difficulties associated in negotiating and designing one-off financing scheme; d) lack of infrastructure and options for transportation arrangements, with the project facing the need to haul equipment from the port in Senegal to Mali; and d) other challenges associated with first-mover projects;
- (ii) Limited ability to raise financing. International banks tend to shy away from countries due to political and off-taker risk. Likewise, local and regional banks face restrictions on regulatory capital and maturity mismatches and therefore do not typically offer loans with tenors above 8 years, whereas utility-scale solar PV projects require a tenor of 12 or more years to ensure project bankability and cost competitiveness in terms of generation. Furthermore, there are no effective utility-scale solar PV in the West Africa region, therefore

³ SREP Mali Investment Plan, 2010

the local banks often have limited or no experience in assessing and lending to solar PV projects of such magnitude;

- (iii) Lack of capacity and challenges linked to the learning curve. In most cases, project parties will have to enter a new market, new sector, or develop a new business model. Operating in an environment that often lacks an established supply chain, experienced local operators, knowledgeable off-taker, etc. leads to an increase in the cost and time to build, manage, maintain, and repair solar PV systems. This lack of capacity increases risks for project sponsors and investors during operations, as prolonged system downtimes and costly repairs can have major cash flow implications that ultimately may affect the bankability of the project. In addition, project parties often have limited experience in addressing environmental and social impacts, and potential issues regarding land acquisition. AfDB and IFC's participation in the project is ensuring the application of high performance standards but the needed learning curve and additional due diligence has also added up to time and costs;
- (iv) Permitting and regulatory compliance. The regulatory environment in Mali has not been commercially tested and this is a crucial barrier. While Mali has renewable policies and/or targets in place, the regulatory support necessary to drive investment in the sector is underdeveloped. For example, despite its goal of significantly increasing installed capacity to address the country's chronic power deficit, Mali has yet to provide the market with supportive regulatory policies such as a feed in tariff, investment/production tax credits or other benefits. Furthermore, in order to minimize regulatory risk, the legal framework under which the project will operate must be clear and not open to dispute. All project developers require clear processes and procedures to obtain the needed approvals and ultimately complete their projects according to a pre-specified timeline and budget. Yet, overly complicated and/or unclear permitting processes for utility-scale renewable projects continue to drive away private sector sponsors;
- (v) Weak transmission network and/or unreliable grid. The grid's ability to absorb and transport generation to load centers is often limited or unknown, adding cash flow risk to potential renewable projects. In order to mitigate this risk, and because the transmission infrastructure was inexistent, the sponsor was required to cover the costs associated with the construction of 2.8 km transmission line between the project site and the nearest substation. While this mitigates an important potential risk, it adds up significantly to the costs. In addition, the impact of integrating this significant large amount of intermittent power into the power grid was assessed by the Lenders' Technical Advisor and the Project Sponsor themselves in order to avoid major technological challenges in the balance of supply and demand with the objective of maintaining grid reliability;
- (vi) Off-taker and country risk. EDM is in a weak fiscal position with a low credit rating due to high leverage, revenue uncertainty, fossil fuel imports and growing CAPEX requirements, which have led the utility to operate below cost-recovery levels with the GoM being required to subsidize the company to fill in any losses. Under these conditions, any sponsor and lenders may find that a long-term PPA, which is critical to the commercial feasibility of a

utility-scale solar PV, is not bankable without additional insurance or enhancements, which are often either unavailable or come at a high cost that add-on to an already capital intensive technology. Furthermore, high poverty levels, periodic civil unrests, systemic corruption, and an unstable political situation may further increase project risk for investors and sponsors.

3.3 While the GoM is planning a major overhaul of the country's power sector which will help addressing some of the barriers mentioned above, concessional finance can create a significant momentum in overcoming barriers linked with first-mover disadvantages. The remote location of the project site, a risky internal market, and low levels of on-the-ground capacity, will likely result in a higher technology cost than elsewhere and a greater need for concessional support. While these barriers add complexity to the project, initial successes in other countries (e.g. Morocco, Zambia and Rwanda) can help Mali to further enhance its policy and regulatory environment for developers and investors, contributing to continued sector growth and bringing down future project costs.

3.4 The project will lead to a higher diversification of Mali's energy mix and improve the overall viability of its power sector by making it less vulnerable to droughts that could highly affect its hydro resources. If well succeeded, the project will in the long-run and as more players come into the sector, put less pressure on the country's annual fossil fuel requirements contributing to less pressure on EDM's balance sheet.

CONSISTENCY WITH SREP INVESTMENT CRITERIA

Increased Installed Capacity from Renewable Energy Sources

4.1 The project will lead to a direct increase in the country's installed capacity of 33MW from a renewable resource with an estimated total annual output of 52,700 MWh or 52.7 GWh over a period of 25 years for a lifetime output of 1,316.75 GWh.

Increased Access to Energy through Renewable Energy Sources

4.2 In addition to the power plant, the project will support an extension of the grid from the project's site to the closest substation. That substation will increase the voltage of the power so that it can be integrated in the national transmission infrastructure before reaching the relevant consumption centers. Given the significant power deficit in Mali, this project is not expected to directly lead to an increase in terms of energy access as power flowing in the grid is fungible but its implementation fits well with the GoM's plans in terms of expanding the share of population with access to non-fossil-fueled electricity and to address the current power deficit in the country. The power output of the power plant would be sufficient to power around 60,000 households.

Low-Emission Development

4.3 By mainstreaming this renewable technology into the country's overall energy system and assuming that the alternative would be to construct thermal power capacity, the project will

contribute to a reduction in Greenhouse Gas (GHG) emissions of 220,293 tCO₂/MWh over a period of 25 years. The calculation was established using the Approach to GHG Assessment in Renewable Energy developed by the International Finance Corporation and is based on the following assumptions:

- (i) Installed Capacity of 33MW;
- (ii) Average Capacity Factor of 18.22%;
- (iii) Marginal Emission Factor of 0.1673 tCO₂/MWh; and
- (iv) Project Lifetime of 25 years.

Productive Use of Energy

4.4 The supply of energy will improve living standards and stimulate economic activities such as employment opportunities which will lead to the development of new activities such as the supply of goods and services (consumer goods, grain purchase, accommodation, etc.). In addition, the project will promote the industrial development of Mali through increased employment opportunities for both youth and women, while enhancing fiscal income.

Economic, Social and Environmental Development Impact

4.5 An economic analysis for the project was carried out to determine whether the expansion of the system by adding the proposed technology is justified economically. The economic Net Present Value of the project is a measure of how much better off the country would be if the project is to be built and its power added to the energy mix, using the current resources and measure the opportunity of undertaking this project in Mali. As benefits, the project will generate revenues for the GoM while contributing to reducing fuel subsidies and energy imports that will accrue to the energy sector of Mali. In addition, the project is expected to yield environmental benefits in terms of avoided GHG emissions. To estimate the economic resource flow statement, financial costs were adjusted for taxes to calculate their economic equivalents. The results of the economic and stakeholder impact assessment point out to net economic benefits over the life project.

4.6 The project is expected to generate employment both during construction and operations phases. There will be approximately 150 temporary local low-skilled jobs created during construction and about 20 permanent jobs during operations phase which include roles for security, panel cleaning and other light maintenance activities. The power plant will produce sufficient power for approximately 60,000 households, though power will be introduced to the grid and dispatched according to priorities of the grid-operator which means that no direct connections will be established as part of the project.

4.7 The Project has been rated as Category 2⁴ by AfDB in terms of social and environment impacts. An Environmental and Social Impact Assessment (ESIA) and an Environmental and Social Management Plan (ESMP) are finalized to address all negative impacts that may arise from the project in line with the Integrated Safeguard System (ISS) requirements. A resettlement action plan has been prepared to mitigate

⁴ AfDB Operations likely to have detrimental, site-specific environmental and social impacts.

any negative impact the project may have on project-affected people. The summaries of required reports were disclosed in-country and on the Bank's website in line with the ISS requirements since May 2016. ESIA pays particular attention to the impact on people who carried out agricultural activities on the Project site. It is estimated that 55 persons are involved in agricultural activities at the site, and there is agreement among the local authorities that these individuals will be compensated land-for-land. It is estimated that the implementation of the Project would help prevent emission of around 28,615 equivalent tons of CO₂ per annum.

Economic and Financial Viability

4.8 SREP funds will support a first-mover to demonstrate the case for later entrants by contributing to address existing barriers and mitigating project risks. Over time, the track record established by this Project will make it more appealing for other investors to join the sector, by testing the technology locally, the regulatory framework and the off-taker creditworthiness. In addition, SREP financing will be of paramount importance in leveraging additional financial resources, including those from AfDB and other lenders and pave the way for future local financial sector engagement in solar PV financing.

4.9 Over time, the need for concessional funds will likely diminish as the overall risk perception decreases thereby also lowering the entry costs for future project developers. These demonstration efforts will also likely lead to an improvement in the capacity of local solar PV technology service providers (equipment supply, engineering, advisors etc.) to further enhancing the sustainability of future utility-scale solar PV projects in Mali at prevailing feed-in tariffs.

Leveraging of Additional Resources

4.10 For every USD 1 of SREP resources deployed in the project, a total of USD 1.45 is expected to be leveraged from other investors and lenders.

Co-benefits of Renewable Energy Scale-up

4.11 The project will pilot the first utility-scale solar PV power plant in the country which will diversify the national energy mix and make the country less dependent to hydro power as the country is prone to droughts that can severely affect Mali's hydro resources. Overcoming barriers to financing this project will push Mali onto a cleaner growth path. In addition, the project is expected to generate the following benefits:

- (i) Improved financial sustainability of EDM. By enabling a cost-competitive solar PV project, SREP will contribute indirectly to strengthen the financial sustainability of Mali's State-owned utility as tariffs under the PPA are below the national average generation cost, which often plays a critical role in the host country's fiscal deficit. In addition the project will reduce fossil fuel consumption and reduce pressure on the country's balance of payment that is forced to import the fuels it needs;
- (ii) Lowering electricity costs. The project will help diversify the power mix, reduce the volatility in the price of electricity, and lower the average cost of power generation contributing to support a lower cost structure for industries and consumers;

- (iii) Local employment. The project is expected to stimulate growth in local employment by engaging local labor during project construction and operation. As per the ESMP, a local recruitment office will be opened to ensure local employment and the delivery of more energy to the grid will allow for expansion of businesses and communities;
- (iv) Spill-over effects. Given the integration of Mali with its neighbors through power interconnection and exchange, political cooperation in the field of energy, as well as a common currency and significant trade links, it is expected that the development of the renewable energy sector will be boosted both in Mali and in the region.

IMPLEMENTATION FEASIBILITY

4.12 AfDB has a strong track record of supporting first-mover private renewable projects in South Africa, Kenya and Morocco and has a strong pipeline of potential solar PV transactions in West Africa.

4.13 AfDB has been engaged with solar PV developers that are seeking long-term funding. Together they represent a pipeline of around 500 MW of potential installed capacity. The project is under appraisal by different lenders and both technical and legal due diligence are well advanced. AfDB's Board Approval is expected during October 2016 while financial close will occur before the end of 2016. The construction phase is expected to start in early 2017. Based on the current plans, construction shall last for a period of 18 months.

POTENTIAL RISKS AND MITIGATION MEASURES

4.14 Potential risks associated with the project include:

- (i) **Construction/Completion Risk.** The components of a solar PV power plant are usually pre-fabricated and their installation is of low complexity; an assembly task which does not require highly skilled or special labor. Civil and electrical works for solar PV power plants are also relatively straightforward. Construction cost can be well controlled while the investment can be done within a short period of time with a good predictability. The construction risk is therefore significantly low compared to other sources of power. In addition, the EPC contract is a fixed-price time-bound contract that will help mitigate construction risk.
- (ii) **Connection Risk.** The Project will be connected via a 2.8 km transmission line to an existing substation with sufficient capacity to absorb the PV power plant's production will be constructed by the project sponsor.
- (iii) **Operating and Maintenance Risk:** The operation and maintenance of a solar PV power plant is relatively simple as it consists of cleaning, regular inspections, minor repairs and measurements, data verification, reporting and site security.

- (iv) **Regulatory risk.** The necessary legal and regulatory framework for the project is established and in place. The Malian Regulatory Commission of Electricity and Water was established in 2000 and is responsible for regulating and overseeing the provision of electricity and water services. However, recognizing that a framework for the development of renewable energy in the country including the development of feed in tariffs for renewable energy is not fully developed, GoM is offering a strong support to the project, including being a joint obligor to the PPA, to make it a success. In addition, lenders will sign a direct agreement with the GoM to protect the project against any change of law.
- (v) **Market risk.** The market risk is considered to be low as there is currently a supply deficit of over 200MW. With a low electrification rate of only 27%, demand is expected to grow rapidly at over 10% per year.
- (vi) **Currency exchange risk.** The PPA obligations are to be denominated and paid in FCFA which is pegged to the EUR. The Purchase Price may be adjusted in the event of a variation in the FCFA/EUR rate of exchange. The SREP loan will be provided in USD to the Project Company and will be repaid in the same currency. In order to mitigate any currency exchange risk associated with the SREP loan, IFC will provide a cross-currency swap to mitigate any risk arising from the exchange of FCFA to USD.
- (vii) **Country risk.** Mali has recently experienced outbreaks of political violence which pose a threat to the country's political and economic stability. While this risk remains high, the near-term economic prospects have improved following presidential and parliamentary elections in 2013. The country's peace and reconciliation agreement, signed on 15th May and 20th June 2015, has stabilized political life, but the security situation is still fragile. In accordance with the African Economic Outlook, while growth slowed in 2015 to an estimated 5.2%, down from 5.8% in 2014, medium-term macroeconomic prospects are good, with overall growth forecast as 5.0% in 2017, driven partly by more public investment and foreign aid and by the agricultural and service sectors. These good prospects could be undermined by continuing risks such as the security situation, unpredictable gold and cotton prices and bad rainfall. Mali's membership of the West African Economic Monetary Union provides for relatively low exchange rates and transfer risk. These two important factors can positively contribute to a consolidation of Mali's political situation and secure stability in the future.
- (viii) **Solar Resource risk.** The volume of electricity produced by a solar power plant is subject to solar irradiation which may vary by weather changes and affect project cash flows. The lenders independent Engineer has reviewed the reliability and quality of the solar resource data and confirmed the projected output. Mali has an excellent solar radiation potential estimated at 5-7 kWh/m²/day with daily sunlight exposure averaging 7-10 hours. Polycrystalline technologies are well known and applied for decades in numerous countries in the world. The PV modules and inverters are being procured from reputable manufacturers in the solar industry with adequate warranties to the Project Company.
- (ix) **Off-taker risk:** The project's revenues depend on EDM's financial capacity and willingness to meet its contractual commitments. To mitigate the risk of delay or non-payment by EDM, the

- (x) **Logistics risk.** Most of the project equipment will have to be imported into Mali. The project site is readily accessed by an existing good road network from the capital Bamako. Access to the site will be through RN 625.

CONCLUSION AND RECOMMENDATIONS

5.1 The Project will help meet the main objective of the SREP Mali Investment Plan by supporting the deployment of a utility-scale solar PV power plant that effectively contributes to poverty reduction and sustainable development in Mali for the benefit of its population. In addition, the proposal is well aligned with the SREP set-aside objective of supporting an innovative project that engages the private sector in piloting and demonstrating the economic, social and environmental viability of low carbon development pathways in the energy sector by increasing energy access through the use of renewable energy.

5.2 The AfDB invites the SREP Sub-Committee to approve a SREP loan of USD 25 million at a grace period not exceeding 24 months from loan signature and a tenor of 17 years.