



REPUBLIC OF MALI
MINISTRY OF MINES, ENERGY AND WATER

NATIONAL ENERGY DIRECTORATE



CIF-REI INVESTMENT PLAN
Renewable Energy Integration Program

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List of acronyms and abbreviations

AER	Mali Renewable Energy Agency
AI	Implementation Agency
AIE	International Energy Agency
AIGE	Independent Electoral Management Authority
AMADER	Malian Agency for the Development of Domestic Energy and Rural Electrification
ANADEB	Agence Nationale de Développement des Biocarburants (National Biofuel Development Agency)
BAD	African Development Bank
BCEAO	Central Bank of West African States
BM	World Bank
BMD	Multilateral Development Bank
CADDEE	Energy and Water Decentralization Support Unit
ECOWAS	Economic Community of West African States
CIF	Climate Investment Fund
CNESOLER	National Center for Solar Energy and Renewable Energies
CPS	Planning and Statistics Unit
CREDD	Strategic Framework for Economic Recovery and Sustainable Development
CREE	Water and Electricity Regulatory Commission
CRFA	Country Resilience and Fragility Assessment
CSLP	Poverty Reduction Strategy Paper
DNE	Direction Nationale de l'Energie (National Energy Directorate)
EDM-SA	Energie du Mali Société Anonyme (Mali's national utility)
EnR	Renewable Energies
FAD	African Development Fund
FIT	Feed-in Tariff
GoM	Government of Mali
GHG	Greenhouse gases
GIE	Economic Interest Grouping
GIZ	German Agency for Technical Cooperation
GWh	Gigawatt hour
IRENA	International Renewable Energy Agency
kWh	Kilowatt hour
MMEE	Ministry of Mines, Energy and Water
MWh	Megawatt hour
NGO	Non-Governmental Organization
PANA	National Action Program for Adaptation to Climate Change
PEN	National Energy Policy
PI	Investment Plan
GDP	Gross Domestic Product
UNDP	United Nations Development Programme
PPA	Power Purchase Agreements
PPP	Public-Private Partnership
PTF	Technical and Financial Partners
PV	Photovoltaic
REI	Renewable Energy Integration
RGPH	General Census of Population and Housing

RI	Interconnected network
SDG	Sustainable Development Goals
S&E	Monitoring & Evaluation
SOGEM	Manantali Energy Management Company
SREP	Programme de Valorisation à Grande Échelle des Énergies Renouvelables (large-scale renewable energy development program)
VAT	Value Added Tax
UEMOA	West African Economic and Monetary Union

Executive Summary of the Investment Plan

Introduction

01. The Climate Investment Fund (CIF) Committee approved the Renewable Energy Integration Program (REI) as one of its new programs in March 2021. The main objective of the CIF-REI Program is to address energy system barriers to renewable energy integration by implementing a combination of flexible measures on both the supply and demand sides, including enabling technologies, infrastructure, market design and improvements in system operations and electrification and demand management.

02. In October 2021, Mali was selected to be part of the CIF-REI program and as such benefit from an allocation of up to \$70 million for investments and up to \$500,000 in funds to prepare its Investment Plan (IP). The IP preparation process takes 18 months. Following official communication from the CIF administrative unit, the GoM, in collaboration with the Multilateral Development Banks (MDBs), began the IP preparation process, including a virtual scoping mission that took place on September 6 and 12, 2022.

03. Previously, in July 2010, Mali was selected as one of the pilot countries for the CIF's SREP (Scaling up Renewable Energy Program). This choice was justified, on the one hand, by the nature and scale of its climatic, environmental, demographic and energy problems, and, on the other, by the Government's considerable efforts to address energy challenges. With the support of the AfDB, a SREP investment plan was prepared around four projects: Photovoltaic Solar Power Plant Project (CS-PV/PPP), Hybrid Systems for Rural Electrification Project, Mini/Micro Hydropower Development Project (PDM-Hydro) and the PAPERM (Project to Support the Promotion of Renewable Energy in Mali). The Government of Mali has had some experience with CIF processes from the implementation of the SREP Investment Plan which involved providing strategic institutional coordination including monitoring/ evaluation and communication.

04. The CIF-REI Investment Plan (IP) was prepared under the aegis of the Government of Mali through the Ministry of Mines, Energy and Water (MMEE), under the technical purview of the National Energy Directorate (DNE) and by various specialized national structures, with the support of the MDBs. The program is therefore country-driven, and in perfect harmony with Mali's energy sector development policies and strategies. These include CREED 2019-2023 (Cadre Stratégique pour la Relance Economique et le Développement Durable - Strategic Framework for Economic Recovery and Sustainable Development), of which energy is one of the strategic axes, as well as policy and strategy documents and planning/programming documents for the energy sector. The IP proposes a coherent program approach to achieve transformational change and promotes public and private operations to overcome barriers that might otherwise have stood in the way of large-scale investment in integrating a larger share of renewable energy and increasing the share of RE in Mali's energy mix.

05. Mali prepared and presented its Investment Plan to the CIF GCAP Sub-Committee in Brazil in June 2023. The Sub-Committee endorsed in principle the Investment Plan and requested the Government of Mali to work with MDBs to revise the IP, considering the comments made by members, which included a recommendation for a modular approach in the financing plan to cope with the current REI resource constraints. Subsequent discussions and proposals for adjusting the initial allocation led to the following outcomes: (i) an initial allocation of USD 32.6 million to Mali based on recommendations from the right-sizing document prepared by the CIF Secretariat; (ii) a second allocation of USD 37.4 million once additional funding become available; which brings the country total REI allocation to USD 70 million. Considering this

indicative allocation, the priority projects included in the IP were reorganized by phases, following a modular programming.

Program description

06. In view of the targets set for solar power generation, both in terms of quantity of energy and the number of production infrastructures built by the private sector, sub-regional organizations (ECOWAS) or major international programs, the challenges of making all this energy available to consumers (domestic and industrial) are enormous.

07. The integration of renewable energies into grids poses unique challenges: (i) Generation variability, leading to increased reserves / ramping requirements or reduced renewable generation; (ii) Location dependency, requiring upgrading of power transit capabilities in lines (distribution and transmission) to accommodate renewables; (iii) A change in voltage, frequency, reactive power and/or fault current performance, resulting in grid operation close to or outside established operating parameters; (iv) A general increase in price volatility, for countries with spot markets, otherwise lower marginal costs leading to impacts on the revenue stream of existing generation facilities.

08. To address these challenges, CIF and its partners propose the establishment of a program to support the large-scale integration of renewable energies. This program would use concessional financing to accelerate investment in enabling technologies, infrastructure, electrification and demand-side management, as well as market design and improved system operation, to promote larger-scale integration of renewable energies.

CIF-REI Mali IP objective

09. The strategic objective of the IP is to identify and propose strategic options for decarbonization by accelerating the country's clean and inclusive energy transition and activities to support the integration of renewable energies into Mali's electricity grids.

10. More specifically, the CIF-REI program aims to (i) reduce the financial, technical and operational barriers to the integration of renewable energy generation into the Malian electricity grid; (ii) support the development of an appropriate infrastructure, including favorable conditions, for increasing quantities of variable renewable energies to be incorporated into grid and off-grid systems.

Investment program

11. The program operationalizes the global operational objectives so that they contribute to improving access to renewable energies with a view to reducing greenhouse gas emissions and unlocking Mali's potential for inclusive social and economic development (including the gender dimension and social injustice that engender grievances towards authorities). More specifically, the program aims to reduce the financial, technical, regulatory and operational barriers that hinder the integration of intermittent renewable energy production into the interconnected grid and isolated centers. To achieve this, the program will use its resources to support the development of appropriate infrastructure and favorable conditions for the integration of increasing quantities of variable renewable energies into the power grid.

12. Concessional CIF-REI resources will catalyze Multilateral Development Bank financing, private investment and other co-financing in the infrastructure and technical assistance projects needed to meet the country's decarbonization and energy transition commitments.

Expected results

13. The IP will serve as a strategic guidance framework in support of the Government of Mali's policies and priorities in its efforts towards zero net emissions and inclusive, climate-resilient development pathways. The expected results are in line with and will directly feed into the country's national and international commitments to mitigate and adapt to the effects of climate change and will also help support socio-economic development in the targeted areas. Ultimately, more than 710,000 tons of carbon equivalent will be avoided/reduced annually through the implementation of priority projects of the CIF-REI investment program, including the construction of enabling transmission lines for the integration of higher share of renewable energy into the grid and off-grid solar PV plants in rural areas.

14. Most of the solar production capacity initiated by the Investment Plan is financed, built and operated by private companies, which means that private capital and know-how can be mobilized on a large scale.

15. CIF-REI's initial concessional resources of USD 32.6 million, combined with a second allocation of USD 37.4 million once additional funding become available, USD 70 million REI resource in total, will enable the mobilization of USD 619.93 million in co-financing to support the priority projects identified, the implementation of which will produce the following results: (i) Increased share of renewable energies in Mali's energy mix; (ii) Improved electricity supply to industrial and domestic consumers; (iii) Improved management of electricity demand and supply; (iv) Reduced legal obstacles to the integration of renewable energies in Mali.

Socio-economic co-benefits

16. The implementation of the investment program, in particular the construction of transmission lines and mini-grids, will directly and indirectly generate more than 5,400 green jobs. Access to energy will contribute to the economic development of the targeted areas through the creation of new income-generating activities and the scaling-up of existing energy-dependent activities. Access to energy will also contribute to improving the living conditions of target populations through social benefits including improved health services and a greater sense of security. Access to electricity contributes to gender equality by fostering economic emancipation, improving educational opportunities, enhancing health and well-being, reducing the burden of household chores, particularly for women and children, and improving safety and security. It plays an essential role in empowering women and girls, enabling them to participate actively in the various spheres of life and promoting overall development in developing countries.

Investments

17. The investments planned in the IP cover three key components and fourteen activities.

Components & activities
Component 1: Financing to accelerate investment in the modernization and development of electricity infrastructure and storage systems for better integration of renewable energies into Mali's electricity grids.
<i>Activity 1.1a: Construction of the 225 kV North Loop around Bamako</i>
<i>Activity 1.1b: Deployment of smart meters for medium-voltage and large consumers in the Bamako region</i>
<i>Activity 1.2: Construction of the 225 kV Kayes -Yelimané line</i>
<i>Activity 1.3: Construction of the 225 kV Koutiala - San- Mopti double-circuit line</i>
<i>Activity 1.4: Investment in storage systems for the Safo and Kambila solar power plants (75 MW/75MWh)</i>
<i>Activity 1.5 - Construction of the 225 kV Ségou - Bamako line</i>
<i>Activity 1.6 - Construction of a 225 kV loop around Kayes ("mining loop")</i>
<i>Activity 1.7 - Construction of a 225 kV Manantali - Bamako double-circuit line</i>
Component 2: Financing for the construction of mini-grids and the development of Mali's renewable energy potential- Solar park grid connection infrastructure
<i>Activity 2.1: Building mini-networks</i>
<i>Activity 2.2 Critical network infrastructure for integrating solar power generation into the grid</i>
<i>Activity 2.3: Strengthening the remote monitoring of mini-power stations</i>
<i>Activity 2.4: Construction/reinforcement and equipping of two test laboratories for quality control of solar equipment and energy-related products</i>
Component 3: Technical assistance
<i>Activity 3.1a: Carry out feasibility studies, including technical, economic, financial and ESIA studies, in preparation for future investment operations.</i>
<i>Activity 3.1b: Drawing up an electricity grid code: including in particular the regulation of technical interfaces for connecting renewable and storage power plants to the interconnected grid.</i>
<i>Activity 3.2: Capacity-building for sector players (EDM-SA, AMADER, DNE, CREE, AER, Ministry) through training and south-south and north-south exchanges to increase knowledge of managing the evolution of the power systems inherent in the development of smart grids and the integration of renewable production sources.</i>
<i>Activity 3.3: Technical assistance to adapt the legal and regulatory framework governing the energy sector in Mali</i>

Table 1 Components & activities

Program coordination

18. A strategic coordination mechanism will ensure the strategic coordination of the program, so that investment projects do not operate separately outside the programmatic approach defined by the Government. The proposed mechanism will ensure that information on best practices and lessons learned is shared nationally and internationally, and that the benefits of RE are fully understood by the public. The strategic coordination mechanism will implement the following activities: knowledge management and information sharing; communication and advocacy; program-level monitoring and evaluation; and cross-functional capacity-building initiatives.

Sources of funding and justification of funding

19. CIF REI Mali has adopted a pro-active strategy to mobilize the necessary additional financial resources from MDBs and other technical and financial partners. The total investment budget is estimated at USD 672.53 million, with a CIF contribution of USD 32.6 million, combined with a potential second allocation of USD 37.4 million through the REI programme and USD 120 million from the SREP programme, including USD 18 million of SREP resources and USD 102 million of co-financing.

Section I: Country Context

01. Geographic and climatic context. The Republic of Mali is located between 11° and 25° north latitude and covers an area of 1,246,814 km², 51% of which is desert. Mali is a landlocked Sahelian country in West Africa, more than 800 kilometers from the nearest coast. The climate is intertropical with a Sudano-Sahelian character, highly variable and characterized by a long dry season and a rainy season averaging one month in the north (in the Timbuktu region) to five months in the south (in the Sikasso region). Rainfall (from 1,200 mm/year in the Sudano-Guinean zone to 200 mm/year in the Saharan zone) has led to a climatic stratification of the country into four main zones, corresponding to four ecological zones with highly diversified agricultural potential.

02. The hydrographic network is made up of two major rivers, the Niger and the Senegal, forming huge watersheds (300,000 km² for the Niger, and 155,000 for the Senegal). The total flow potential of these two river systems is estimated at 56 billion m³ per year, and the country's hydropower potential is currently estimated at nearly 1 GW. Electricity generation is vulnerable to climate variability, since a significant proportion of the supply to the EDM-SA network comes from hydroelectric power plants¹.

03. Socio-economic context. In 2021, Mali's population is estimated at 21.9 million, with an annual growth rate of 3.2%. Around 55% of the population lives in rural areas. The urbanization rate is 45%, but is steadily increasing². Population growth is a major concern for the country, as it implies a sharp increase in basic needs, which will put additional pressure on energy production. It also implies that a significant proportion of the Government of Mali's budget will have to be devoted to non-productive sectors (for example, the proportion of the budget devoted to education has risen steadily in recent years).³

04. Economic growth. Economic forecasts for Mali predict an upturn in economic activity in 2023. After declining to 2.5% in 2022 (from 3.1% in 2021) due to the negative impact of ECOWAS and West African Economic and Monetary Union (UEMOA) sanctions, combined with the Covid pandemic and the war between Ukraine and Russia, growth should increase to 5.2% in 2023 and 5.5% in 2024, driven by the expected recovery in cotton production, extractive activities (lithium mining), industrial gold production, the launch of new industries, and the restructuring of ailing industries.

05. Inflation and monetary policy. After reaching 8.2% in 2022, inflation could fall back to around 3.0% in 2023, as cereal production continues to improve (+7.7% and +5.1% respectively), coupled with the government's decision to implement a safeguard measure suspending the export and re-export of cereals until further notice. To bring inflation back within the Central Bank's target range (1% to 3%) over the medium term, the Monetary Policy Committee of the Central Bank of West African States (BCEAO) decided on March 1, 2023 to raise by 25 basis points (i) its main key rate to 3% as of March 16, 2023 (from 2.75% on December 16, 2022), and (ii) its marginal lending rate to 5% as of March 16, 2023 (from 4.75% on December 16, 2022).

06. Budget deficit. The budget deficit will be 4.7% of GDP in 2023 and 3.2% in 2024 (compared with 5.6% in 2022), due to the continuation of tax reforms and the policy of rationalizing expenditure, with the introduction of the Integrated Management System for civil servants expected to lead to a contraction in

¹ EDM annual activity report (2020)

² <https://data.worldbank.org/indicator/SP.POP.TOTL?end=2021&locations=ML&start=1960&view=chart>

³ <https://odi.org/en/publications/lappui-budgetaire-les-instruments-daide-et-lenvironnement-le-contexte-national-mali/>

current expenditure. The difficulties encountered by Mali in mobilizing resources on the WAEMU financial market (of the first five issues of public securities in 2023, four were unsuccessful, with coverage rates ranging from 91.73% in February 2023 to 34.49% in March 2023), combined with the non-existence of budgetary support, raise concerns about the coverage of the financing requirement in 2023, estimated at USD 2.4 billion. These concerns are all the more justified given that the government's objective is to mobilize USD 2.3 billion on the financial market in 2023 (i.e. 94.8% of the financing requirement).

07. Public debt. According to estimates, public debt could rise from 53.9% of GDP in 2022 to 55.3% in 2023. The debt outlook assumes two types of risk: (i) a crowding-out effect on credit to private companies from 2023 onwards, when domestic debt (28.6% of GDP) is expected to exceed external debt (26.7% of GDP), leading to concerns about its sustainability, and (ii) a risk of high concentration of domestic debt maturity (68% of outstanding debt matures between 2023 and 2027), inducing pressure on public finances and thus shrinking fiscal space.

08. Current account deficit. After reaching 8.4% in 2022, the current account deficit is expected to decline to 7.7% of GDP in 2023, in line with the continued implementation of the 2022-2025 action plan of the National Export Development Strategy aimed at increasing exports by 25% by 2025, and the 2021-2025 action plan of the National Strategy for the Implementation of the African Continental Free Trade Area.

09. Political transition. Mali is continuing its political transition towards a return to constitutional order, scheduled for 2024. Political, institutional and electoral reforms are being implemented. The draft of the new Constitution has been drawn up, and the referendum process for its adoption has begun. On the other hand, the process of preparing for elections is continuing, with: (i) the adoption, on February 28, 2023, of a bill amending the new electoral law; and (ii) the adoption, on February 20, 2023, of draft texts relating to the administrative and territorial reorganization of Mali. Delays have been noted in the execution of the timetable, mainly linked to the process of installing the regional branches of the Independent Electoral Management Authority (AIGE) (more than six months). The referendum for the new constitution was approved on 18 June 2023. 97% voters said yes to the constitution amendments which include amongst others: (i) the creation of two new regions in line with a 2015 agreement with separatists in northern Mali; and (ii) provisions for more powers of the [President](#), transforming the country to a kind of [presidential system](#) with the post of prime minister remaining.

10. Multidimensional crisis. Since 2012, Mali has been experiencing a crisis characterized by the near-absence of public and local administration (mainly in the northern and central regions of the country), political instability, inter-community conflicts, underdevelopment, poverty, droughts and floods, food insecurity, the closure of socio-economic structures (schools and health centers, etc.), and the almost total halt to economic activity. This situation has had a major impact on the lives of communities and individuals. It has led to major population movements within the country and towards countries bordering Mali. These populations are confined to refugee camps or to the homes of inhabitants in areas where there is relative calm.

11. As of February 2021, there were 5.9 million people in need of humanitarian assistance; 358,212 people are estimated to be refugees or internally displaced persons; 950,000 people require food assistance. Inter-community violence has also increased in the south-central part of the country. Of the total number of protection incidents, 35% were recorded in Mopti (in the center of the country). The number of internally displaced people, which stood at 311,193 in October 2020, has risen to 353,455 in 2021.

12. International humanitarian aid organizations, Mali's technical and financial partners (bi- and multilateral cooperation), international and local NGOs and the Malian government are working tirelessly to help populations affected by the crisis. These salutary interventions are often limited to emergency aid, and often with enormous constraints.²

13. Social conditions. The overall situation is improving. Economic recovery in 2023 will bring the extreme poverty rate down to 44.7% in 2023 from 45.4% in 2022, indicating that the number of poor people will fall by 50,000 a year. Access to basic social services will be hampered by insecurity in 2023, although there have been recent improvements on the ground. The humanitarian situation will continue to give cause for concern in 2023, with the number of people in need of humanitarian aid rising by 17%⁴. However, Mali is one of the poorest countries in the world, ranking 186th out of 191 countries⁵. In 2021, GDP per capita is estimated at 745 USD (constant 2015), while world GDP per capita is estimated at 11,011 USD. Despite the efforts of recent years and the major projects underway, Mali has yet to remedy major shortcomings in terms of access to basic services.

14. National and international climate strategies and plans. Mali committed itself to combating climate change by signing the United Nations Framework Convention on Climate Change in 1994, the Kyoto Protocol in 1999 and the Paris Climate Agreement in 2016. Mali's NDC was established in 2015 and was revised and updated in 2021. The country drew up a National Program of Action for Adaptation to the Effects of Climate Change (PANA) in 2007 and its National Policy on Climate Change in 2011. The climate change dimension is integrated into the development planning process, notably in the implementation of the Strategic Framework for Economic Recovery and Sustainable Development (CREDD), which constitutes the single frame of reference for all the country's development policies for the period 2019-2023. It has also drawn up a strategic framework for the realization of a resilient and green Mali, which will enable the effective realization of a resilient, low-carbon economy, while giving fresh impetus to its growth and poverty reduction objectives.

15. On the legislative front, Mali is in the process of drafting legislation to combat climate change and preserve the environment. In addition to legislative texts on environmental preservation, the Government of Mali has adopted a law (Law No. 2020-009 of May 11, 2020) exempting renewable energy equipment from VAT and import duties and taxes. The exemption offers easy access to RE equipment, and therefore acts as a catalyst in terms of the volume of use of such equipment by private individuals, and above all encourages private investors to build large-scale RE power plants at reasonable cost. As a result, this tax exemption initiative will considerably reduce CO₂ emissions and help combat climate change.

16. At the institutional level, the Ministry of the Environment, Sanitation and Sustainable Development is responsible for taking climate change into account. It has entrusted the Environment and Sustainable Development Agency (AEDD) with the task of managing the various aspects of climate change. Mali has also set up a National Committee for Climate Change (CNCC), which is a forum for consultation, guidance and mobilization of the country's forces.

17. Mali has adopted a national low-carbon energy strategy as part of its efforts to reduce greenhouse gas emissions and adapt to climate change. The strategy aims to promote the use of renewable energy

⁴ Note: The Bank's Statistics Department is currently revising the macroeconomic projections for Mali and all RMCs. Therefore, as soon as the new projections are available, this economic analysis should be modified.

⁵ <https://hdr.undp.org/data-center/human-development-index#/indicies/HDI>

sources and reduce dependence on fossil fuels. Among the measures included in this strategy are the promotion of solar and wind energy.

18. RE potential. Mali has significant solar and wind energy potential, and its strategy aims to encourage the development of these energy sources. This may include setting up subsidy programs to support (directly) the development of renewable energy projects, as well as technical measures (storage, grid rehabilitation) and technical and legal assistance (market studies, drafting of legal texts and regulations) promoting the use of these energy sources. To this end, in 2021 it drew up the Master Plan for Low-Cost Production (PDPMC 2040), which defined the requirements for renewable energy production sources.

19. There are a number of shortcomings and obstacles that have hampered the effective implementation of climate strategies and plans. Firstly, the country's weak institutional capacity and limited financial resources. The lack of qualified personnel and technical resources has also limited the country's ability to effectively implement its climate strategies and plans. Mali also faces a number of economic and social challenges that can hamper the effectiveness of its climate strategies and plans. For example, the country faces poverty and food insecurity, making it difficult to adopt sustainable technologies and practices that could reduce greenhouse gas emissions.

20. Gender situation. In Mali, women are often the hardest hit by the effects of climate change, due to their dependence on agriculture and water for their livelihoods and their limited access to resources and opportunities. In addition, women are often excluded from decisions relating to the use and management of natural resources, which limits their ability to participate in political processes. It is therefore important to ensure that development strategies take into account the different experiences and needs of women and men, and that they are equitably involved in the implementation of these efforts. This can include equitable access to resources and opportunities, as well as the active participation of women in decision-making processes. In addition to the income-generating activities that electricity can bring to women, the following actions are likely to bring about real positive change: (i) increasing the representation of women in jobs in the electricity sector; (ii) improving working conditions for women in the electricity sector; (iii) promoting equitable access for all to electrical services. The Malian legislator has already passed a law that reinforces the consideration of gender in all positions, including elective mandates.

21. At regional level, ECOWAS, in its Regional Policy⁶, has proposed a series of activities to be carried out. These include: (i) conducting a gender assessment/gender audit of the energy sector; (ii) collecting gender-disaggregated data on energy use, production and service provision; (iii) raising gender awareness among Ministry of Energy staff; (iv) conducting public awareness campaigns; (v) supporting scientific research on gender and energy.

22. At national level, the program could strengthen the capacities of the Gender Unit of the National Energy Directorate (DNE) and all the structures of the departments and agencies in charge of energy, as well as support initiatives to promote women players in the energy sector: training for female promoters, scholarships for high school or university students in energy sciences and techniques, support for local manufacturing units of energy-saving equipment. More broadly, the program could support the Malian

⁶ National action plan for the implementation of the regional policy on gender mainstreaming in energy access in Mali, October 2020

authorities in implementing the national gender and diversity policy⁷. In this regard, the implementation of the IP will be aligned with ongoing initiatives such as through the AfDB Desert to Power G5 Sahel Financing Facility which will support gender mainstreaming in Mali. This concerted effort will involve: (i) carrying out a communication campaign to disseminate the relevance of integrating gender and diversity aspects when submitting proposals; (ii) supporting gender mainstreaming⁸ in all proposed projects and technical assistance; (iii) providing training activities to increase women's technical knowledge of renewable energy, electrical energy storage and financial market opportunities, among others; (iv) implementing training activities to increase the knowledge of Implementing Agency (IA) staff on gender and diversity issues; (v) promoting female workforce participation in the sector through employment and skills programs targeting women and other social sub-groups; (vi) selecting suppliers willing to promote gender equality.

⁷ On November 12, 2015, Mali's National Assembly passed a landmark gender quota bill. The new law, which requires at least 30% of elected or appointed civil servants to be women.

⁸ Gender mainstreaming is the process of assessing the implications for women and men of any planned action, including legislation, policies or programs, in all areas and at all levels. It is a strategy for making women's and men's concerns and experiences an integral part of the design, implementation, monitoring and evaluation of policies and programs in all political, economic and societal spheres, so that women and men benefit equally and inequality is not perpetuated. The ultimate goal of mainstreaming is to achieve equality between women and men. ECOSOC. 1997.

Section II: Background to the Integration of Renewable Energies

2.1. Electricity Sector Background

23. Mali adopted a National Energy Policy (PEN) in 2006. Its overall objective is to contribute to the country's sustainable development, through the provision of energy services accessible to the greatest number, at lower cost and favoring the promotion of socio-economic activities. In 2018, Mali, with the support of the AfDB, undertook a review of the NEP and other fundamental sector documents to adapt them to the sector's current context and take on future challenges, notably the priority given to Renewable Energies. The documents in question are: the National Energy Policy (PEN); the National Renewable Energy Development Strategy; the National Strategy for the Development of Energy Management; the Rural Electrification Framework 3; the sector's institutional framework; Ordinance N°00-019 /P-RM of March 15, 2000, on the organization of the sector; and Ordinance N°00-021/P-RM of March 15, 2000 creating and organizing the Electricity and Water Regulatory Commission.

24. Several characteristics stand out in Mali's energy context. Demand for energy is growing strongly, while production capacity remains relatively low in relation to this growing demand. The sector benefits from costly state subsidies but is heavily dependent on oil imports.

25. Household energy consumption is mainly dominated by biomass. However, the sector faces difficulties in mobilizing the financing needed for its development, including for research and development. High electricity tariffs are not adapted to consumers' ability to pay, limiting access to electricity.

26. Instability in the north of the country since 2012 has been a major constraint to the development of energy projects in this region because of constant threats on security and safety of workers, project staff and beneficiaries. Access to electricity remains low throughout the country. In addition, complex and non-transparent administrative procedures hamper the construction of power generation facilities.

27. Coordination and information sharing between different projects, government agencies, the private sector and civil society organizations are inadequate. Finally, the sector suffers from insufficient human resources and institutional capacity.

Key industry data for 2020/21

28. The national electrification rate is 78.5%, including 24% in rural areas where over 70% of the country's total population, estimated at 21 million, live. The energy balance is characterized by the following ratios⁹:

- Biomass in total energy consumption 77%;
- Petroleum product in total energy consumption: 18%;
- Electricity in total energy consumption: 5%;
- Very strong growth in electricity demand, averaging more than 10% per year;
- Large share of thermal power in the energy mix on the interconnected grid: 38.5%;

⁹ 2021 EDM SA report

- Annual production 2,810 GWh (interconnected network + isolated centers in 2021) compared with 2,595 in 2020;
- Number of subscribers on the interconnected network (2021): 665,713 compared with 602,890 in 2020;
- Number of isolated center subscribers (2021): 83,312 (vs. 81,347 in 2020).

29. Main electricity suppliers. Electricity is mainly supplied by Energie du Mali EDM-SA, the main concessionaire of the public electricity service, via the interconnected grid and the networks of isolated centers, the networks of rural electrification operators of the Malian Agency for the Development of Domestic Energy and Rural Electrification (AMADER), and the electricity production facilities of independent producers (IPPs) and self-producers. Electric power in Mali is generated by the following sources:

- thermal power plants;
- hydroelectric power plants;
- solar power plants;
- individual stand-alone sources (kits, etc.);
- electricity purchases;
- electricity imports from Côte d'Ivoire, with Guinea and Ghana in the pipeline;
- in 2021, EDM-SA will provide public electricity service in 68 localities, including 35 on the interconnected network, 31 isolated centers and two supplied by the Ivorian network.

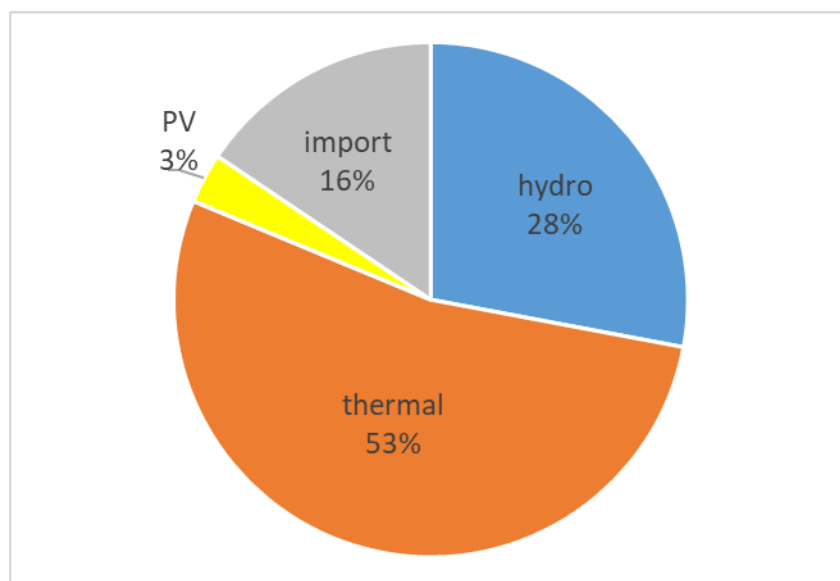


Figure 1 Electricity mix (% GWh), 2021

30. Characteristics of the network (interconnected network and isolated centers) and generation plants. EDM-SA's transmission and distribution network is made up of two components: (i) the interconnected network serving a number of urban centers, including the capital; and (ii) 21 isolated centers, mainly served by thermal power plants operated by EDM-SA. The interconnected network is supplied by five power stations owned by EDM-SA, with an installed capacity of 180 MW, divided between the Sélingué (48 MW) and Sotuba (6 MW) hydroelectric power stations, and the Dar Salam (37 MW), Balingué DEUTZ (21 MW) and B.I.D (68 MW) thermal power stations.

31. These include Manantali, with an installed capacity of 200 MW, of which 104 MW is Mali's share (SOGEM10); Félou, with an installed capacity of 65 MW, of which 27 MW is Mali's share (SOGEM); and Gouina, with an installed capacity of 140 MW, of which 47.6 MW is Mali's share (SOGEM) since 2022. 50 MWp solar power plant in Kita, operated by AKUO Energy.

32. Independent producers with thermal power plants include SOPAM, which operated a thermal power plant with an installed capacity of 56 MW on a BOOT basis¹¹. As the concession expired in May 2016, the plant was transferred to the government in 2016 and has been non-functional since May 2017, and ALBATROS, which also operates a BOOT thermal power plant with an installed capacity of 90 MW, 66 MW of which is guaranteed.

33. Rental plants include AGGREKO in Balingué (20 MW), Kati (22 MW) and Darsalam (18 MW), SES in Lafiabougou (40 MW) and Sirakoro (10 MW), and AKSA in Sirakoro (40 MW).¹²

34. The interconnected grid, operated by Energie du Mali SA, mainly supplies the capital Bamako and several of the country's main towns, especially in the southwest of the country. Electricity is transmitted via 30/33 kV, 63 kV, 150 kV and 225 kV lines, with future transmission projects also envisaging voltages of 90 kV and 330 kV.

35. To connect production centers and supply consumption sites, the transmission network is structured according to several voltage levels. These are as follows:

- the main transmission networks (225 kV and 150 kV) are the country's arteries and interconnections with neighboring countries to evacuate electricity from production sites;
- the distribution network (63 kV, 33 kV and 30 kV) supplies local areas.

36. The country's power transmission network comprises some 1,640 km of electrical circuits at all voltage levels. The existing transmission lines in 2021 are as follows:

- 225 kV lines with a total length of 390 km;
- 150 kV lines with a total length of 377 km;
- 63 kV lines with a total length of 226 km;
- 30 and 33 kV lines with a total length of 649 km.
- 14 substations (HV/MV) form the nodes of the electrical network and direct the flow of electricity to the localities served. Network losses are in the order of 15-20% (Interconnected network / Isolated centers).¹³

37. Mali currently has two international interconnections, one with Senegal (OMVS network, which mainly transfers hydroelectric power from the Manantali, Félou and Gouina dams to Senegal and Mauritania) and the other with Côte d'Ivoire. Other international interconnections, also for imports, are planned for the future with Mauritania, Burkina Faso and Guinea.

38. **Characteristics of off-grid electricity generation, rural electrification.** Over the past fifteen years, Mali has implemented a policy of rural electrification (off-grid) designed to increase access to modern energies, and in particular electricity, in rural areas. Since its operationalization in 2003, with the

¹⁰ The Société de Gestion d'Énergie de Manantali (SOGEM) is a public inter-state company whose purpose is to operate, maintain and renew shared facilities, as well as to design, build and finance certain works on behalf of OMVS.

¹¹ Build-Own-Operate-Transfer

¹² AGGREKO end of contract 2022, SIS and AKSA end of contract 2026

¹³ see : Optimal Investment Master Plan for Mali's electricity sector

introduction of the internal procedures needed to manage the administrative, financial, technical, legal and regulatory aspects of rural electrification in Mali, AMADER has enabled the electrification of around three hundred rural localities with various types of public and private financing. Rural electrification projects essentially comprise a hybrid power plant (solar PV + diesel with battery storage) and a distribution network. The use of renewable energies aims to reduce tariffs by cutting fossil fuel consumption and extending service life.

39. Despite the Government of Mali's efforts to subsidize investment in rural electrification projects through loans from donors, it must be acknowledged that implementation of the rural electrification strategy remains mixed. A number of difficulties inherent in the planning, investment, operation of installations and economic, financial and social evaluation of projects are compromising their sustainability.

40. AMADER's new approach to sustainable rural electrification, based on the provision of energy services accessible to the greatest number of the population at the lowest cost and promoting socio-economic activities, will certainly reduce the difficulties associated with access. This initiative is in line with Mali's overall plan to achieve universal access to electricity by 2030, notably through the development of a National Strategy for Access to Electricity.

2.2. Renewable Energy Portfolio Analysis

41. For several years now, Mali has been exploiting the potential of renewable energies through mainly small-scale installations and devices, targeting all available renewable energy sources and building the capacities of the players involved. While large-scale hydroelectric projects have been under way for several decades, considerable development and testing of small-scale solar energy applications has taken place in recent years. Various small-scale solar thermal and photovoltaic applications have been tested and adapted to local conditions for a variety of uses (lighting, pumping, refrigeration, cooking, drying in agriculture or fruit production, heating in health centers and households, solar home systems for households and community institutions, etc.).

42. As mentioned above, the interconnected grid has already seen the implementation of an initial 50 MW solar power plant, operated since 2020 by independent power producer Akuo Energy. Several similar projects are currently being planned by other private developers, as well as by EDM and within the framework of West African Power Pool (WAPP) and OMVS. In total, the portfolio of planned solar PV projects already totals some 1,400 MW of power up to 2030.¹⁴

43. For Mali to take full advantage of its renewable energy resources, it will need to put in place various actions such as scaling up energy storage investments, reinforcing and densifying power transmission lines to facilitate the connection of new photovoltaic power plants, routing large quantities of renewable energy to consumption centers, integrating greater intelligence into the grid to facilitate operation, adding greater storage capacity to smooth solar production and provide flexibility options (see PDPMC results). It is also important to take into account the evolution of the institutional and regulatory framework to accompany the development of IPP projects, as well as the capacity-building needs of the sector's players, taking into account the gender dimension and inclusivity for social cohesion.

¹⁴ A list of projects (PV and storage) has been proposed in Fichtner's study on the maximum integration of solar energy (2023).

2.3. Involvement in Zero-Carbon Energy Strategy

44. Mali accounts for just 0.05% of global emissions, making it a low-emission country. However, Mali is committed to reducing its emissions under international agreements. The use of renewable energies has a positive impact on the climate and the environment, as the quantity of greenhouse gases released into the atmosphere is limited compared with fossil fuels.

45. Mali has committed itself to combating climate change by signing the United Nations Framework Convention on Climate Change (December 28, 1994) and the Kyoto Protocol (January 27, 1999). Mali has ratified the majority of Multilateral Environmental Agreements, notably :

- the Convention to Combat Desertification, adopted in Paris on June 17, 1994 and ratified by Mali on October 31, 1995
- the Convention on Biodiversity adopted on May 22, 1992
- Paris Climate Agreement ratified on September 23, 2016.

46. The country also drew up its National Adaptation Program of Action (PANA) in 2007. It has submitted its first, second and third national communications to the Convention, and its first Biennial Report is currently being validated.

47. Mali also drew up its National Policy on Climate Change back in 2011, accompanied by a Strategy and Action Plan. Here, the country is integrating the environmental dimension in general and climate change in particular into its development planning processes, notably in the implementation of the Strategic Framework for Economic Recovery and Sustainable Development (CREDD), which constitutes the single frame of reference for all the country's development policies for the period 2019-2023.

48. The government has also drawn up a Strategic Framework for the Realization of a Resilient and Green Mali, which will enable the effective realization of a resilient, low-carbon economy, while giving fresh impetus to its economic growth and poverty reduction objectives.

49. On the legislative front, Mali is in the process of drafting legislation to combat climate change and preserve the environment, such as Law No. 2020-009 of May 11, 2020, which exempts renewable energy equipment from VAT and import taxes.

50. At the institutional level, the Ministry of the Environment, Sanitation and Sustainable Development is responsible for taking climate change into account. It has entrusted the Environment and Sustainable Development Agency (AEDD) with the task of managing the various aspects of climate change.

51. Mali has also set up a National Committee on Climate Change (CNCC), which is a forum for consultation, guidance and mobilization of the country's strengths. This committee is regularly consulted to support the teams preparing the national contribution.

52. The activities of this Investment Plan are in line with Mali's three-pronged climate strategy. The country receives funding to combat climate change from a variety of sources, including funds under the Paris Convention, support from technical and financial partners, and bilateral and multilateral development banks.

53. As part of the implementation of the actions of the new NDC, the Strategy has been developed along three lines:

Axis 1: Project portfolio development: The mobilization of financial resources is strongly linked to the availability and quality of projects or programs. Projects will be prioritized in an Investment Plan like the one presented here.

Axis 2: Improve access to sources of financing by increasing the number of direct access entities and, above all, by creating a framework for operational cooperation with international entities operating in Mali.

Axis 3: Improve internal mobilization through State co-financing via the special investment budget to facilitate international resource mobilization.

54. The mobilization and approval of additional CIF-REI and other CIF Program resources to support the implementation of the programs identified in the CDN is a prerequisite if Mali is to achieve its GHG reduction targets by further integrating renewable energies. It is in this context that Mali will embark on a low-carbon economic development trajectory that is resilient to climate change, and contribute to global efforts to stabilize greenhouse gas emissions.¹⁵

2.4. Institutional Landscape and Regulatory and Legal Framework

55. Sector institutions. The sector is managed by the Prime Minister's Office, which oversees the regulatory body, the Water and Electricity Regulatory Commission, five ministerial departments, four central technical services, and four services under the Ministry of Mines, Energy and Water. These include the National Energy Directorate (DNE), whose mission is to draw up the elements of the national energy policy, and to coordinate and control the sector.

56. Sector players. The main players in Mali's electricity sector fall into four categories: state players, civil society organizations/NGOs, the private sector and technical and financial partners (donors).

State actors

57. Ministère des Mines de l'Énergie et de l'Eau (MMEE) – supervisory department: Plays an overall supervisory and coordinating role for all energy-related activities in Mali. It draws up energy policies, defines strategic priorities and oversees the implementation of various initiatives in the energy sector.

58. Direction Nationale de l'Énergie (DNE) - central service: Responsible for planning, coordinating and monitoring activities in the energy sector. The DNE is responsible for energy policy development, data collection, promotion of renewable energies and energy efficiency, and supervision of rural electrification activities.

59. Agence des Énergies Renouvelables - Mali (AER-Mali): AER-Mali is responsible for promoting and developing renewable energies in Mali. AER-Mali facilitates access to information and technical resources, provides advice and consultancy services for renewable energy projects, and plays a key role in mobilizing investment in this sector.

60. Agence Malienne pour le Développement de l'Énergie Domestique et de l'Électrification Rurale (AMADER): Responsible for rural electrification and improving access to domestic energy in Mali. AMADER implements programs and projects aimed at providing clean, affordable energy to rural populations, with an emphasis on decentralized renewable energies.

¹⁵ Ministère de l'Environnement de l'Assainissement et du Développement Durable: Contribution Déterminé au Niveau National révisé (2021)

61. Agence Nationale de Développement des Biocarburants (ANADEB): Responsible for promoting and developing the use of biofuels. ANADEB encourages the production and sustainable use of biofuels, focusing on energy crops, research and technological development, as well as awareness-raising and training.
62. Agence pour l'Environnement et le Développement Durable (AEDD): Responsible for protecting the environment and promoting sustainable development. AEDD provides advice and technical support in assessing the environmental impact of energy projects, managing natural resources and raising awareness of environmental issues.
63. Cellule d'Appui à la Décentralisation/Déconcentration de l'Energie et de l'Eau (CADDEE): This unit is responsible for promoting the decentralization and deconcentration of activities in the energy and water sectors in Mali. CADDEE facilitates coordination between local players, local authorities and technical services in the implementation of decentralized energy projects.
64. Commission de Régulation de l'Electricité et de l'Eau (CREE): The CREE is responsible for regulating and monitoring the electricity and water sectors in Mali. It oversees the application of regulations and standards, ensures transparency and competition in the electricity and water markets, and protects consumer rights. CREE sets tariffs, regulates access to the electricity network and supervises the activities of players in the sector.
65. Énergie du Mali (EDM-SA): This is Mali's public electricity company. It is responsible for producing, transporting, distributing and marketing electricity throughout the country. EDM-SA operates electricity infrastructures, maintains the network, manages supply contracts and invoices consumers. Its role is essential in ensuring access to electricity and energy supply in the country.
66. Office National des Produits Pétroliers (ONAP): ONAP is responsible for managing and regulating the petroleum products sector in Mali. It is responsible for supplying petroleum products, managing stocks, controlling quality, setting prices and supervising the activities of players in the sector. ONAP ensures the availability and efficient distribution of petroleum products throughout Mali.
67. Public-Private Partnership & Investment Agency Unit: This unit is responsible for promoting public-private partnerships and attracting investment in Mali's energy sector. It facilitates collaboration between the public sector and private investors, promotes renewable energy projects and offers assistance services to investors. Its role is to promote the development of energy infrastructure and stimulate investment in Mali's energy sector.
68. Civil society organizations/NGOs. NGOs (national and international), cooperatives, women's and socio-professional organizations, consumer associations, etc. play a very important role in the development of renewable energies in Mali. These organizations are involved in implementing projects (of modest size) in the field, often for the benefit of disadvantaged people (in urban and rural areas); raising awareness/informing people about the advantages of using RE, etc. These organizations remain an essential segment for the development of renewable energies in Mali. These organizations remain an essential segment for the dissemination of RE and energy-saving equipment, replacing or complementing state intervention. They will be called upon to play an important role in implementing the program, particularly at the level of domestic consumers, but also in setting up productive uses of energy (women's associations, craftsmen, etc.).

69. The private sector. In the energy sector, the private sector is made up of different players, not only in terms of size but also in terms of sector of activity: (i) Independent electricity producers (national or foreign): they operate under concessions granted by the Government of Mali; they produce either from large-capacity thermal power plants or solar power plants; their electricity production is sold to EDM-SA under electricity purchase and sale contracts. (ii) Rural electrification operators (local private operators): they operate in the field of rural electrification through public-private partnerships with AMADER, in line with the rural electrification reference framework. There are more than thirty of them involved in over three hundred electrification projects. (iii) Equipment importers and installers: they form the core group for the import (manufacture), distribution and installation of renewable energy equipment. This highly dynamic group has real expertise in the installation of PV (+storage), lighting, refrigeration/air conditioning, pumping and other motorization systems, and provides after-sales service. These players are grouped together in a number of socio-professional organizations. The private sector will play a key role in implementing the program, particularly in terms of components 1&2. A number of activities, particularly in terms of technical and financial capacity building, are also envisaged.

70. Technical and financial partners (donors). They participate in the financing of projects and programs through public or private institutions. These are essentially: the World Bank, the African Development Bank, the International Finance Corporation, the United Nations Development Program, the European Union Delegation (not exhaustive). Development partners (bilateral cooperation). Within the framework of bilateral cooperation, they are involved in financing projects and programs through public or private institutions. These include GIZ, KfW (Germany), USAID, Danish Cooperation (DANIDA), Agence Française de Développement (AFD), Belgian Cooperation, Dutch Cooperation and India (not exhaustive).

71. Technical and financial partners are involved in Mali's energy sector, focusing on reforming the sector and strengthening production and distribution network capacities (including rural electrification). In terms of renewable energies, multilateral and bilateral partners are investing both in equipment and in technical assistance/capacity building.

72. In Mali, TFPs are actively involved in implementing the Paris Declaration, in partnership with the Government of Mali. A Joint Country Assistance Strategy (SCAP) commits 14 partners, including the African Development Bank and the World Bank Group, to improving aid effectiveness and alignment with national priorities. TFPs are also organized into sectoral Thematic Groups, including the "Energy" group, chaired by the World Bank (rotating presidency). The partners coordinate their sectoral dialogue with the Ministry in charge of Energy within the framework of this thematic group.

73. In addition, human resource capacity in the electricity sector is limited, particularly in the areas of technical expertise and management skills, especially in view of new requirements such as the integration of renewable energies into the grid. There is a need to improve training and development programs (capacity building) in order to build a skilled workforce capable of operating and maintaining the electricity infrastructure efficiently.

74. As part of this Investment Plan, emphasis will be placed on the need to acquire new skills in the design and operation of electrical infrastructure to meet the challenge of Mali's ambitious plans to increase the injection of intermittent renewable energy production. Beyond purely technical measures, such as the installation of storage batteries and the reinforcement of networks, this involves the promotion of technical skills for the design, engineering, procurement and construction as well as the operation of facilities, but also legal knowledge with regard to the development of renewable energy legislation, Feed-in Tariffs (FITs), Power Purchase Agreements (PPAs) and the design of public-private partnerships.

2.5. The Role of the Private Sector

75. Public-Private Partnerships (PPPs) are a way of using private capital to enhance the impact of limited state financial resources. In a PPP, the private sector contributes the technical expertise, financial resources and innovative capacity needed to develop renewable energies more quickly and efficiently. It actively encourages private investment in renewable energy projects, particularly solar, wind and hydro power.

76. They can therefore be used to mobilize resources to meet the UN Sustainable Development Goal (SDG) for accessible, low-carbon energy by 2030, with limited government resources, etc. On this basis, the government has structured a program to promote private sector participation through PPPs.

77. The effectiveness of the enabling environment for private sector participation and PPP policies in Mali depends on a variety of factors, including political stability, economic conditions, investor confidence and the country's general business environment. While these risks and challenges remain significant, the CIF-REI Investment Plan will reduce the technical risks associated with the provision of transmission lines to address the significant deficits in transmission lines to evacuate key solar power plants. In addition, the Investment Plan will include measures to improve the country's regulatory situation. Mali benefits from the AfDB's G5 Sahel Desert to Power Financing Facility, which provides up to USD 16 million in partial risk guarantees as one of the financing instruments to reduce the risk of non-payment of IPPs. The GCF funds providing this guarantee will also be complemented by partial risk guarantees (PRGs) from the AfDB's African Development Fund (ADF) and potentially from SIDA (under discussion).

78. CIF-REI funds support this type of partnership by creating, through concessional financing, the conditions that enable private investors to participate in projects that would not otherwise be undertaken. This creates a leverage effect that multiplies the impact of the initial CIF investment.

79. As these measures also have the characteristics of public goods, since no market player can be reasonably excluded before their use, they are also additional to existing investment plans.

80. Other technologies for reducing CO₂ emissions include e-mobility. The Malian government recognizes the potential of this technology to reduce carbon emissions, improve air quality and promote public health. Electric vehicles, such as electric motorcycles, offer a clean and sustainable alternative to traditional means of transport.

81. The government plans to encourage the private sector to invest in the local manufacture or assembly of electric motorcycles in Mali. This could create local jobs, stimulate local industry and promote sustainable economic development.

82. To encourage private-sector participation, the government provides tax incentives, administrative facilities and favorable financing mechanisms. It also establishes public-private partnerships for renewable energy projects, thus providing a framework conducive to private investment.

83. The government's ambition is to create an enabling environment that attracts private investment in Mali's renewable energy sector. It recognizes that the involvement of the private sector is essential to achieving carbon emission reduction targets, developing a green economy and promoting sustainable development.

84. It should be noted that there are already a number of solar projects (candidates) from the Solar Integration Plan that are earmarked for private financing and whose realization will be facilitated by the improved integration of renewable energies by the CIF proposed in this Investment Plan.

85. The private sector is already involved in the development of renewable energy sources, notably solar, wind and hydroelectric power. The Malian government has introduced fiscal and financial incentives to encourage private investment in renewable energies, and has adopted a national energy strategy to promote the use of renewable energies. Since the end of EDM's monopoly on wholesale electricity markets in 2010, electricity generation has been opened up to the private sector. Initially, the current regulatory framework was not sufficiently supportive of private investment in the energy sector. However, the PPP law was only adopted in December 2016¹⁶ and several capacity-building programs have been implemented to improve the regulatory framework for private sector participation and launch the bidding processes for IPPs. Nevertheless, most IPP projects have been awarded on the basis of direct negotiations with higher tariffs than in neighboring countries, reflecting the equally high risks to which private investors are exposed in Mali's power sector.

86. **Sustained development of renewable energies.** From 2015 to 2020, there will be vigorous development of renewable energies. Already in 2015, 25 projects for hybrid power plants with associated or grid-connected mini-grids were recorded; seven agreements for PV power plants were signed; 10 memorandums of understanding for PV power plants were signed; and numerous projects for the distribution of solar lighting kits, solar lanterns and street lamps, and pico-solar equipment were implemented. In addition, two PV panel assembly units have been built by private operators.

87. Since 2015, 38 RE development projects have been approved, and public and private funding for RE projects has risen from USD 500 million in 2015 to USD 1,458 million in 2020, representing a clear increase in public and private funding. In addition to rural electrification projects, the financing of large-capacity power plants and projects in the country's northern regions by the United Nations system, bilateral cooperation and certain NGOs have had a considerable impact on this indicator. Between 2015 and 2020, investments in renewable energy projects under the Special Investment Budget (BSI) rose from 7% to 55%. From 2019 to 2021, agreements for the installation of around 1 GWp of solar power plants by private investors have been recorded.

¹⁶ Law no. 2016-061 of December 30, 2016

Section III: Program Description

3.1. Introduction

88. One of the priorities of Mali's energy sector is to make the most of the country's considerable potential. To this end, appropriate measures have been taken and others are in the process of being adopted to create a favorable environment for the development of renewable energies. These measures include (i) the institutional, legislative and regulatory framework; (ii) attractive conditions for PPP and private sector involvement; (iii) mobilization of financing.

89. In July 2010, Mali was selected as one of the pilot countries for the CIF's SREP (Scaling up Renewable Energy Program). This choice is justified, on the one hand, by the nature and scale of its climatic, environmental, demographic and energy problems and, on the other hand, by the Government's considerable efforts to tackle energy challenges. With the support of the AfDB, a SREP investment plan has been drawn up around four projects: Photovoltaic Solar Power Plant Project (CS-PV/PPP), Hybrid Systems for Rural Electrification Project, Mini/Micro Hydropower Development Project (PDM-Hydro) and the PAPERM (Project to Support the Promotion of Renewable Energy in Mali) ensuring strategic coordination, with SREP institutional coordination, monitoring/evaluation and communication as key missions.

90. The impact of SREP on the development of renewable energies in Mali is very significant: (i) the catalytic role of SREP funding, which has led to substantial additional financing (private and public); (ii) the involvement of a large number of private operators in the program; (iii) support for the government in drawing up documents (the National Energy Policy; the National Renewable Energy Development Strategy; the National Strategy for the Development of Energy Management; the Reference Framework for Rural Electrification; the institutional framework for the sector; etc.); (iv) capacity-building for all players; (iv) development of on-grid and off-grid renewable energy production capacities.

91. In view of the targets set for solar energy production, both in terms of quantity of energy and number of production infrastructures by the private sector, sub-regional organizations (ECOWAS), or major international programs (DtP), the challenges of making all this energy available to consumers (domestic and industrial) are enormous.

92. The integration of renewable energies into grids poses unique challenges: (i) Generation variability, leading to increased reserves / ramping requirements or reduced renewable generation; (ii) Location dependency, requiring upgrading of power transit capabilities in lines (distribution and transmission) to accommodate renewables; (iii) A change in voltage, frequency, reactive power and/or fault current performance, resulting in grid operation close to or outside established operating parameters; (iv) A general increase in price volatility, for countries with spot markets, otherwise lower marginal costs leading to impacts on the revenue stream of existing generation facilities.

93. To address these challenges, the Climate Investment Funds and their partners are proposing the establishment of a program to support the large-scale integration of renewable energies. This program would use concessional financing to accelerate investment in enabling technologies, infrastructure, electrification and demand-side management, as well as market design and improved system operation, to promote larger-scale integration of renewable energies.

94. The CIF-REI program is perfectly aligned with Mali's energy sector development policies and strategies. These include CREED 2019-2023 (Cadre stratégique pour la Relance Economique et le

Développement Durable - Strategic Framework for Economic Recovery and Sustainable Development), of which energy is one of the strategic axes, as well as policy and strategy documents (Politique Énergétique Nationale, Cadre de Référence pour le Développement de l'Electrification Rurale, Cadre de Référence pour l'Energie Domestique, Stratégie de Développement des Energies Renouvelables, Stratégie de Développement des Bio-carburants, Lettre de Politique Sectorielle de l'Energie, Stratégie de développement de la maîtrise de l'énergie) and energy sector planning/programming documents (Plan Directeur d'Electrification Rurale 2010-2025, Plan d'Investissements Optimaux -PDIO- pour la période 2015-2035, Plan de redressement du secteur de l'électricité 2020-2025, Plan Gaz butane, Programme décennal de l'électrification rurale -PRODER-, Programme de Valorisation à grande échelle des Energies renouvelables -SREP-, Plan d'action National des Energies renouvelables, Plan d'Action National d'Efficacité Énergétique, and the Programme d'Actions de l'Energie durable pour tous SE4ALL pour la période 2015-2030, PRODERE -UEMOA).

3.2. Objectives

95. Overall objective of the Climate Investment Funds. Accelerate transformational change in Mali through climate finance to achieve net zero emissions and inclusive, climate-resilient development trajectories. This overall objective is supported by the Renewable Energy Integration (REI) program, which contributes to the flexibilization of energy systems in order to increase the integration of larger shares of variable renewable energy generation into the grid and improve off-grid access to renewable energy.

96. Objective of the CIF-REI Mali Investment Plan. Identify and propose strategic options, decarbonization by accelerating the country's clean and inclusive energy transition and activities to support the integration of renewable energies into Mali's electricity grids.

97. More specifically, the CIF-REI program aims to (i) reduce the financial, technical and operational obstacles to the integration of renewable energy production into the Malian electricity grid; (ii) support the development of an appropriate energy transmission and distribution network infrastructure, including favorable conditions, for increasing quantities of variable renewable energies to be incorporated into grid and off-grid systems.

98. The Investment Program operationalizes the global operational objectives so that they contribute to improving access to renewable energies with a view to reducing greenhouse gas emissions and unlocking Mali's potential for inclusive social and economic development (including the gender dimension). More specifically, the program aims to reduce the financial, technical, regulatory and operational barriers that hinder the integration of intermittent renewable energy production into the interconnected grid and isolated centers. To achieve this, the program will use its resources to support the development of appropriate infrastructure and favorable conditions for the integration of increasing quantities of variable renewable energies into the power grid.

99. Concessional CIF-REI resources will catalyze Multilateral Development Bank (MDB) financing, private investment and other co-financing in the infrastructure and technical assistance projects needed to meet the country's commitments to decarbonization and energy transition.

100. The types of technologies, infrastructures, innovative models and improvement activities prioritized by the program that will be eligible for funding correspond to those described below in the supported activities section.

3.3. Expected Results

101. The investment plan will serve as a strategic guidance framework in support of the Government of Mali's policies and priorities in its efforts towards zero net emissions and inclusive, climate-resilient development pathways. The expected results are in line with and will directly feed into the country's national and international commitments in terms of climate change mitigation and adaptation, and will also contribute to supporting socio-economic development in the targeted areas.

102. The investment plan expected results scope and targets remain unchanged with the modular programming. because the targets for the integrated results framework were set considering REI resources as seed funding and the IP as wider programmatic framework to support renewable energy integration in Mali. As such the targets do not cover only category A projects, but also category B, for which there is no CIF allocation, and the Government of Mali needs to mobilize additional resources.

103. Avoiding CO₂ emissions: Ultimately, more than 710,000 tons of carbon equivalent per year will be avoided/reduced through the implementation of the priority projects of the CIF-REI investment program. Over the 7-year horizon of the Investment Plan, this represents around 4.9 million tons of CO₂.

104. Mobilization of private capital: The mobilization of private investment for investments in solar power generation initiated by the Investment Plan is estimated at \$300 million.

105. Increasing the share of renewable energies in Mali's energy mix: Implementation of the investment program will make it possible to take over and integrate into the grid a surplus of current as well as future production renewable energy capacity which will reach a minimum of 599 MW¹⁷ that Mali plans to install by 2030, including 90 MW through the SREP programme, estimated at 980 GWh annually. These will be complemented by the construction of 38 mini-grids (8 led by EDM and 30 led by AMADER) for a total capacity of 103.39 MW and annual clean energy output of 172.33 GWh. Implementation of the investment program, in synergy with similar initiatives across the country, will contribute to increasing the share of renewable energies from 13% in 2020 to 35% by 2030 and facilitate access to clean energy for over 1 million people including 52% of women.

106. Improved electricity supply for industrial and domestic consumers: Lowering the cost of producing energy from renewable sources and promoting climate-resilient energy infrastructure will directly improve access to clean energy sources in Mali.

107. Improved management of electricity demand and supply: The implementation of priority projects will improve grid and off-grid services by increasing the number of injection points for solar power plants into the grid, installing 2,000 smart meters and building 38 mini-grids. Supported by institutional capacity-building activities, these investments will encourage the implementation of new power plants and the arrival of new operators in the sector.

108. Reducing legal barriers to the integration of renewable energies: CIF-REI resources will support the development of a grid code that will serve as a basis for better tariff regulation, particularly in rural areas, and encourage private sector participation through the promotion of public-private investment.

¹⁷ This estimate is based on the possible completion of the following photovoltaic installations: PV Safo (50MW) ; Kambila (40 MW) ; Tiakadougou-Dialakoro (50 MW) ; Fana 1 (60 MW) ; Segou (33 MW) ; Sikasso (50 MW) ; Fana (legendre) (50 MW) ; Sanankoroba (100 MW) ; Koutiala (25 MW) ; Tinkéle (48 MW); Bla (93 MW).

109. Socio-economic co-benefits: Implementation of the investment program, in particular the construction of transmission lines and mini-grids, will generate green jobs. Access to energy will contribute to the economic development of the targeted areas through the creation of new income-generating activities and the scaling-up of existing energy-dependent activities. Access to energy will also help to improve the living conditions of disadvantaged populations such as women and young people, through social benefits including improved health services and a greater sense of security.

3.4. Proposed Components and Activities

110. Participatory process in the preparation of the CIF-REI IP. A comprehensive participatory process, involving all institutional players in the energy sector, private operators in the sector, bilateral cooperation under the leadership of the Government of Mali, represented by the Minister of Mines, Energy and Water, with the support of the MDBs, led to the selection of the program's main components and priority activities, as well as the development of the CIF-REI investment plan.

111. Three main components have been identified. Through them, funding will be made available for the program's priority activities, including mainly battery-based electricity storage systems, the extension of transmission lines (and associated substations) for energy evacuation and the provision of grid injection points, reinforcement and rehabilitation associated with renewable energy projects, and infrastructure associated with the promotion of active and flexible energy demand, in order to absorb variable renewable energy from the grid with the participation of the private sector.

112. The implementation of these components will enable the financing of energy transition activities. The government has identified several key areas for action to promote the integration of renewable energies and improve the electricity sector. The protagonists in this story are key players working together to make these ambitious goals a reality.

113. Reinforcing and rehabilitating the power grid is essential to ensure reliable and efficient electricity distribution. This involves modernizing existing infrastructure, repairing damaged lines and improving the network's capacity to accommodate more renewable energies.¹⁸

114. In order to diversify energy sources, interconnections with neighboring countries are being developed. Transmission lines are being deployed, enabling electricity to be imported and exported between countries. This enhances security of supply and facilitates the sharing of renewable energies when some countries produce excess power.

115. Demand side management is an important strategy for optimizing the use of electricity. A team specialized in data analysis and information technology works with consumers to implement energy conservation measures, incentive rates and intelligent management tools to reduce demand during peak periods.

¹⁸ A transmission master plan is currently being completed, but its basic assumptions have been modified due to recent political developments which have resulted in the termination of some definitively planned transmission lines. As a result, its relevance to the identified congestion points is limited. It is recommended that this master plan be updated as soon as possible.

To modernize the electricity system, smart grids are being deployed. Sensors and smart meters, known as smart metering, are being installed in homes and businesses to collect real-time data on energy consumption. This valuable information enables electricity suppliers to better understand consumer needs, adjust production and optimize distribution. Components	Amount allocated CIF-REI (mUSD)	Total amount (mUSD)
Component 1: Financing to accelerate investment to modernize and develop electricity infrastructure and storage systems for better integration of renewable energies into Mali's electricity grids. Objective: Contribute to the modernization of Mali's electrical infrastructure, by making it "smarter", thereby optimizing the entire energy chain from production to the final point of consumption. This component is based on seven (07) activities that will be financed, in part, by resources from the Climate Investment Fund's renewable energy integration program.	42,3	1119,93
Activity 1.1a: Construction of the 225 kV North Loop around Bamako		175,43
Activity 1.1b: Deployment of smart meters for medium-voltage and large consumers in the Bamako region	2	14
Activity 1.2: Construction of the 225 kV Kayes -Yelimané line	10	90
Activity 1.3: Construction of the 225 kV Koutiala - San- Mopti double-circuit line	30,3	230
Activity 1.4: Investment in storage systems for the Safo and Kambila solar power plants (75 MW/75MWh)		30
Activity 1.5 - Construction of the 225 kV Ségou - Bamako line		230
Activity 1.6 - Construction of a 225 kV loop around Kayes ("mining loop")		229
Activity 1.7 - Construction of a 225 kV Manantali Bamako double-circuit line		121,5
Component 2: Financing for the construction of mini-grids and the development of Mali's renewable energy potential Objective: To support the Malian government's initiatives to achieve its objectives of universal access to modern energy services, while reducing carbon emissions from the electricity system and guaranteeing security of installations. This component comprises three activities that can be financed in part by the resources of the new CIF program and the resources of the AfDB.	25,3	69,3
Activity 2.1: Building mini-networks		28
Activity 2.2 : Critical network infrastructure for integrating solar power generation into the grid	25,0	40
Activity 2.3: Strengthening the remote monitoring and security of mini-power stations		1
Activity 2.4: Construction/reinforcement and equipping of two test laboratories for quality control of solar equipment and energy-related products.	0,3	0,3
Component 3: Technical assistance Objective: To support the initiatives of the government, in particular the Ministry, institutions, agencies and public companies in charge of the energy sector, in developing and promoting activities aimed at increasing the share of renewable energies in the energy mix. The component is based on three activities.	2,4	2,8
Activity 3.1a: Carry out feasibility studies, including technical, economic, financial, conflict analysis, security assessment and ESIA studies, in preparation for future investment operations.	0,8	1,0
Activity 3.1b: Drawing up an electricity grid code: including in particular the regulation of technical interfaces for connecting renewable and storage power plants to the interconnected grid.	0,3	0,3

Activity 3.2: Capacity-building for sector players (EDM-SA, AMADER, DNE, CREE, AER, Ministry) through training and south-south and north-south exchanges to increase knowledge of managing the evolution of the power systems inherent in the development of smart grids and the integration of renewable production sources.		0,8	1,0
Activity 3.3: Technical assistance to adapt the legal and regulatory framework governing the energy sector in Mali.		0,5	0,5

Table 2 Components & financing

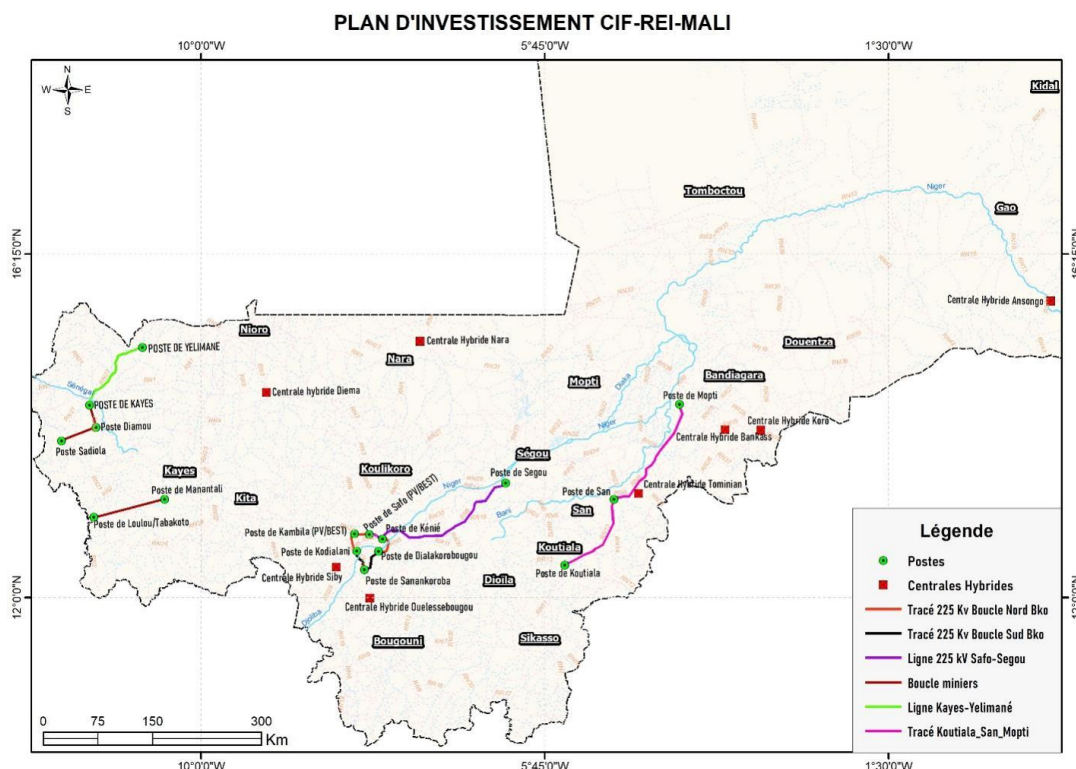
116. To support these initiatives, technical resources are mobilized. Their role is to provide technical assistance and build the capacities of players in the energy sector. They share their expertise on new technologies such as energy storage and the integration of intermittent renewable energies into the power grid. They are also working on the adaptation of a legal and regulatory framework to facilitate these changes and ensure compliance in a context of increasing security risks.

117. Weather forecasting plays a crucial role in the energy transition. Partnerships need to be established with meteorological organizations to develop accurate forecasting models. This will enable us to better anticipate the production of solar and wind energy according to weather conditions, thus improving grid efficiency.

118. Finally, to guarantee the quality of solar equipment, quality control and assurance experts are in place. They work closely with solar equipment manufacturers and suppliers.

119. Priority components and activities. The priority activities identified have been grouped into three components, as described below.

Figure 2 Overview of proposed activities



Section IV: Financing Plan and Instruments

4.1. Budget Requested for Capital Expenditure

120. This section presents the financing plan for implementing the activities proposed to be supported by Mali's CIF-REI investment program, including costs and sources of funding. The envelope requested for the investment program amounts to USD 32.6 million, combined with a second allocation of USD 37.4 million once additional funding become available. Thanks to the expected leverage effect of co-financing by other financial institutions, it may be possible to mobilize an additional USD 619.93 million, including USD 120 million from the SREP program (SREP resources: USD 18 million, co-financing: USD 102 million), bringing the total volume of activities to USD 672.53million.

121. The consultation process for the Climate Investment Fund's Mali Renewable Energy Integration Program has led to the identification of three components with several activities that have been grouped into three project categories. Category A1 includes projects to be prioritized for CIF-REI funding up to USD 32,6 million, category A2 includes projects that could receive CIF-REI additional funding up to USD 37.4 million, while category B includes other projects and activities that are prioritized and for which additional resources will be mobilized. The total cost of interventions for Category A1 and A2 projects is estimated at 672.53million USD, of which 70 million USD will come from CIF-REI resources. These funds would enable additional financing to be mobilized from the MDBs, other development partners, including their commercial lending windows, and the private sector with a financing ratio of 1/8. This ratio excludes CIF-REI and CIF-SREP funding and potential contributions from the Government of Mali.

122. The allocation of resources from the C-REI program will support the construction of priority transmission lines identified by the government to enable the evacuation of energy from solar power plants; investment in auxiliary equipment to enable the injection into the grid of energy produced from renewable sources, solar in particular, in order to ensure the stability and security of grid operation, regardless of the variability of solar production; development of smart grids, including the deployment of smart meters to facilitate the integration of higher shares of renewable energies, particularly solar PV; and technical assistance to help sector players including EDM-SA, Mali's national electricity company, to manage the operation and maintenance of the national grid with a higher share of renewable energies. The investments will pave the way for future private sector investment in other priority areas, such as electric mobility through the manufacture/assembly of electric motorcycles, three-wheelers and other electric vehicles.

123. The financing arrangements for the projects to be supported are likely to include a combination of grants and concessional loans. The modalities will be determined at the time of appraisal, in accordance with the relevant guidelines for the REI program and the multilateral and bilateral financing partners of this investment plan. This decision will take into account, among other things: the country's debt situation and revenue generation prospects, as well as the investment's financial rate of return. All investments will also meet MDB due diligence requirements, particularly in terms of environmental and social safeguards.

124. Due to the socio-political situation, several donors have suspended their funding to Mali, delaying the implementation of major projects such as the construction of the 225 kV northern loop transmission line and the Safo and Kambila solar power plants. Given the urgency of the energy access situation, Mali has committed funding from the AfDB, through the Desert to Power Initiative, and other multilateral partners such as the West African Development Bank (BOAD), the Islamic Development Bank (IDB) and the

OPEC Fund to complete these priority projects. Other funds mobilized through the Green Climate Fund will support the implementation of priority projects in category A of the Investment Plan.

4.2. Financing Instruments and Co-Financing Arrangements Proposed in Mali CIF REI

125. Mali falls into the Tier 1 category of the CIF's financing arrangements. This investment plan therefore proposes a maximum level of grant financing of 60% of CIF REI resources, for a total of \$19,6 million, and concessional loans of \$13 million for the initial allocation. For the second potential allocation of USD 37.4 million, this would amount to USD 22.4 million in grants and USD 15 million of concessional loans. CIF financing will also follow the standard CIF-approved interest rate of 0.52% for the US dollar and 0.30% for the euro, with a 40-year term and a 10-year grace period.

126. Co-financing from the development institutions supporting Mali in implementing its Renewable Energy Integration Program Investment Plan will follow the terms and conditions associated with public sector financing. Co-financing from the African Development Bank will be in line with African Development Fund financing, which includes a 40-year maturity, a 10-year grace period and a 0% interest rate. Mali is also eligible for financing from the International Development Agency (IDA) under conditions similar to those of the CIF REI. The West African Development Bank (BOAD) grants financing at interest rates ranging from 2.25% to 6%, with a maturity of 10 to 18 years and a grace period of 3 to 5 years. Specific conditions will be determined on a project-by-project basis and may depend on the amount of financing. The Islamic Development Bank provides grants and concessional loans with maturities ranging from 15 to 30 years, including a grace period of 3 to 10 years. Through the Desert to Power initiative, efforts will be made to obtain grants to reduce the debt burden of the Government of Mali. For example, Mali is eligible for a grant element of around 31% with the OPEC Fund for International Development.

127. CIF-REI resources will be allocated through the AfDB and channeled through the Ministry of Finance. These CIF-REI resources allocated by the AfDB will be used to reduce financing costs, extend loan maturities and diversify its financing sources, thus better meeting the financing needs of private and public investors. The cost of each activity and the distribution of CIF-REI financing resources among the participating financial institutions are presented in the table below, as shown in **Category A1 and A2**.

128. **Category B** projects are also priority projects that will directly support the integration of more variable renewable energy into the grid in Mali. Category B projects represent a total of **USD 609,75 million**.

Indicative financing plan for Category A1 projects

PROJECTS	Activities	Estimated cost (MUSD)	Year of approval	Climate Investment Fund			Indicative funding proposals (MUSD)						
				REI (AfDB)	REI (WB)	SREP	AfDB	BOAD	IDB	OPEC Fund	WB	GCF	OTHER
Bamako 225 kV North Loop Project	Activity: Construction of the 225 kV North Loop project	175.43	2023				40.4	48.4	45.0				41.63
	Activity: Deployment of medium-voltage smart meters for large consumers in the Bamako region	14.0	2023	2.0			5.0		5.0			2.0	
	Activity: Development of a network code	0.3	2023	0.1			0.2						
	Activity: Carrying out feasibility studies, including technical, economic, financial, conflict analysis, security assessment and ESIA studies, in preparation for future investment operations.	8.9	2023	8.9									
	Activity: Capacity-building for sector players (EDM-SA, DNE, CREE, Ministry)	1.0	2024	0.4	0.5								0.1
	Activity: Technical assistance to adapt the legal and regulatory framework governing Mali's energy sector	0.5	2024	0.4									0.1
Kayes-Yelimane transmission line project	Activity: Construction of the 225 kV Kayes-Yélimané line and associated substations	90	2023	10.0			20.0	30.0	.				30
Safo and Kambila solar power plants	Activity: Construction of two solar photovoltaic power plants in Safo and Kambila	90	2024				10.0	30.0	.	25.0			25.0

PROJECTS	Activities	Estimated cost (MUSD)	Year of approval	Climate Investment Fund			Indicative funding proposals (MUSD)						
				REI (AfDB)	REI (WB)	SREP	AfDB	BOAD	IDB	OPEC Fund	WB	GCF	OTHER
	Activity: Construction and equipping of two test laboratories for solar equipment quality control	0.3	2024	0.3									
	Activity: Construction of storage systems for two solar power plants	30.0	2024			18.0	10.0						2.0
PHASE 1 Solar Park grid connection infrastructure project	Activity: Critical network infrastructure for integrating solar power generation into the grid –	15.0	2024		10.0						5.0		
	TOTAL	425.43		22.1	10.5	18.0	85.6	108.40	50.0	25.0	5.0	2.2	98.63

Table 3 Budget and distribution of financial resources and other priority projects - Category A1

Indicative financing plan for Category A2 projects

PROJECTS	Activities	Estimated cost (MUSD)	Year of approval	Climate Investment Fund			Indicative funding proposals (MUSD)						
				REI (AfDB)	REI (WB)	SREP	AfDB	BOAD	IDB	OPEC Fund	WB	GCF	OTHER
Koutiala - San - Mopti transmission line project	Activity: Construction of the Koutiala-San-Mopti line and associated substations – Phase 2	222.1	2026	22.4			50.0	30.0	.				137.10
Solar Park grid connection infrastructure project	Activity: Critical network infrastructure for integrating solar power generation into the grid – phase 2	25.0	2026		15.0						10.0		
	TOTAL	247.1		22.4	15.0		50.0	30.0			10.0		137.10

Table 4 Budget and distribution of financial resources and other priority projects - Category A2

Category B projects

Projects	Activities	Cost Est. Total (MUSD)	Year of approval
Construction of the 225 kV Ségou - Bamako line	Activity: Construction of the 225 kV Ségou - Bamako line and associated substations	230	2025
Mini-network construction	Activity: Mini-network construction	28	2024
	Activity: Reinforcing remote monitoring and security of power plants	1	2024
	Activity: Capacity-building for industry players (AMADER, AER)	0.25	2024
Construction of a 225 kV loop around Kayes ("mining loop")	Activity: Construction of the 225 kV line around Kayes, and associated substations.	229	2025
Construction of the 225 kV Manantali Bamako double-circuit line	Activity: Construction of the 225 kV line between Manantali dam and Bamako and associated substations.	121.5	2023
TOTAL		609.75	

Table 4 Budget and distribution of financial resources and other priority projects - Category B

129. Beneficiaries of financing. Financing will be aimed at creating the conditions enabling consumers to have access to cheaper energy and producers to earn adequate returns on their investments. The beneficiaries of the program will also be national institutions and local authorities, insofar as they have adequate legislative and regulatory frameworks in place, enabling them to drive local development. A significant proportion of the funding will benefit the private sector, which will be mobilized, for example, through public-private partnerships or as subcontractors for infrastructure construction, operations, etc.

130. Institutional arrangements. An institutional arrangement needs to be put in place for the overall coordination of the CIF-REI program for the integration of RE and the implementation of its investment projects. A large number of players are involved in the implementation of priority activities (supervisory authorities, executing agencies, TFPs, service providers, beneficiaries, etc.), each of whom will have a role to play.

131. The implementation of a program of this size must obey certain guiding principles, the most important of which are: the coherence and efficiency of all priority activities, respect for the principle of "subsidiarity" in the implementation of activities (with the empowerment of those closest to the grassroots), optimization of management costs, and consolidation of lessons learned from past experience.

4.3. Program Management and Coordination

132. The institutional organization proposed for the steering, coordination and implementation of Mali's REI-CIF program complies with administrative provisions while observing the operational imperatives linked to the program's various priority components and activities. The proposed institutional arrangement for program steering, coordination and implementation is based on the following structures:

- Steering Committee (SC);
- Program Strategic Coordination Unit;
- Implementing agencies: DNE, AMADER, AER-Mali, EDM-SA, CREE.

133. Given that the program is divided into several priority components and activities implemented by several Implementing Agencies, it is imperative to set up a steering and coordination mechanism to: (i) ensure the overall movement of the program; (ii) ensure compliance with CIF-REI guidelines; (iii) ensure the raising of additional funds; facilitate dialogue with national authorities; (iv) ensure information and knowledge management and sharing; and so on. The proposed mechanisms are largely inspired by the SREP.

4.4. Steering Mechanisms

134. Steering and general supervision of the program is to be ensured by a Steering Committee responsible for the general and strategic orientation, supervision and execution of the program, and evaluation of progress achieved. This structure will be made up of representatives of the relevant ministerial departments, the various implementing agencies involved in the program, representatives of the private sector and, as observers, representatives of the MDBs and relevant cooperation agencies.

135. The Steering Committee will also have the role of guiding, supporting and advising all activities undertaken as part of the CIF-REI program and investment projects. In particular, it will be responsible for reviewing and approving annual program and project work plans (prepared and/or validated by the Strategic Coordination Unit), checking and approving technical and financial balance sheets, and program performance reports.

4.5. Program Coordination Mechanisms

136. Program coordination mechanisms. The overall coordination of the program is ensured by a Program Coordination Unit (CC), housed within the National Energy Directorate. The main tasks of the CC are as follows:

- Strategic coordination: (i) Ensure overall coordination of CIF-REI-Mali, by strengthening collaboration between all stakeholders; (ii) Compile the annual work plans of the program's implementing agencies for presentation to the Steering Committee; (iii) Ensure harmonization of the program's approach with national energy policy and CREED; (iv) Ensure synergy between the 13 priority activities; (v) Encourage and organize the conducting of cross-functional analytical studies, in support of the various priority activities.
- Knowledge management and sharing (KM): (i) Disseminate and communicate CIF-REI results at local, regional, national and international levels; (ii) Support the management of all knowledge acquired by the program in terms of integrating RE into the power grid (approaches, methodologies and lessons); (iii) Liaise with the CIF administrative unit and draw up regular reports on program implementation for CIF-REI; (iv) Conduct targeted studies, including security assessments, organize consultation workshops and support dialogue forums; (v) Participate in various forums organized by CIF-REI or other partners to exchange experiences with other pilot countries.
- Monitoring and evaluation (M&E): (i) Operate the CIF-REI program's monitoring, evaluation and risk management system and provide information on the various logical framework indicators; (ii) Ensure implementation of the Environmental and Social Management Framework Plan and continuously assess the social, economic and environmental impact of all program activities (including those relating to the GPC); (iii) Harmonize the Malian program's logical framework with the CIF-REI's global logical framework in order to ensure feedback to the CIF and facilitate the capitalization of information.
- Capacity-building (in coordination with capacity-building activities for priority activities): At institutional level, for private operators and other partners, etc.
- Mobilizing additional financial resources: Define and carry out specific activities (advocacy, information, etc.) aimed at mobilizing additional financial resources from development partners.

137. **Composition of the Coordination Unit.** It is headed by the National Energy Directorate (DNE) and comprises the following experts (some of whom will be recruited to reinforce the DNE's capacities):

- An institutional expert - in charge of the overall planning and coordination of the program, ensuring consultation between all stakeholders and carrying out activities linked to reforms at institutional, regulatory, etc. levels.
- One M&E expert - responsible for implementing the program's M&E system in coordination with the M&E experts in the implementing agencies.
- A risk management expert – responsible for monitoring and reporting on identified risks and ensuring that new risks are identified, assessed, and taken into account during the IP implementation.
- A communications/knowledge management expert - responsible for defining and implementing the program's communications strategy in conjunction with the Implementing Agencies.

138. Other experts (e.g. in financial management/procurement, environment, etc.) may join the unit, together with support staff (precise requirements to be defined at a later date). Each expert, as a member of the Strategic Coordination Unit, will be housed at the DNE. Each will be bound to the program by a performance contract, which will be subject to annual evaluation. The administrative procedures for recruiting and paying experts will comply with current Malian legislation. The Strategic Coordination Unit will also be able to call on the services of external expertise on an ad hoc basis, should the need arise.

139. **Inclusive monitoring.** The monitoring of project implementation by stakeholders is done at several levels: (i) **at the overall program level:** in accordance with the proposed institutional arrangement, a Steering Committee bringing together all the stakeholders and affected by the projects (energy, health, agriculture, territorial administration, private sector, MDBs, heads of Executing Agencies, etc.) will be put in place; (ii) **at the level of each of the priority projects:** the specific monitoring of each project by the stakeholders will be done through traditional project management structures. Thus, a consultation and exchange framework will be set up at the level of each of the priority projects to monitor the implementation of the project; (iii) **public or community monitoring:** this monitoring will be carried out by the relevant local authorities, civil society organizations (NGOs, associations and cooperatives, consumers, etc.). Their actions are based on the conclusions and recommendations of the ESAs (for each of the priority projects).

Section V: Additional Development Activities

140. The implementation of the CIF-REI Investment Program could have a significant positive impact on the environment, the economy and society. New business opportunities could emerge to accompany the program and beyond, ensuring its sustainability and supporting the sector's development.

141. The development of an electrical industry. The electrical industry in Mali is practically embryonic. A few industrial units exist, but their impact is fairly low. Implementation of the investment program, given the size of the infrastructure, the importance of the equipment and the expertise required, will lead to the emergence of local subcontractors and probably the local manufacture/production of many components.

142. The emergence of new types of operators. Implementation of the program could lead to the emergence of numerous SMEs/SMIs (small and medium-sized enterprises/industries) driven by the private sector to meet the needs of the program's major infrastructure projects and beyond. Job creation is estimated at 5,400.¹⁹

143. Strengthening national expertise. There is very limited expertise in the energy sector. Implementing the program over a long period of time will help to strengthen the expertise of local qualified personnel, as well as local engineering and consultancy firms.

144. The emergence of medium- and long-term partnerships between private Malian and foreign operators. Implementation of the program will encourage the emergence of such partnerships, given the very high technical level of certain technologies and the need for certain international companies to have local representatives.

145. New industrial activities. The availability of sufficient quantities of clean, low-cost electricity could facilitate the installation of new industrial units, particularly in the agro-industrial and mining sectors. The country could also play a role in the global energy transition by producing, for example, batteries for vehicles, as it has the necessary raw materials.

146. Improved policy and regulatory framework. In particular, the legal framework for the injection of renewable energy (feed-in tariffs, tax breaks, subsidies, public guarantees, grid code), will reduce the perception of risk by international investors, so that private sector investment in renewable energies will materialize. In addition, an investment-friendly environment would be created by events to publicize business opportunities²⁰ (business models, partnerships) or by setting up a "one-stop shop" in one of the participating institutions.

147. Improving the situation of women, young people and other disadvantaged groups. The three axes of gender mainstreaming suggested in the IP are: (i) increasing the representation of women in jobs in the electricity sector; (ii) improving working conditions for women in the electricity sector; and (iii) promoting equitable access to electricity services for all. These areas include the following activities:

¹⁹ 5.5 per GWh for PV considering (980 GWh-180 GWh) as additional generation (4000 addl. jobs);

https://www.ilo.org/wcmsp5/groups/public/@ed_emp/@emp_ent/documents/publication/wcms_176462.pdf

²⁰ There is a long pipeline of solar projects whose completion depends, among other things, on an improvement in the supply possibilities of the Malian grid, made possible by the intervention of the CIF. These include : PV Sélingué, PV Kambila, Parc solaire vocation régionale I (Fana), PV Ségou, PV Sikasso, PV Touna Bla, PV Fana (Phanes), PV Safo, Parc solaire vocation régionale II (Sanankoroba), PV Koutiala, PV Ouléssebougou, PV Koulikoro, PV Diéma.

From the government side

148. Increasing access to financing: Women entrepreneurs in Mali face major obstacles in accessing financing. This is a major constraint on their ability to start up and develop their (small or medium-sized) businesses. Consequently, measures enabling women to access affordable financing and other financial services could be introduced.

149. Promote education and vocational training that can help women acquire the technical and managerial skills needed to work in the renewable energy and technology sector, whether as employees or entrepreneurs.

150. Encourage the participation of women in decision-making at all levels, from the community to the national level. This can take the form of a proactive policy in recruitment in the various departments of the Ministry of Energy (quota for women) and also progressively in appointments to positions of responsibility. This is essential to promote their economic empowerment.

151. Promote gender-sensitive policies and regulations that favor women's participation and address the specific challenges they face in the renewable energy sector. This could include (i) policies that promote the inclusion of women in supply chains, (ii) gender-specific technical standards and (iii) the collection of sex-disaggregated data.

In the private sector

152. Develop gender-sensitive products and services to meet the specific needs of women entrepreneurs in the renewable energy sector. For example, they can offer flexible financing options that take into account the unique challenges faced by women-led businesses.

153. Invest in women-led renewable energy businesses by providing equity, debt or other forms of financing. They can also provide technical assistance, mentoring and other forms of support to help these businesses succeed, in addition to privileged access to women-friendly windows within national banks with trained contact persons (attentive to the specific needs of these women).

154. Promote women's leadership and participation by creating opportunities for women to participate in decision-making processes and leadership roles. This should include ensuring that women are represented on the boards of professional or consular bodies and in other key decision-making positions.

155. Combat gender prejudice and stereotypes by creating an inclusive corporate culture that promotes diversity. This can include training programs, mentoring and other initiatives that help combat unconscious prejudice, gender-responsive ESG/CSR, development of company gender strategies and action plans (as part of the criteria), gender-sensitive codes of conduct including equal pay, maternity and parental leave, childcare, etc.

156. Collaborate with other stakeholders (development partners, CSOs, foundations, universities ...) to create an enabling environment for women's economic empowerment in the renewable energy sector. This can include advocacy efforts to promote gender-sensitive policies and regulations, as well as joint initiatives to address the specific challenges faced by women-led businesses.

157. By implementing these transformative actions, the economic empowerment of women in Mali's renewable energy sector can be strengthened, with positive impacts on their own lives, as well as on the wider community and the country's economic development.

Section VI: Risk Assessment

158. The projects included in Mali's REI Investment Plan are primarily large-scale infrastructure projects, encompassing transmission lines and associated substations, solar power plants with large-capacity storage systems, along with mini grids for rural electrification, and various technical assistance activities, including energy efficiency studies, capacity building, and enhancements to the governance of the energy sector. These projects have a wide geographical reach, covering the regions of Kayes, Koulikoro, Sikasso, Ségou, and Mopti, stretching from the center to the south-southwest of the country, and benefiting a significant number of people.

159. The priority projects in the IP are potentially exposed to significant security risks, both at the national level and specific to each project, given the dynamic nature of the security situation that can vary from one area to another. In fact, Mali, like other countries in the sub-region, though to varying degrees, has been grappling with insecurity in various forms for more than a decade, including jihadist armed groups, intercommunal conflicts, crime, and banditry, among other challenges.

160. During the preparation of the Mali's CIF-REI Investment Plan with the support of Multilateral Development Banks, including the African Development Bank and the World Bank, security considerations, including risks, were considered. Operational mitigation recommendations were formulated, as illustrated in Table 5 below. Furthermore, in April 2022, just a year ago, the World Bank conducted a study entitled 'Security Risk Assessment (SRA) and Security Management Plan' as part of their 'Strengthen the Electricity System and Improve Access to Electricity Project' in Mali, some components of which are included in the Mali Investment Plan to be eligible for CIF funding. The original version of the report for this study in French is attached to the investment plan, as well as the English translation. This study addresses, among others, the policy, legal, and institutional frameworks for SRA, relevant key strategies and policies, key stakeholders in SRA implementation, actors (government, private security companies, civil society organizations), security risk assessment, and the Security Risk Management Plan.

161. There are significant similarities between the World Bank's project and the priority projects included in the REI Investment Plan (IP): (i) the intervention areas are almost identical, except for the Mopti region, covered only a section of the Koutiala-San-Mopti line; (ii) the objectives and expected outcomes are similar; (iii) the main stakeholders are the same; (iv) the actors and their responsibilities are similar. Thus, the relevant provisions of the Risk Management Plan of the 'Strengthen the Electricity System and Improve Access to Electricity Project' by the World Bank in Mali fit perfectly with the conditions for implementing the projects of the IP, for which the World Bank and the African Development Bank are partners.

162. Despite the availability of this security assessment study by the World Bank, the African Development Bank has initiated the process of conducting a specific study on the security aspects of the IP projects. This study focuses on the 'Assessment of Security Threats and Risks in the Implementation of the Investment Plan projects in Mali for the Climate Investment Fund's Renewable Energy Integration Program and the establishment of a conflict sensitivity framework.' It will have the advantage of being more recent than the World Bank's study and will be included as an annex to the Mali's CIF REI investment plan.

RISKS	MITIGATION
Political risks	
<ul style="list-style-type: none"> - Political instability: The success of this project will be determined to a large extent by the adoption and effective application of the proposed policies. Lack of political support may compromise the achievement of results. - Insecurity: Mali's multidimensional crisis often leads to armed clashes, and some parts of the country are still not completely secure. 	<ul style="list-style-type: none"> - The reforms underway give grounds for optimism about a return to normal institutional order. This will involve building a coalition of partners and stakeholders (private sector, NGOs and international development agencies), whose interest in the program will be maintained; ensuring that the proposed activities are in line with national electrification and renewable energy objectives. - Engage professional security advice, work closely with national authorities and partners; adapt projects/activities to the security profile; give priority to interventions in regions of the country where the security situation is more favorable.
Safety risks	
<ul style="list-style-type: none"> - Energy produced here but totally transported and consumed elsewhere: When populations suffer the inconveniences associated with production, but do not see the fruits of their sacrifices, they can express their dissatisfaction strongly, even violently. - Poorly negotiated land expropriation process: Such a process can give rise to conflicts of all kinds: firstly between the local communities themselves (who claim historical ownership of the land on which the work is to be carried out, and therefore the related compensation), and then conflict with the companies in charge of the work. The latter's staff will no longer feel safe, with the fear of assault, even kidnapping, and so on. In these tense situations, women and people with disabilities are the hardest hit, as they are much more vulnerable than others... - Similarly, unemployment and the lack of opportunities (jobs on site) for local youth can lead to tensions between "foreign" workers and local people. These situations can sometimes lead to sabotage of structures and installations. - Finally, ill-conceived resettlement programs can also lead to insecurity surrounding the works. If communities or groups feel they have been wronged, if they have been resettled on inappropriate land (disputed, unfertile, stony, undeveloped, etc.), they may see their livelihoods and living conditions deteriorate sharply. 	<ul style="list-style-type: none"> - Provide facilities to meet local energy needs to some extent, particularly for community structures: street lighting, maternity and health centers, schools, literacy centers, etc. Also offer lightweight solutions (solar kits, for example) for households wishing to purchase them.... - Conduct the land expropriation process in a transparent and inclusive manner. All land and use rights must be diagnosed, analyzed and returned to the communities for validation. The program should not, under any circumstances, be used to "reawaken" tensions between communities, families or clans. - Provide local workers with job opportunities, particularly those in line with their skills or qualifications: laborers, security/protection, small-scale crafts and catering, etc. - Transparent communication and the implementation of solid plans to restore livelihoods for the benefit of all will go a long way to mitigating this threat. <p>In general, the program needs to be proactive on any potential source of tension to prevent a small spark from turning into a fire.</p>

This can lead to grievances and acts of violence.	
Institutional and regulatory risks	
<ul style="list-style-type: none"> - Lack of clear and consistent policies and regulations to support program development. - Bureaucratic inefficiency in government licensing processes. - The volume of actions to be carried out, including preliminary assessments and the preparation, implementation and monitoring of calls for tender, exceeds the capacities of the public bodies responsible for implementation. 	<ul style="list-style-type: none"> - Support the government in finalizing ongoing efforts to develop and adopt policy and strategy documents, as well as legislative and regulatory texts that support the development of renewable energies. - Conduct due diligence on potential government partners, contractors and suppliers to identify any bureaucratic inefficiencies in their operations. - Carry out an in-depth risk assessment of the political and security environment to establish an effective implementation entity.
Gender and social risks	
<ul style="list-style-type: none"> - Cultural norms and gender stereotypes that limit women's participation in the renewable energy workforce. - Social acceptability, community displacement and conflicts over land rights, particularly in areas where large-scale projects are proposed. - Respect for local customs and practices / sexual harassment and violence. 	<ul style="list-style-type: none"> - Promote diversity and gender inclusion in the renewable energy workforce through training, mentoring and hiring practices. - Engage with local communities to address any concerns or conflicts regarding land rights and displacement. Increase added value for the populations concerned and the local economy. - Sensitize foreign workers to respect local norms and practices, in particular to avoid verbal or physical abuse, harassment of young girls and married women.
Financial risks	
<ul style="list-style-type: none"> - Limited access to affordable financing and lack of creditworthiness of local businesses. - An increase in global demand for storage equipment could lead to a rise in the cost of importing equipment. - Uncertain revenues and the potential risk of non-payment by the public utilities company, EDM-SA. 	<ul style="list-style-type: none"> - Obtain affordable financing from CIF-REI to minimize the risk of default or non-payment, carry out due diligence on the companies concerned. - Introduction of measures (including tariffs) to cover costs and improve EDM's financial situation so that it can fulfill its missions. - Provision of state guarantees.
Technological hazards	
<ul style="list-style-type: none"> - Limited technical expertise and capacity in the design, installation and maintenance of energy storage systems. - Low-quality equipment and components imported from unreliable suppliers, leading to system failures and reduced performance. 	<ul style="list-style-type: none"> - Use proven technologies and replicate solutions that have been successfully introduced in the region. - Implement strict controls on the standards of equipment that can be imported and installed in the country. - Set up back-up power supply systems to ensure continuous battery operation in the event of a power cut.

<ul style="list-style-type: none"> - Intermittent grid connectivity and frequent power outages that could impact storage system operation. 	
Construction logistics risks	
<ul style="list-style-type: none"> - Solar projects to be supported, whose production needs to be smoothed or evacuated, are delayed, which means that investments lose their technological basis. 	<ul style="list-style-type: none"> - Very precise coordination of works, mutual ownership where applicable.

Table 5 Risks & mitigation

Section VII: Monitoring and Evaluation

7.1. Integrated Approach to Monitoring and Evaluation

163. The monitoring and evaluation (M&E) approach for Mali's Investment Plan is designed to enable the monitoring and reporting of progress towards the achievement of results and objectives, reflecting the results chain of the implementation of the Investment Plan support activities presented in section 0.

164. As part of this integrated approach, project impact is measured through multiple dimensions of M&E and other key cross-cutting approaches such as gender mainstreaming, all with the aim of providing a nuanced and holistic understanding of program progress and thematic specificities.

165. Generally speaking, each support activity envisaged under this Investment Plan is aimed at removing specific obstacles to greater integration of renewable energies in Mali's energy sector. The implementation of these activities, through the use of concessional financial resources, is expected to deliver specific results, as illustrated in **Error! Reference source not found.** which presents the general theory of change approach applied to the Investment Plan.

166. We have developed a specific approach for the Malian energy sector. It consists of three elements: (i) a description of the problem, assumptions for change and assessment of the evidence base; (ii) a diagram visualizing the causal pathway, with details of intermediate steps; (iii) an M&E framework, including indicators and means of verification (using existing development indicators wherever possible). This approach is presented below.

7.2. Problem Statement and Theory of Change

167. Mali's electricity sector remains largely underdeveloped in terms of installed capacity, access to energy and overall consumption. Installed capacity is insufficient to meet current demand, and power shortages are holding back economic growth and job creation. Many domestic and industrial consumers in Mali suffer power cuts and depend on generators for their electricity needs. Energy is cited as a major constraint to business operations. EDM relies on costly peaking power such as diesel power plants to alleviate the situation.

168. The need for major investment in electricity generation and transmission capacity is obvious, especially in view of Mali's economic growth, which has been one of the main drivers of electricity demand over the past decade. To meet future demand levels, Mali will need to build considerable capacity over the next few years.

169. Energy production and consumption are development factors, but also major contributors to climate change. The proportion of renewable energies in Mali's electricity sector is still low, and new conventional power plants could be built. To avoid climate risks and related environmental costs, as well as high fuel costs, the new capacity required should come from renewable energy sources to mitigate climate change and promote Mali's economic and social development.

170. However, new renewable electricity generation is not developing fast enough, as it is intermittent and poses particular challenges in terms of supply. Meeting these challenges is one of the objectives of this investment plan.

171. Input/activities: CIF-REI provides resources to support Mali's energy transition, while improving the supply of electricity to industrial and domestic consumers and promoting the country's inclusive

economic and social development. The resources will help Mali mobilize the financing needed to catalyze the investments required to overcome the technical, institutional and political barriers associated with the planned large-scale expansion of renewable energies, mainly from intermittent solar photovoltaic resources.

172. Part of the resources will be allocated to investments aimed at smoothing the flow of electricity from intermittent sources and increasing the network's transfer capacity (storage, network rehabilitation and extension). Another portion will be used to enhance the knowledge and capabilities of sector stakeholders in addressing their challenges in integrating renewable energies on a large scale into the Malian electricity market (commercial structuring of RE projects, storage business models, power purchase agreements (PPAs), cost-covering tariffs (time-of-use), power system planning, strategy design for the introduction of e-mobility or hydrogen technologies (white, green)). On the policy front, support will help decision-makers design a legal framework conducive to integrating increasing shares of renewable energy into the Malian power system (benchmark studies, analyses of the benefits of substituting electricity imports).

173. Results (immediate): Following implementation of the activities of the three components, the framework conditions in Mali's electricity sector, particularly for renewable energies, will have improved. This will increase interest in investment in Mali's renewable energy sector from international developers and financing institutions. The existing list of solar energy projects will be built up with considerable private sector participation, as the perceived risk associated with this type of investment in Mali will be reduced. Temporary jobs in construction and local demand for goods and services will increase, and permanent jobs in plant operation and service provision will be created.

174. (Intermediate) results: The investments proposed in the Investment Plan will catalyze an increase in green energy production capacity. This will help reduce the duration of power cuts and lost sales. Businesses will thus reduce their dependence on costly back-up solutions. Increased power reliability will also enable businesses to produce for longer and at lower cost, resulting in more output for businesses and higher taxes for the government. Additional renewable generation capacity can also reduce the need for costly peak power supplies, saving energy costs. All these benefits come at a time when greenhouse gas emissions from renewable sources are lower than from fossil-fuel power plants, and production from these sources will help avoid greenhouse gas emissions.

175. Impact: Increased industrial production capacity has repercussions on the rest of the economy, leading to economic growth, job creation and increased wealth for the population, thus contributing to Mali's social and economic development, while the production of electricity from renewable sources helps to mitigate climate change.

	Annual monitoring		evaluation	
Input	Activities	Immediate results	Intermediate results	Impact
Sphere of control		Triggering changes	Systemic changes	Sphere of interest
Component 1	A1.1a: Loop Bamako Nord A1.1b: Smart meters A1.2: Line Kayes - Yelimané A1.3: Line Koutiala - San - Mopti A1.4: Storage for PV Safo/Kambila A1.5: Line Ségou - Bamako A1.6: Mining loop (Kayes) A1.7: Line Manantali Bamako	<p>Reduced obstacles to the integration of renewable energies into the grid and in demand-side management.</p> <p>Increased commitment from the private sector through attractive business models for renewable energy production and storage.</p> <p>Strengthened national and local renewable energy stakeholders are able to act in favor of renewable energies and attract climate finance.</p> <p>Improved enabling and inclusive legal framework for on-grid and off-grid renewable energies.</p>	<p>Improved electricity supply for industrial and domestic consumers.</p> <p>Increased share of renewable energies in the Mali energy mix.</p> <p>Catalyzed public and private capital in renewable energies through innovative financing models.</p> <p>Improved management of electricity demand and supply.</p> <p>Improved authorities' negotiation capacities on tariff-setting and public-private agreements (PPA).</p> <p>Reduced legal barriers to investment in renewable energies.</p>	<p>Accelerated transformational change toward net-zero emissions and inclusive, climate resilient development pathways.</p> <p>Flexibility of energy systems to integrate higher shares of variable renewable energies generation into the grid.</p> <p>Increased off-grid access to renewable energy.</p> <p>Reduced GHG emissions and unlocked gender-sensitive social and economic development potential through transformative access to renewable energies in Mali.</p>
Component 2	A2.1: Mini - grids A2.2: Remote monitoring and security A2.3: Laboratories for quality control			
Component 3	A3.1a: Feasibility studies (various) A3.1b: Development of a grid code A3.2: Capacity strengthening A3.3: Adapt legal & regulatory framework			

Assumptions: stable political and security situation in the target intervention areas, financial arrangements in place, technical level of authorities improved

Assumptions: grid can absorb electricity, RE production replaces conventional electricity

Assumptions: the environment is right for the private sector

Table 6: Conceptual diagram of the theory of change

7.3. Integrated Approach to Monitoring, Evaluation and Learning

176. The monitoring, evaluation and learning approach for the Investment Program is based on the Integrated Results Framework (IRF) of the CIF-REI. It is established by the government and national implementing entities, in cooperation with multilateral development banks, to enable monitoring and reporting of progress towards outcomes and targets, reflecting the results chain of activities supporting the implementation of the Investment Plan.

177. In this approach, the measurement of program and project impact is achieved through multiple dimensions of monitoring, evaluation, learning and other cross-cutting approaches such as gender mainstreaming, all with the aim of providing a comprehensive understanding of program progress.

7.4. Integrated Results Framework

178. Each support activity envisaged under this Investment Program aims to remove specific obstacles to greater integration of renewable energies into the Malian power grid. The implementation of these activities, thanks to the use of concessional resources, should enable specific results to be achieved, as illustrated in Table 6 which presents the program's general theory of change approach. In addition, indicators are already defined in the Integrated Results Framework (IRF) of the Investment Program, as shown in Table 7 which will make it possible to monitor and evaluate the results achieved on the basis of the expectations designed for the program.

179. Relevance: The Investment Program is based on the consideration that Mali needs to achieve transformational change through the components and activities supported here. While some of these activities could be considered higher priority due to the associated economic and social benefits or greater impact on greenhouse gas emission reductions to be achieved, in principle, these types of activities will have the same opportunities to access CIF-REI financing based on the initiatives that investors can present in line with the Investment Plan and compliance with all eligibility criteria. The components of the Investment Plan are all in line with and derive from Mali's national and international strategic documents for the energy sector and climate change, including the Nationally Determined Contributions (NDCs) and the Sustainable Development Goals (SDGs).

180. Systemic change: The development of the grid code and the improvement of the regulatory framework in general, the promotion of enabling technologies including smart meters, the promotion of public-private partnerships, the increase in the number of interconnections to renewable energy plants, and the securing of transmission lines, among other examples, will enable a profound change in Mali's renewable energy sector and foster the mobilization of additional resources in the sector. In addition, by mainstreaming approaches to the inclusion of women and minorities in all proposed activities, this Investment Plan hopes to achieve a progressive impact in terms of poverty reduction, and this approach can be integrated into the development of various types of projects in the energy sector, and more specifically into those that are part of the development of an equitable and sustainable approach to energy as part of the development of an equitable and inclusive energy transition.

181. Scale: In terms of scale, although the amounts of investment that the country plans to implement to achieve energy transition, economic recovery and overall sustainable growth are considerable, and the resources of the CIF-REI program represent only a small fraction of this total, the aim of this IP is rather to support marginal progress and targets that will in any case be significant in terms of replicability and scalability, insofar as other agents and programs should be able to build on the experiences gained and the results expected. The investment plan will support an increase in the rate of access to electricity in Mali, from 13% in 2020 to 35% by 2030, through a significant increase in on-grid and off-grid services.

182. Speed: The planned investments are in line with Mali's current or planned renewable energy capacity, likely to use transmission and interconnection lines, and the timetable for implementing the change in the legal framework will be inclusive and gradual, while limiting the distributive impacts. The speed factor to be applied to the just transition implies that the introduction of new technologies, such as the deployment of storage batteries or smart meters, must be accompanied by the creation of new employment opportunities to be offered fairly and as a priority to those actors who suffer a negative impact.

183. In this sense, the impact to be produced on stakeholders such as, for example, the staff in charge of recording analog meter readings, must be taken into account. Actions taken to mitigate the effects on vulnerable communities will be taken into account right from the initial stage of these projects. The rate at which these mitigation measures can be applied determines the speed at which new projects should be developed.

184. Adaptive sustainability: The identification of productive activities that can be associated with and promoted through the energy solutions provided becomes relevant, as these revenues can be decisive in ensuring the sustainability and scalability of projects. Similarly, the generation of initial human capacity in terms of knowledge and skills around new technologies, in areas such as energy storage systems, will contribute as a catalyst for the progressive development of sufficient quantities and levels of knowledge to meet the scale of transformation that the country's transition will progressively require.

185. Different signals on the transformational changes to be produced throughout program execution will be addressed and analyzed through environmental impact analysis, just transition, co-benefits or social inclusion and gender studies, as well as through other specific learning-oriented activities, including the positive impact of the investment plan on a country in a situation of fragility such as Mali. This task will be accomplished through evaluations and studies promoted by CIF, the country and the MDBs, depending on which program activities ultimately receive financial support.

186. In short, the approaches proposed should make it possible to combine systematized monitoring with research and evaluation designed to complement each other, taking advantage of different types of mixed methods which, through different tools and forms of evidence, contribute to the construction of a complete and clear vision of what will ultimately be achieved and what will be learned from program implementation.

RESULT STATEMENT	MONITORING APPROACH					EVALUATION AND LEARNING APPROACH
	INDICATORS	DESCRIPTION	BASELINE	MEANS OF VERIFICATION	TARGET (DATE) ²¹	KEY AREAS
CIF-LEVEL IMPACTS						
Accelerated transformational change toward net-zero emissions and inclusive, climate resilient development pathways	CIF 1. Mitigation: GHG emissions reduced or avoided (mt CO2 eq)	Reduced GHG emissions based on an emission factor of 0.704 tCO2eq/MWh ²² , considering the production of renewable energy to be integrated into the grid through transmission lines (indirect), the construction of mini-grids and the installation of storage batteries (direct).	0	Annual and cumulative report by project and report on Mali's investment plan	Annual: 709,158 tCO2eq Direct: 121,318 tCO2eq Indirect: 587,840 tCO2eq Cumulative (2030): 4,964,106 tCO2eq Direct: 849,229 tCO2eq Indirect: 4,114,880 tCO2eq	Transformational change: In the context of the climate crisis and for a country in a situation of fragility like Mali, transformational change signals will be analyzed by taking into account the five dimensions (relevance, systemic change, speed, scale and adaptive sustainability) and through various methods, tools and studies in order to document the social, economic impacts and changes needed to achieve zero greenhouse gas emissions targets, increase social inclusion, manage distributive impacts, improve the resilience of infrastructures and target populations. This area of impact will be measured through the CIF's evaluation and learning activities, which will not be the direct responsibility of the MDBs for annual reporting.
	CIF 2. Adaptation: Strengthened climate resilience of land (ha), people (#), and physical assets (\$) through a CIF supported adaptation mechanism	Sample adaptation activities with REI support will include the construction of transmission lines and mini-grid networks resilient to the effects of climate change, solar powered irrigation schemes, etc.	0	Annual and cumulative report by project and report on Mali's investment plan	TDB – Concrete adaptation interventions will be determined at projects design and track through project level indicators	
	CIF 3. Beneficiaries: Number of women and men benefiting from CIF investments	Total number of men and women benefiting from improved access to energy and other energy technologies / services promoted and supported by the REI investment plan in Mali	0	Annual and cumulative report by project and report on Mali's investment plan	1,000,000 people (52% women) 200 businesses	Transformative gender impacts: These aspects will be assessed through evaluative and learning-based approaches, in combination with monitoring data on the following areas: promoting gender-sensitive policies and regulations, increasing access to climate finance for women and their organizations, promoting women's leadership and participation in the energy sector. New and additional climate finance mobilized: As CIF-REI resources are intended to have a catalytic effect on climate finance in Mali with a financing ratio of 1/7, various evaluation and learning approaches will be used to better understand CIF's contribution to mobilizing public and private resources for the renewable energy sector.
	CIF 4. Co-Finance: Volume of co-finance leveraged (USD)	Total amount of public and private co-financing mobilized to support implementation of the investment plan	0	Annual and cumulative report by project and report on Mali's investment plan	499.93 USD million ²³ AfDB: USD 135.6 million World Bank: USD 15 million BOAD: USD 138.4 million IDB: USD 50 million FVC: USD 2,2 million Others: USD 158.73 million	

²¹ All targets exclude those associated with the Safo and Kambila solar power plants, which will be reported under the SREP programme (90 MW of installed capacity, 75 MW of battery storage, 75 USD millions of co-financing, etc.)

²² Guidance Manual Greenhouse Gas Accounting for Energy Investment Operations, World Bank (2015), 0.704 kgCO2eq./kWh pour le Diesel, (<https://documents.worldbank.org/en/publication/documents-reports/documentdetail/269221468178766476/guidance-note-greenhouse-gas-accounting-for-energy-investment-operations>)

²³ The volume of co-financing leveraged does not include the 18 USD million of SREP resources and associated 75 USD million co-financing (AfDB: 20 USD million, BOAD: 30 USD million, OPEC Fund: 25 USD million) for Safo and Kambila solar power plants, which will be reported under the SREP programme.

RESULT STATEMENT	MONITORING APPROACH					EVALUATION AND LEARNING APPROACH
	INDICATORS	DESCRIPTION	BASELINE	MEANS OF VERIFICATION	TARGET (DATE) ²¹	KEY AREAS
REI PROGRAM-LEVEL IMPACTS						
Reduced GHG emissions and unlocked gender-sensitive social and economic development potential through transformative access to renewable energies in Mali	Share of renewable energy generation in supported countries' grid connected energy systems (%)	Proportion of grid-integrated renewable energy in Mali, excluding hydropower	13% (2020)	National statistics and other secondary data sources on Mali's energy sector	35% (2030)	<p>Signals of transformational change: The signals of transformational change to be documented at this level will focus on the flexibility of Mali's energy system to take greater account of renewable energies, and the systemic change brought about by the implementation of the investment plan.</p> <p>Gender and just transition: As part of the implementation of the investment plan at national level, the following learning points will be documented: women's participation in the energy sector, women's access to energy-based production activities, redeployment and conversion measures for private-sector players operating in fossil fuels in rural areas, etc.</p>
	National off-grid access (%)	Proportion of people with access to the energy system in rural areas through mini grids	25 % (2020)	National statistics and other secondary data sources on Mali's energy sector	55% (2030)	
	National energy access (%)	Proportion of people with access to energy in Mali.	78.5% (2020)	National statistics and other secondary data sources on Mali's energy sector	100% (2040 ²⁴)	
	Mali RISE score of renewable energy on network connection and use	RISE assesses countries' policy and regulatory support for each of the four pillars of sustainable energy (access to electricity, access to clean cooking, energy efficiency, and renewable energy). As part of this IP, progress will be tracked through the specific score on network connection and use, in alignment with the REI objectives	7 ²⁵ (2022)	World Bank Group' statistics on RISE scores	13 (2030)	
REI PROGRAM-LEVEL OUTCOMES						

²⁴ Low-cost production master plan (PDP/MC) 2023-2040 for the interconnected electrical network of Mali, March 2023; page 11

²⁵ <https://rise.esmap.org/country/mali>

RESULT STATEMENT	MONITORING APPROACH					EVALUATION AND LEARNING APPROACH
	INDICATORS	DESCRIPTION	BASELINE	MEANS OF VERIFICATION	TARGET (DATE) ²¹	KEY AREAS
Increased share of renewable energies in the Mali energy mix.	REI CORE 1 (= CIF 1). Mitigation: GHG emissions reduced or avoided (t CO2 eq) – direct/indirect	Reduced GHG emissions based on an emission factor of 0.704 tCO2eq/MWh ²⁶ , considering the production of renewable energy to be integrated into the grid through transmission lines (indirect), the construction of mini-grids and the installation of storage batteries (direct).	0	Annual and cumulative report by project and report on Mali's investment plan	Annual: 709,158 tCO2eq Direct: 121,318 tCO2eq Indirect: 587,840 tCO2eq Cumulative (2030): 4,964,106 tCO2eq Direct: 849,229 tCO2eq Indirect: 4,114,880 tCO2eq	The reference values are based on an overall analysis of Mali's energy system, in order to determine the added value of the investment plan's interventions on these various indicators. The consistency and parameters of this reference scenario will be reviewed in detail and validated during the preparation of specific projects arising from the investment plan. Various specific evaluation and learning initiatives will support the documentation of knowledge gaps on the sector in general or on specific aspects such as the effects of improved grid services on energy efficiency in Mali.
	REI CORE 2. Installed Capacity: Installed capacity of variable renewable energy available to the grid (MW) – direct/indirect	Additional variable renewable energy capacity from 11 solar PV plants (25-100 MW) integrated into the grid through transmission lines (indirect) and 38 mini-grids in rural areas(direct)	67 MW (2022)	Monitoring report of multilateral development banks (MDBs)	Solar: 613.39 MW (2030) ²⁷ On-Grid: 510 MW Off-Grid: 103.39 MW Direct: 103.39 MW Indirect: 510 MW	
	REI CORE 3. Renewable Energy Production: Annual renewable energy output (MWh)	Total production of variable renewable energy from 11 solar PV plants (25-100 MW) integrated into grid through transmission lines(indirect) and generated by 38 mini-grids in rural areas (direct)	187.6 GWh (2022)	Monitoring report of multilateral development banks (MDBs)	Solar: 1,007.33 GWh (2030) On-Grid: 835 GWh Off-Grid: 172.33 GWh Direct: 172.33 GWh Indirect: 835 GWh	
	REI CORE 4. Grid Services: Increase in available grid services and improvements (#)	Counting of grid and off-grid services deployed for energy monitoring and management, including smart meters, batteries, demand-side management systems, etc.	623,070 prepaid meters (ISAGO) 202,877 conventional meters 3,298 low voltage meters 11 medium voltage meters	Monitoring report of multilateral development banks (MDBs)	Households: 4,000 new low voltage meters Industries: 2,000 new smart meters (medium voltage)	

²⁶ Guidance Manual Greenhouse Gas Accounting for Energy Investment Operations, World Bank (2015), 0.704 kgCO2eq./kWh pour le Diesel, (<https://documents.worldbank.org/en/publication/documents-reports/documentdetail/269221468178766476/guidance-note-greenhouse-gas-accounting-for-energy-investment-operations>)

RESULT STATEMENT	MONITORING APPROACH					EVALUATION AND LEARNING APPROACH
	INDICATORS	DESCRIPTION	BASELINE	MEANS OF VERIFICATION	TARGET (DATE) ²¹	KEY AREAS
	OPTIONAL: Increase in grid interconnections to accommodate higher shares of VRE (#)	Number of regional and national interconnection lines built and/or upgraded	03 Côte d'Ivoire-Mali Manantali I LSBSB	Monitoring report of multilateral development banks (MDBs)	10 new regional and national interconnection lines built and/or upgraded	
Reduced legal barriers to investment in renewable energies.	REI CORE 5. Policies: Number of policies, regulations, codes, or standards related to renewable energy integration that have been amended or adopted (#)	Number of policies and instruments on the regulatory framework for the renewable energy sector in Mali (grid code, tariff regulation in rural areas, etc.).	04 PDER SNDDR PANEE PANER	Monitoring report of multilateral development banks (MDBs)	Revision of 4 existing	Changes in policies, plans, and institutional capabilities will also be incorporated in analyses of signals of transformational change, which contribute toward the fundamental systems change described above. Evaluation and learning activities at this level, will build on achievements from SREP investments on strengthening the enabling for renewable energy in Mali and highlight the importance of conducive environment in achieving transformational change and just transition
Catalyzed public and private capital in renewable energies through innovative financing models.	REI CORE 6 (= CIF 4). Co-Finance: Volume of co-finance leveraged (USD)	Total amount of public and private co-financing mobilized to support implementation of the investment plan	0	Monitoring report of multilateral development banks (MDBs)	499.93 USD million ²⁸ AfDB: USD 135.6 million World Bank: USD 15 million BOAD: USD 138.4 million IDB: USD 50 million FVC: USD 2,2 million Others: USD 158.73 million	
Improved electricity supply for industrial and domestic consumers	REI CORE 7. Renewable Energy Access: Number of women and men, businesses, and community services benefiting from improved access to electricity and/or other modern energy services – direct/indirect (# of people)	Total number of men and women, businesses and community services benefiting from improved access to energy and other technologies promoted by the program in Mali	0	Monitoring report of multilateral development banks (MDBs) EDM and AMADER statistics	1,000,000 people (480,000 men and 520,000 women) 200 businesses	Gender-responsive aspects of energy access will be studied in more detail through targeted research, evaluations, and/or case studies. Examples of relevant issues include impact on women-owned businesses/firm users; impact on community services specifically catering to women; and women's awareness and ability to use electricity access for productive purposes.
	OPTIONAL: Increase in duration of planned household energy access per day (hours/day)	Hourly increase in access to energy in areas targeted by the investment plan with the objective to hybridize all existing diesel power plants	Hybrids power plants: 18h/day Diesel power plants: 8h/day	EDM and AMADER statistics	Hybrids power plants: 24h/day	
Improved authorities' negotiation capacities on tariff-setting and	REI CORE 8. System Costs: Reduced total energy system cost (USD)	Estimated annual reduction in the energy system thanks to the deployment of innovative	0	Monitoring report of multilateral	TBD – smart meters being relatively new in Mali, their financial impact as result a	

²⁸ The volume of co-financing leveraged does not include the 18 USD million of SREP resources and associated 75 USD million co-financing (AfDB: 20 USD million, BOAD: 30 USD million, OPEC Fund: 25 USD million) for Safo and Kambila solar power plants, which will be reported under the SREP programme.

RESULT STATEMENT	MONITORING APPROACH					EVALUATION AND LEARNING APPROACH
	INDICATORS	DESCRIPTION	BASELINE	MEANS OF VERIFICATION	TARGET (DATE) ²¹	KEY AREAS
public-private agreements (PPA).		technologies such as smart meters.		development banks (MDBs) EDM statistics	better energy efficiency will be analyzed and factored in the design of specific projects as part of the investment plan implementation	
Improved management of electricity demand and supply.	REI CORE 9 (= CCV 1). Innovation: Number of innovative businesses, entrepreneurs, technologies, and other ventures demonstrating a strengthened climate responsive business model	Number of companies and individuals active in innovative business models in the renewable energies sector, including solar powered mobility, solar refrigerators, etc.	0	Monitoring report of multilateral development banks (MDBs) EDM and AMADER statistics	4 companies 50 active entrepreneurs	Further evaluative and learning-based activities aiming to improve the understanding of REI's innovation and entrepreneurship aspects may be applied in coordination with the MEL approach for the CIF Climate Ventures (CCV) window.
	OPTIONAL: (=CCV 2): Number of innovative products, services, technologies, and processes that have entered a new market context	Innovative technologies to be promoted as part of the investment plan, including solar powered mobility and solar refrigerators.	0	Monitoring report of multilateral development banks (MDBs) EDM and AMADER statistics	2	
CO-BENEFICES DU PROGRAMME REI						
Social and Economic Development Co-Benefits	CO-BENEFIT 1. Employment and Livelihoods: Jobs created – direct and indirect	Number of jobs created by the construction of transmission lines, interconnections, mini-grids and batterie storages (estimated based on 5,36 jobs per GWh, ILO Methodologies for assessing green jobs, Policy brief, February 2013 ²⁹)	0	Monitoring report of multilateral development banks (MDBs) EDM and AMADER statistics	5,400 (52% women) Direct: 920 Indirect: 4,480	Quality and distribution of jobs: Through both just transition and gender-responsive approaches, further evaluative and learning-oriented analyses will center on the types of jobs created (and lost), and which subpopulations are gaining (and losing) employment opportunities. In the specific case of Mali, this might include generating evidence on women's access to medium- and high-skilled green jobs in the energy sector and vocational training. Modeling: The current modeling is based ILO methodologies for assessing green jobs. More robust accounting methods of jobs created will be developed at specific projects design phase including job induced by an improved access to energy, which will be

²⁹ https://www.ilo.org/wcmsp5/groups/public/@ed_emp/@emp_ent/documents/publication/wcms_176462.pdf

RESULT STATEMENT	MONITORING APPROACH					EVALUATION AND LEARNING APPROACH
	INDICATORS	DESCRIPTION	BASELINE	MEANS OF VERIFICATION	TARGET (DATE) ²¹	KEY AREAS
						estimated using modeling techniques alongside projects' reporting of direct job creation.
	CO-BENEFIT 2. Just Transition: Social Inclusion and Distributional Impacts	Number of people trained on new business models in the renewable energy sector.	0	Monitoring report of multilateral development banks (MDBs) EDM and AMADER statistics	People trained: 500 (52% women)	Just transition-framed analyses will examine the enhancement of social inclusion processes and procedures, such as stakeholder engagement at local and national levels, the extent to which vulnerable groups in impacted areas have been represented, gender inclusion, and the scope of social partners involved, considering the fragility and security context of Mali. Distributional impacts will also be furthered examined along other evaluative lines or with additional focus on specific sub-populations, such as ethnic, religious, and racial minorities, female-headed households, and local communities. The fragile and security context of Mali will be factored in the analysis.
	CO-BENEFIT 3. Policy and Planning: Coherence across sectors	Degree of alignment between the network code and other sectors such as agriculture, transport, etc.	Medium alignment between sectors	Monitoring report of multilateral development banks (MDBs) EDM and AMADER statistics	High alignment between sectors. Illustrative activities include 05 Women's and youth agricultural cooperatives to be supported through the REI IP to benefit from electricity services for agriculture	Evaluation and learning approaches will not only consider the degree of alignment between NDCs, national policy, and REI Investment Plans, but also the degree of alignment between the energy sector and other key development sectors such as agriculture, transport, SMEs development, etc..
REI PROGRAM LEVEL OUTPUTS						
Improved enabling and inclusive legal framework for on-grid and off-grid renewable energies.	OPTIONAL: Number of policies, regulations, codes, or standards supported to enhance the enabling environment for renewable energy uptake (#)	Number of policies dedicated to the adoption of renewable energies	04 PDER SNDDR PANEE PANER	Monitoring report of multilateral development banks (MDBs)	07 Existing: 04 New: 0 Revised: 03	Specific evaluation and learning activities will support output-level learning and assessment. Monitoring data from the output level will also feed into the evidence base for transformational change signals and other higher-level analyses related to REI implementation in Mali.
	OPTIONAL: Number of technical/financial analyses completed to enhance the enabling environment for RE uptake (#)	Technical and financial analyses of mini-grids, smart metering, and battery storage deployment	0	Monitoring report of multilateral development banks (MDBs)	40	

RESULT STATEMENT	MONITORING APPROACH					EVALUATION AND LEARNING APPROACH
	INDICATORS	DESCRIPTION	BASELINE	MEANS OF VERIFICATION	TARGET (DATE) ²¹	KEY AREAS
				EDM and AMADER statistics		
Strengthened national and local renewable energy stakeholders are able to act in favor of renewable energies and attract climate finance.	OPTIONAL: Number of persons trained on issues related to renewable energy markets and systems (#)	Total number of men and women in the energy sector benefiting from capacity building, including the national green technology laboratory	0	Monitoring report of multilateral development banks (MDBs) EDM and AMADER statistics	120 (52% women)	Gender trainings: While CIF will not track all types of trainings directly, specific REI projects in Mali will measure trainings designed to address gender considerations, such as women's awareness of productive use applications and trainings focused on providing women green skills that enable them to access medium and high-skilled green jobs in the energy sector.
Reduced obstacles to the integration of renewable energies into the grid and in demand-side management	OPTIONAL: Number of supply management technologies, infrastructure, or other solutions deployed	Number of smart meters deployed.	11	Monitoring report of multilateral development banks (MDBs) EDM statistics	2000 smart meters Existing: 11 New: 2,000	
	OPTIONAL: Number of demand management technologies, infrastructure, or other solutions deployed	Number of solar-powered technologies deployed. Number of solar refrigerators deployed.	0	Monitoring report of multilateral development banks (MDBs) AMADER statistics	02	
Increased commitment from the private sector through attractive business models for renewable energy production and storage.	GESP 1. Energy Rating: Energy rating (MWh) of storage systems installed	Energy rating of installed storage systems with REI support (direct) and energy rating for storage systems induced by the IP interventions including the ones of the solar power plants to be connected to the grid through transmission lines (indirect). All storage systems will be placed at energy generation level	0	Monitoring report of multilateral development banks (MDBs)	800 MWh Direct: 0 MWh Indirect: 800 MWh	
	GESP 2. Power Rating: Power rating (MW) of storage systems installed	Power rating of installed storage systems with REI support (direct) and power rating for storage systems	0	Monitoring report of multilateral	200 MW Direct: 0 MW Indirect: 200 MW	

RESULT STATEMENT	MONITORING APPROACH					EVALUATION AND LEARNING APPROACH
	INDICATORS	DESCRIPTION	BASELINE	MEANS OF VERIFICATION	TARGET (DATE) ²¹	KEY AREAS
		induced by the IP interventions including the ones of the solar power plants to be connected to the grid through transmission lines (indirect). All storage systems will be placed at energy generation level		development banks (MDBs)		
	OPTIONAL: Number of energy storage systems installed	Number of storage systems installed	187	Monitoring report of multilateral development banks (MDBs)	225 New: 38 Existing: 187	
	OPTIONAL: Number of renewable mini and off-grids solutions installed	Number of mini grids built including 8 managed by EDM and 30 managed by AMADER	102	Monitoring report of multilateral development banks (MDBs)	140 New: 38 Existing: 102	

Table 7 REI Mali Integrated Results Framework

Section VIII: Appendices

8.1. Appendix 1: Gender Dimensions in the Energy Sector

187. In recent years, Mali has made progress towards gender equality in the following areas: (i) the country is continuing its efforts to harmonize its national legal framework with its international commitments, and is therefore enforcing its laws; (ii) it is successfully meeting the challenge of reconciling respect for its customs and traditions with positive law that respects human rights; (iii) women are informed of their rights and have the opportunity to assert them; (iv) women have control over their sexual and reproductive health, and couples are aware of the importance of family planning; (v) practices that harm the physical integrity of women are abolished.

188. However, customs and traditions are still very much alive. Malian society is made up of different ethnic groups spread throughout the country. Three quarters of the population live in rural areas. They are either nomadic or sedentary and are involved in three dominant production systems: agriculture, fishing and livestock breeding, supplemented by crafts and trade. These ethnic groups are traditionally characterized by a strong social hierarchy and the specific differentiation of male and female roles (men in a productive role, women in a reproductive role).

189. But in the city as in the country, access to energy for cooking is an obstacle course. Rural women have to collect wood and cow dung, while urban women have to buy wood or coal to cook their meals. Electric lighting is still a luxury for most households, and small businesses (workshops, stores, etc.) have very little access to quality energy. The fruits of various public policies are beginning to make themselves felt, particularly in large urban areas. However, rural communities still have a long way to go.

190. To accelerate the momentum, gender needs to be integrated into energy planning processes. Mali has adopted the ECOWAS Draft Policy on Gender Mainstreaming in Energy Access. The ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) and the ECOWAS Gender and Social Affairs Department have formulated a policy for gender mainstreaming in energy access, to encourage member states to take action to eliminate all forms of inequality in energy production and consumption in the ECOWAS region. In practice, this basically means recognizing that men and women may have different roles, responsibilities and decision-making powers when it comes to energy use.

191. Measures to integrate gender into national energy planning and policies include:

- close collaboration with the Ministry for the Promotion of Women, Children and the Family;
- gender mainstreaming at every stage of the energy project cycle and in all major strategies and sub-sectoral action plans developed;
- increasing the participation of women in the public sector in energy-related technical fields and in decision-making positions - incorporating significant roles for women in the planning, design and execution of energy programs, including those relating to energy efficiency;
- to ensure that women and men have equal opportunities to enter and succeed in energy-related fields in the private sector;
- the development of microfinance programs, specifically targeting women, to stimulate investment in clean energy technologies, and promote women as energy entrepreneurs;
- proactive targeting of female-headed households;
- encouraging girls to study engineering, and courses to enhance their knowledge of energy technologies.

Women and domestic energy

192. Energy in Mali, like most West African countries, relies on traditional sources. These include wood, coal, agricultural waste and oil.

193. With the exception of oil, all these resources are used primarily in the kitchen, notably for cooking and heating water. Kerosene is mainly used for lighting (lamps) and, to a lesser extent, for cooking (kerosene stoves). These energies are largely directed towards the kitchen, where women's responsibilities in the household are significant. Men, on the other hand, mainly need energy as fuel for their vehicles (motorcycles or cars) or for their work equipment and tools (workshop machinery, tractors, etc.). For households with a certain level of income, electricity comes in handy for lighting and household appliances: television, refrigerator, computers, recharging cell phone batteries.

194. Women's access to energy is very complex. In rural areas, the collection of firewood is the woman's responsibility. This is a time-consuming activity. With deforestation and the progressive encroachment of the desert, wood gathering is taking place further and further away from residential areas. In addition to the scarcity of wood resources, the route is littered with numerous risks for the woman: accidents/falls, reptile bites, physical assaults, etc.

Improving the availability and regularity of clean energy will (especially for women) free them from many constraints. In addition to saving time (time saved on collection), and preserving her health and the environment, this will enable the woman to devote herself to other economic, social (market gardening) or training activities (apprenticeship, advanced training, literacy, etc.).

Women and new energy sources

195. For a very long time, energy supplies for women were limited to wood, charcoal and agricultural waste (post-harvest residues). With the constraints associated with access to this type of resource (scarcity, cost, health risks, environmental impact, etc.), alternatives began to be developed. Improved stoves, which are more economical (as they consume less wood or coal) and less polluting, have been developed and promoted in urban and peri-urban areas. Gas and electricity were introduced in households with the financial means to pay for them. But they remained out of reach for the majority of the population. In recent decades, renewable energy technologies have undergone significant development, particularly solar energy, leading to improved performance and democratization.

196. These new energies, which are cleaner and less time-consuming, make production quicker and easier. They are comfortable to use, and enable food to be cooked in a short space of time under hygienic conditions acceptable to women and their families (no smoke, reduced risk of burns, etc.). They save considerable time (collection, lighting, etc.) and facilitate the development of income-generating activities (mechanization of certain economic activities: food processing, workshops, stores, etc.). Although these technologies arouse great interest among users, the cost of acquiring them remains relatively high. This is an obstacle for most women. The public authorities therefore need to implement regulatory, fiscal and pricing measures to reduce the cost of such equipment.

Access to energy

197. Although energy supply has become increasingly diversified in recent years, it remains out of reach for many sections of society, particularly vulnerable groups such as women, the elderly, young people and the disabled. Because of their low purchasing power, these groups are unable to access and enjoy the new energy opportunities. The situation is even more critical for single mothers with insufficient income.

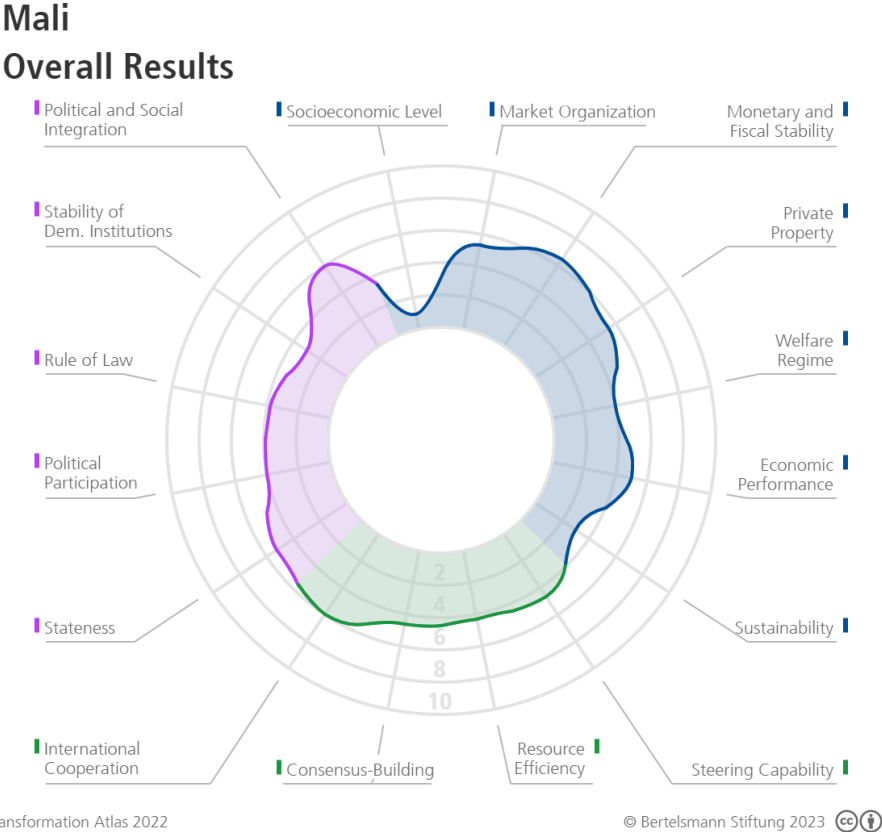
Women in the energy sector

198. Generally speaking, initiatives to promote renewable energies are considered highly technical and are implemented without paying particular attention to gender issues. We need to remain aware of the important role played by women in the development of the energy sector, not only as users, but also as key players and decision-makers in the energy sector.

199. Opportunities and chances for men and women in the energy sector are different, and often unequal. This is still the case in many countries in the sub-Saharan region. The gender issue must therefore be taken into account in all energy promotion initiatives. This means, for example, increasing women's involvement in the diagnosis, analysis and decision-making processes in the energy sector, and their full participation in the energy sector.

8.2. Appendix 2: Assessment of the Country's Absorption Capacity

200. Mali ranks among the world's relatively low-qualified countries in terms of economic transformation (no. 98 out of 137) according to the BTI 2022 Transformation Index, and related categories (e.g. position no. 77 out of 137 in good governance and 84 out of 137 in political transformation), illustrating the limited conditions for motivating and attracting local and foreign investment. Ranking no. 148 out of 190 countries in the Ease of Doing Business Index (2020) and 103rd out of 136 countries in Bloomberg's Climatescope contribute to this evidence. Details of the classification are shown in the following image:



201. If Mali continues its political transition process towards a return to constitutional order, with the implementation of political, institutional and electoral reforms and the adoption of the new Constitution, increased economic activity and lower inflation could create a favorable environment for the planned investments.

8.3. Appendix 3: Review of Compliance of Selected Options with CIF-REI Investment Criteria

202. The investment plan indicates that the planned investment will attract both the public and private sectors to help finance the program. The program aims to leverage loans from multilateral development

banks (MDBs), national banks and the private sector. In the absence of data on project viability, it is too early to expect contributions from MDBs. There is a lack of information on the willingness of MDBs to co-invest in these activities; if such information exists, it should be included in the investment plan.

203. **Enabling environment.** The investment program sets out the country's commitment to promoting renewable energies over the long term as part of its energy strategy and energy access objectives. In fact, renewable energies will be the main tool for implementing this strategy and improving access to energy. The program supports the strengthening of Mali's policy, regulatory environment and institutions to facilitate investment in renewable energies.

204. **Increasing access to energy.** The proposed investment plan would significantly improve access to reliable and affordable energy through the use of grid-connected solar energy, including storage, which addresses significant barriers to increasing electricity supply.

205. **Implementation capacity.** The investment program will be mainly implemented by DNE, EDM-SA and AMADER, with some involvement of other national institutions (AER-Mali, ANADEB) and MDBs. Although private sector financing is available, there are no details on how it might be organized and carried out. It is also proposed to strengthen local and national public execution capacities. The sustainability of the proposed implementation, including how to involve the private sector, is not really addressed.

206. **Improve the long-term economic viability of the renewable energy sector.** There is still a lack of information on the returns on investment for the program components. The investment plan addresses the country's strategy for private sector development in the renewable energy sector, without providing the necessary details, particularly in terms of the division of responsibilities between public and private companies in the production, installation, operation and maintenance of renewable energy technologies. This should be done at the start of the next project development phases (feasibility studies).

207. **Transformational impact.** As the installed capacity envisaged by the investment plan significantly affects Mali's energy balance, the investment plan brings about considerable transformational change at the national level once the expected results are achieved. This change could continue significantly and sustainably after the program is implemented. However, two players are essential to achieving this goal and need to be involved: private and local financial institutions to develop photovoltaic and storage solutions.

8.4. Appendix 4: Stakeholder Consultations

208. The CIF-REI Mali Investment Plan for the Integration of Renewable Energies is the result of a participatory and inclusive process that saw the participation of numerous institutional players, MDBs and other institutions and structures involved in the development of the energy sector. The process was entirely piloted by the Government of Mali through the Ministry in charge of energy. Main activities of the process :

- National committee for the preparation of the CIF-REI IP. Under the aegis of the National Energy Directorate (DNE), this committee brings together all stakeholders involved in the development of the energy sector. All facets of energy are involved: technical, financial, environmental, social, economic, etc. This committee has held numerous meetings in order to take into account the concerns and desires of the various parties as far as possible.
- Exchange meetings. Numerous meetings (including online meetings) were held throughout the preparation of the investment plan, with technical and financial partners, NGOs, the private sector and others. Important documents were also made available to stakeholders.
- National information workshop on the Renewable Energy Integration Program (REI) held on May 4, 2023 in Bamako. This workshop, which brought together several dozen participants

representing the MDBs, national authorities, key state players in the sector, private sector operators, etc., had the overall aim of coordinating actions and supporting the Government of Mali in preparing for the REI program. The overall aim of the workshop was to coordinate actions and support the Government of Mali in preparing the Investment Plan (IP) for the REI Program, with the specific objectives of: (i) informing and raising awareness among the various regional and local players of the REI's principles and objectives, (ii) sharing and validating with them the REI's investment priorities and the parties' levels of commitment, and (iii) bringing to their attention and discussing the priority projects proposed as part of the investment plan. Work focused on :

- *the presentation of the Renewable Energy Integration Program, which elicited pertinent observations and remarks from participants.* These included: (i) the inclusion of the gender dimension, not only with regard to women, but more generally with regard to vulnerable people; (ii) the modalities and mechanisms for financing projects, including associated costs; (iii) the timeframe for implementing the plan and the projects identified; (iv) the involvement of civil society in the implementation of this plan, particularly component 3 dedicated to technical assistance and capacity building.
- *Presentation of Mali's Investment Plan for the CIF-REI Renewable Energy Integration Program.* The objectives of the Investment Plan, the issue of renewable energy integration, the CIF Renewable Energy Integration Program, the framework of Mali's Investment Plan for the CIF-REI program, and the activities by component. Following the presentation, participants raised a number of questions, notably concerning: (i) the possibility of proposing other projects, (ii) the construction of the 225 kV Ségou-Bamako line: is it a new line or a reinforcement of the existing one? (iii) the storage strategy envisaged, (iv) the strategy for collaboration between EDM and other operators in marketing the surplus energy produced, (v) the criteria for choosing target areas, (vi) the importance of the Kayes loop for localities and (vii) the failure to take account of bioenergy and the cooking energy sub-sector in the activities.
- *Reflection and discussion on expected results (theory of change) and result indicators.*
- *Reflection and discussion on the potential for transformational change in the investment plan.*
- *Participants' concerns about implementation of the IP:* Following the discussions, participants voiced a number of concerns about implementation of the Plan: (i) consideration of the socio-economic and security aspects; (ii) mobilization of all funding; (iii) timely completion of projects; (iv) involvement of grassroots communities; (v) occupation of the high-voltage line right-of-way by the population; (vi) place of CSOs in the program.

209. Generally speaking, the national workshop made the following main recommendations: (i) take into account the gender dimension and vulnerable people in the implementation of the IP; (ii) better define project financing methods and mechanisms, including associated costs; (iii) indicate the timeframes for implementing the plan and the projects identified; (iv) involve civil society in the implementation of the IP, particularly in terms of technical assistance and capacity building.

8.5. Appendix 5: Development Co-Benefits

210. The implementation of the CIF-REI Program through its three components and 15 priority activities generates several co-benefits, including:

- Reducing greenhouse gas emissions: Solar energy is a clean, renewable energy source that produces no greenhouse gas emissions. The use of solar energy can help Mali reduce its carbon footprint and contribute to global efforts to combat climate change.
- Reducing air pollution: Traditional energy sources such as diesel generators are a major source of air pollution in Mali. The use of solar energy can help reduce air pollution and improve public health.

- Cost reduction: Solar energy is a cost-effective alternative to conventional energy sources in Mali, particularly in remote areas where the cost of transporting fuel can be high.
- Reduced dependence on imported petroleum products.
- Job creation: The introduction of solar energy and storage technologies can create jobs in the renewable energy sector, helping to stimulate economic growth and development.
- Increased energy independence: The use of solar energy can help Mali reduce its dependence on imported fossil fuels, improving energy security and reducing the risk of price volatility.
- Help reduce the pressure of the energy sector on the national budget by reducing the share of imported fossil fuels in the national energy mix.
- Improving resilience: The use of solar energy and storage technologies can help Mali build resilience to power outages and other disruptions to energy supply, particularly in remote areas where the grid is unreliable.

8.6. Appendix 6: Existing Renewable Energy Activities

The African Development Bank

211. The African Development Bank (AfDB) has frequently been involved in financing Mali's electricity sector. In 2016, the AfDB participated in the financing of Mali's first photovoltaic power plant project (Ségou), and in 2017 it contributed to the financing of the project for the development of mini hydroelectric power plants and associated distribution networks (PDM-HYDRO), as well as the interconnection between Guinea and Mali. The AfDB has also provided funding for other energy projects and programs, such as the Scaling Up Renewable Energy Programme (SREP) and the Project to Support the Promotion of Renewable Energy in Mali (PAPERM).

212. The "Desert to Power" initiative was launched by the African Development Bank. It aims to harness the solar potential of 11 countries (Burkina Faso, Ethiopia, Eritrea, Djibouti, Mali, Mauritania, Niger, Nigeria, Senegal, Sudan and Chad) to install up to 10 GW of solar photovoltaic power plants by 2030, providing access to electricity for around 250 million people.

The World Bank

213. The World Bank is active in the electricity sector in Mali, focusing on improving access to electricity in rural areas. In 2018, the bank approved financing to support the implementation of the "Renewable Energy Project for Rural Electrification in Mali", providing electricity to rural communities. The World Bank is also involved in the implementation of the "Project to Support the Energy Sector in Mali", promoting private sector participation in the electricity sector. The project covers the financing of: (i) modernization of the power transmission line between Ségou and Bamako; (ii) modernization and reinforcement of 30 kV facilities in the Bamako peripheral zone, including the 150 kV loop; (iii) modernization and reinforcement of low and medium-voltage distribution networks in Bamako; and (iv) modernization and reinforcement of medium and low-voltage distribution networks in the regions of, among others, Kati, Ségou, Kayes, Mopti, Sikasso, and Koutiala.

European Investment Bank

214. The European Investment Bank (EIB) is another international donor bank active in Mali's electricity sector. In 2020, they committed to the 225 kV Boucle Nord Bamako (EDM). The project involves building the northern section of Bamako's high-voltage (225 kV) loop, which will eventually form the main backbone of the Malian capital's power supply and distribution system. It comprises (i) a 103 km-long

225 kV double-circuit HV line, (ii) the extension of two existing substations, and (iii) the construction of three new substations.

215. The overall objective of the program is to (i) support regional electricity trade in Mali, (ii) the integration of local and regional power generation projects, and (iii) the growth of energy demand in the Bamako metropolitan area.

French Development Agency

216. The French Development Agency (AFD) has been involved in Mali's electricity sector through various initiatives. In 2020, the agency granted a loan to support the implementation of Mali's "Sustainable Energy Access and Efficiency Program", aimed at improving access to electricity and promoting energy efficiency. AFD also co-financed the construction of the Manantali hydroelectric dam, and developed hybrid solar-thermal networks to electrify rural communities. It has also worked to optimize the interconnection of networks in Mali, Senegal, Mauritania and Guinea. However, in view of the evolving political and security situation, AFD suspended all its activities in this country in November 2022.

U.S. Agency for International Development

217. United States Agency for International Development (USAID) is active in the electricity sector in Mali through PowerAfrica: They were involved in the Albatros thermal power plant (90 MW) in Kayes under a build-own-operate-transfer model. In 2022, the development aid agreement between the United States and Mali was amended. This support for Mali is part of a comprehensive assistance package and will fund both new and ongoing activities in the fields of health, governance, agriculture and basic education, as well as humanitarian assistance.

West African Development Bank

218. The West African Development Bank (BOAD) has financed several projects in Mali, including those in the electricity sector. One example is the financing of the West African Power Pool (WAPP), which aims to improve electricity supply and reduce energy costs in the West African region. As part of this initiative, BOAD financed the construction of electricity transmission infrastructure in Mali. In 2018, BOAD provided a loan to support the construction of the Ségou solar power plant in Mali and the construction of the Kourouba hydroelectric plant and its connection to the power grid. They have also been committed to i) the rural electrification of 50 communities in the regions of Kayes, Koulikoro, Sikasso and Ségou through isolated low-carbon solar photovoltaic systems that are resilient to climate change, ii) the rehabilitation of the Sélingué and Sotuba hydroelectric plants for additional electricity production of 255 GWh. In 2019, BOAD secured financing for the Bamako distribution network reinforcement project, which aims to improve the reliability of Bamako's electricity supply.

Islamic Development Bank

219. The IsDB Group has been involved in the MDB & DFI's efforts towards the development of the Malian energy sector since the 1990's. 5 projects were implemented between 1997 and 2018, an OMVS Hydropower, a rural electrification project, expansion of the Balingué Power Plant – Balingué I, and Balingué II (with EDM). Also, in co-financing with a number of DFIs, the IsDB Group (IsDB & ICD) contributed to the financing of the Albatros IPP in Kayes, commissioned in 2018.

220. IsDB is currently financing the implementation of 2 energy projects in the country. These are (i) the 100 MW HFO Sirakoro Power Plant (and its evacuation system) outside of Bamako, expected to be completed in 2024 (with EDM), and (ii) a rural electrification project via off-grid PV installations with AMADER.

Furthermore, IsDB Group’s trade finance arm, the ITFC, supports the sector via trade financing of fuel supply for EDM. Just recently, the GoM and the ITFC signed a major financing agreement destined for amongst others, the energy sector and food security (see the provided links).

Arab Fund for Economic and Social Development

221. The Arab Fund for Economic and Social Development has financed the Mali-Mauritania electricity interconnection project, which aims to improve energy security and the reliability of electricity supply in both countries. The project involves the construction of a high-voltage transmission line between Mali and Mauritania via Senegal.

Projects/programs	Technical and Financial Partners
Mini hybrid networks for rural electrification	World Bank UNDP BADEA AFD ADFD (Irena) KfW GIZ UEMOA ECOWAS DANIDA
Solar PV (SHS, solar lantern, solar EP, pumping, etc.) Solar thermal (water heater, dryer)	WB Group supports development of solar lighting market WB supports solar PV mini-grids on a case-by-case basis The Netherlands and GIZ support small-scale electricity generation from solar PV in targeted communities Indian cooperation co-finances village lighting with solar kits DANIDA supported the creation of an atlas of solar energy resource potential UNDP
Mini/micro hydropower	WB AfDB ECOWAS
Wind	DANIDA supported the creation of a wind energy atlas
Biomass	GIZ improved fireplaces and stoves ECOWAS - improved cooking WB and AFD support biofuel initiatives on a case-by-case basis UNDP, Gates Foundation and FAFPA support the introduction of bioenergy in multifunctional platforms
Capacity building and technical assistance	UNDP provides targeted support to women's associations through renewable energy AfDB through PAPERM (public/private players, print, broadcast and online journalists, etc.). The WB, IFC, the Netherlands and USAID support the development of a strategy to promote private investment in renewable energies

	WB provides support for sector reforms, including tariff reforms UEMOA (energy planning - Energy Information System) ECOWAS (ECREEE) UN - women
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Table 8 Ongoing initiatives supported by TFPs (RE)

8.7. Appendix 7: Components and Activities³⁰

Component 1: Financing to accelerate investments to modernize and develop electrical infrastructure and storage systems for better integration of renewable energy into Mali's electricity grids

222. The aim of this component is to contribute to the modernization of Mali's electrical infrastructure, by making it "smarter", thereby optimizing the entire energy chain from production to the final point of consumption. The implementation of this component will enable the national electricity company, EDM-SA, to improve the quality of service provided to its customers, to contribute to the control of electricity demand among large customers, particularly those connected to the medium-voltage network, and also to promote the penetration of renewable energies in the energy mix. This component is based on seven (07) activities that will be financed, in part, by resources from the Climate Investment Fund's renewable energy integration program.

Activity 1.1a: Construction of the 225 kV North Loop around Bamako (Category A)

223. The 225 kV loop is considered by the Government of Mali to be the country's priority project in the energy sector. The construction of this 225 kV loop will not only secure the supply of electricity to the city of Bamako through the injection of local production, but also through the use of energy from interconnection lines with neighboring countries. In addition, its construction will enable the connection to the interconnected grid of the solar power plants planned for the Safo and Kambila sites, with a total output of 90 MWp, combined with storage capacities of around 75 MW/75 MWh.

Problem statement

224. The 225 kV Bamako loop is of crucial importance for Mali. In order to support the capital's development, it has become essential to reinforce the Bamako transmission network. The loop comprises the main substations at Kodialani, Kambila (Kati), Safo, Kénié, Dialakorobougou and Sanankoroba.

Proposed contribution to initiate the transformation

225. The construction of this 225 kV loop will not only secure the supply of electricity to the city of Bamako through the injection of local generation but will also enable the use of energy from interconnection lines with neighboring countries. In addition, its construction will enable the connection to the interconnected grid of the solar power plants planned for the Safo and Kambila sites, with a total output of 90 MWp, combined with storage capacities of around 75 MW/75 MWh.

Availability for implementation

226. With the southern loop (Kodialani-Sanankoroba-Dialakorobougou sections) currently being financed, it is essential to complete the northern section to complete the capital city loop.

³⁰ For projects marked "Category A", please refer to Table 3, Category A section and Appendix 8 for more information.

Justification for CIF-REI financing

227. Construction of the loop will connect the Kambila and Safo solar power plants, with a total capacity of 90 MWp, to the interconnected grid, together with storage capacities of around 75 MW and many others. The construction of this loop will enable customers on the outskirts of Bamako to be connected, thereby relieving the load on substations inside the city. This will have a positive impact on the quality of electricity service for domestic and industrial consumers.

Activity 1.1.b: Deployment of smart meters for medium-voltage and large consumers in the Bamako region (Category A)

Problem statement

228. This activity involves the acquisition (number of meters to be defined with EDM-SA) and deployment of smart meters for customers connected to medium voltage and large consumers in the Bamako region.

Proposed contribution to initiate the transformation

229. This deployment will enable EDM-SA to improve the quality of service provided to medium-voltage customers and large consumers, while controlling their demand for electricity and at the same time promoting the integration of renewable energies into the energy mix. The deployment of smart meters will also help to protect the company's income.

Availability for implementation

230. This activity will support the benefits of the 225 kV North Loop project.

Justification for CIF-REI financing

231. The use of smart meters will help improve energy efficiency and protect revenues. The activity will be financed in part by CIF resources, administered by the AfDB, and AfDB ADF resources.

Activity 1.2: Construction of the 225 kV Kayes -Yélimané line

Problem statement

232. This project, which forms part of the section of the power interconnection line between Mali and Mauritania, essentially consists of the construction of :

- 120 km of 225 kV HV double-circuit line between Kayes-Yélimané,
- extension of the Kayes substation in Mali;
- construction of the Yélimané substation in Mali.

Proposed contribution to initiate the transformation

233. The completion of this line will have the dual effect of facilitating the exchange of electrical energy between the two countries and increasing the share of renewable energies in the energy mix.

Availability for implementation

234. With energy exchanges included in national and regional plans, this project is important to the Government of Mali.

Justification for CIF-REI financing

235. Completion of the line will promote rural electrification of the localities crossed by the line. As a result, it will create jobs through income-generating activities and the establishment of industries.

Activity 1.3: Construction of the 225 kV Koutiala - San- Mopti double-circuit line (Category A)

Problem statement

236. The specific aim of the project, which is part of Mali's electricity sector development strategy, is to increase the supply and security of electricity supply. This 225 kV line, with a total length of around 300 km, will extend Mali's transmission network to the north.

Proposed contribution to initiate the transformation

237. The construction of this line will have two major benefits. On the one hand, it will boost electricity transmission capacity, thereby helping to achieve the objectives set by the government in terms of integrating renewable energies. Secondly, it will enable the isolated centers of San and Mopti, which currently operate on thermal power, to be connected to the interconnected grid, and these diesel-fired power stations to be switched off, while electrifying the large rural towns located along the line.

Availability for implementation

238. Feasibility and ESIA studies are under way. This demonstrates the interest of the Government of Mali in this project.

Justification for CIF-REI financing

239. In addition to facilitating the integration of renewable energies (PHANES solar power plant), the line will also boost the economy in the beneficiary areas, particularly the Mopti region, which has been hit by the security crisis.

Activity 1.4: Investment in storage systems for the Safo and Kambila solar power plants (Category A)

240. This had been planned as part of the construction of the 225 kV North Loop around Bamako.

Problem statement

241. This project will involve the construction of two solar PV injection power plants at the Kambila (40 MWp) and Safo (50 MWp) substations. The solar power plants will be combined with storage units with a total capacity of 75 MW/75MWh.

Proposed contribution to initiate the transformation

242. Quality of service is improved when voltage drops.

Availability for implementation

243. The energy supplied by these two plants will smooth solar production according to sunshine levels, reduce peak production at midday, and provide auxiliary services to the power system, such as regulating grid frequency or replacing all or part of the thermal spinning reserve.

Justification for CIF-REI financing

244. Reducing CO₂ emissions, creating businesses and jobs, and improving basic social services are just some of the benefits generated by the project.

Activity 1.5: Construction of the 225 kV Ségou - Bamako line

245. The completion of this line will increase and reinforce the security of supply of electrical energy to the interconnected grid, while eliminating constraints on the evacuation of partially solar renewable energy production.

Problem statement

246. The project involves the construction of a 225 kV double-circuit line linking Bamako to Ségou via Fana, where a solar power plant is expected to be built as part of the implementation of the Regional Solar Park (PSR), an initiative supported by the World Bank.

Proposed contribution to initiate the transformation

247. Small and medium-sized businesses and agri-food industries to benefit from availability of electricity

Availability for implementation

248. The new line will increase the transit capacity of the Bamako-Ségou link. It will facilitate and secure the exchange of energy with Côte d'Ivoire in the event of unavailability of the 225 kV Sikasso-Bougouni-Bamako line.

Justification for CIF-REI financing

249. This project fits perfectly with the CIF's objectives in terms of integrating renewable energies, given that the lines will promote the injection and evacuation of electricity.

Activity 1.6: Construction of a 225 kV loop around Kayes ("mining loop")

250. The construction of this loop will extend Mali's power grid to the south-western part of the country. This will enable low-carbon electricity to be supplied to mining industries, semi-urban towns, rural localities and local small and medium-sized businesses and industries, using hydroelectricity and solar power plants planned for the region.

Problem statement

251. This project aims to extend Mali's power grid in the south-western part of the country (Kayes Region/Kayes Cercles-Bafoulabé-Kéniéba) to supply power to mining industries, semi-urban towns, rural localities and local small and medium-sized businesses and industries.

Proposed contribution to initiate the transformation

252. It will promote economic growth in the region and contribute to poverty reduction.

Availability for implementation

253. Together with the existing 225 kV Manantali - Kayes (Médine) line, this will form a complete 225 kV loop with all the attendant advantages in terms of operating flexibility and security of supply. A feasibility study has been carried out.

Justification for CIF-REI financing

254. This loop will support the evacuation of energy from renewable sources, particularly solar power plants to be developed near the line, as well as hydroelectricity. It is understood that mining companies have also begun to develop solar projects for their own self-generation. The principle of third-party access to the grid could offer opportunities for various companies to sell their surplus energy to the Transmission System Operator.

Activity 1.7: Construction of a 225 kV double circuit line Manantali Bamako

255. The construction of this line will strengthen the existing transmission network between Manantali and Bamako (eastern part of the OMVS interconnected network). This line will increase the amount of renewable energy on Mali's interconnected grid and further secure coverage of Bamako and surroundings as well as cities and rural centers in the area.

Problem statement

256. This project is an extension/reinforcement of the interconnected network. It will evacuate electrical energy from the Félou, Gouina and all future OMV power plants as well as the Albatros power

plant in Bamako. The two new associated substations (in particular that of Kambila) are injunctions of future solar power plants

Proposed contribution to initiate the transformation

257. The project will promote and support the economic development of the area through the development of large industries (cement factories, agro-industries, etc.). It will contribute to the creation of many jobs and reduce poverty.

Availability for implementation

258. The line and its associated substations will contribute to the junction of the Mali-RCI and Mali-Guinea interconnections with the OMVS interconnections; This will ensure operational flexibility and security of supply. The construction work of this line has begun on an acquired financing whose disbursements are suspended while the execution rate is about 21%.

Justification for CIF-REI financing

259. This line will ensure the evacuation of renewable energy particularly from Kambila solar power plant, and future solar power plants to be developed near the line but also from the OMVS hydroelectric dams (Manantali, Félou, Gouina, Koukoutamba, Boureya etc.). The principle of third-party access to the network could offer opportunities for different companies to sell their surplus energy to EDM-SA's Transmission System Manager through the OMVS network.

Component 2: Financing for the construction of mini-grids and the development of Mali's renewable energy potential

260. The aim of this component is to support the Malian government's initiatives to achieve its objectives of universal access to modern energy services, while reducing carbon emissions from the electricity system. This will be achieved by setting up mini-grids powered by renewable sources to electrify rural populations that cannot be connected to the national interconnected grid. This component comprises three activities that can be financed in part by the resources of the new CIF program, as well as by AfDB resources.

Activity 2.1: Building mini-networks (Category A- Yelen Siri)

261. These projects will electrify 30 localities within the AMADER perimeter and eight localities within the EDM-SA perimeter, and increase the production of electricity from renewable sources, thereby helping to reduce greenhouse gas emissions.

Availability for implementation

262. As part of the drive to bring electricity to rural areas, the development of mini-grids is an important pillar in the country's access strategy.

Justification for CIF-REI financing

263. Private sector players are a major stakeholder in the deployment of mini-grids. This activity will help create green jobs for young people and women.

Funding will be provided for the construction/upgrading of mini-grid infrastructure, particularly low-voltage distribution networks and storage systems powered by solar PV plants.

Some players have proposed that the surplus energy produced by mini-grids in rural areas and individual solar kits in the city of Bamako be integrated into the grid.

Activity 2.2: Strengthening the remote monitoring of mini-power stations

Problem statement

264. The aim of this activity is to build two buildings and equip them in order to reinforce the remote monitoring system for mini-power stations, with a view to improving the monitoring of their operation.

Proposed contribution to initiate the transformation

265. This measure will optimize the management of mini-power plants and enable any anomalies or malfunctions to be detected quickly. It will also provide real-time statistics on the management of rural power plants.

Availability for implementation

266. With reference to the lessons learned from rural electrification, real-time monitoring of power plant operation will go some way to resolving certain operational difficulties.

Justification for CIF-REI financing

267. This project is in line with energy efficiency, in particular access to a quality electricity service.

Activity 2.3: Construction/reinforcement and equipping of two test laboratories for quality control of solar equipment and energy-related products (Category A)

Problem statement

268. This activity involves financing the construction or reinforcement of two test laboratories and equipping them. The first will be dedicated to quality control and conformity testing of solar PV equipment, while the second will be devoted to energy-related products such as LED lamps and household appliances.

Proposed contribution to initiate the transformation

269. These laboratories will facilitate testing, quality control and labeling of renewable energy equipment for the benefit of developers.

Availability for implementation

270. The project will support activities to promote renewable energies in Mali.

Justification for CIF-REI financing

Job creation and the efficiency of Renewable Energy equipment will be direct results of the project.

Component 3: Technical assistance

271. The aim of this technical assistance component is to support government initiatives, in particular the Ministry, institutions, agencies and public companies in charge of the energy sector, in developing and promoting activities aimed at increasing the share of renewable energies in the energy mix. The component is based on three activities: (i) carrying out feasibility studies to prepare for future investment operations, including the development of a network code; (ii) capacity building and knowledge sharing for players in the sector; (iii) adapting the legal and regulatory framework governing the energy sector in Mali.

Activity 3.1a: Carrying out feasibility studies, including technical, economic, financial and ESIA studies, in preparation for future investment operations (Category A)

Problem statement

272. This activity involves carrying out feasibility studies for priority projects, in particular the 225 kV Bamako (Kambila) - Kolokani - Diéma - Kayes line to connect these localities to the interconnected grid and enable the construction of solar power plants identified in the region.

Proposed contribution to initiate the transformation

273. It will contribute to the availability of feasibility studies for priority projects, so as to anticipate the search for funding.

Availability for implementation

274. The Government of Mali has drawn up investment plans and studies for the integration of solar energies, with a view to implementing the projects targeted by the studies.

Justification for CIF-REI financing

275. With a view to sustaining the benefits of investments already under way, these studies will provide additional support for new projects.

Activity 3.1b: Development of an electrical network code (Category A)

Problem statement

276. The aim of this activity is to draw up a document defining the conditions and criteria for the generation, transmission, distribution, sub-regional and/or cross-border interconnection and marketing of electrical energy in Mali.

Proposed contribution to initiate the transformation

277. The reliability of the network will depend not only on the quality of the equipment, but also on how it is used. This code will regulate access to the network.

Justification for CIF-REI financing

278. Reducing network disruptions for better integration of renewable energies.

Activity 3.2: Capacity building for sector players (EDM-SA, AMADER, DNE, CREE, Ministry) through training and south-south and north-south exchanges to increase knowledge of managing the evolution of the power systems inherent in the development of smart grids and the integration of renewable production sources. (Category A)

- i. EDM-SA: Capacity building could focus on topics related to planning, design and analysis of electrical networks, protection and automation of electrical networks, SCADA, operation and maintenance of smart electrical networks integrating renewable production sources.
- ii. AMADER: The program is based on theoretical training sessions and exchanges of experience on best practices, through immersion in a nearby hybrid power plant. It aims to build the capacity of 150 managers and technical staff of the licensees, including a percentage of women, given that the plants will be managed by operators with different levels of education (technicians and engineers).
The program is structured around three (3) training themes, each of which will lead to a certificate. These are :
 - Planning and implementation of solar power generation facilities;
 - Operation and integration of photovoltaic solar energy into the grid;
 - Maintenance and performance monitoring of photovoltaic solar power plants;
 - Financial, accounting and commercial management of PV/diesel mini-grids.
- iii. DNE/Ministry: Capacity building concerns the DNE and the Ministry, and will be based on mastery of planning, control and management tools for renewable energy production infrastructures, energy efficiency and control, mastery of procurement processes and contract negotiations. One component will involve study trips to renewable energy production sites.

- iv. CREE: Capacity building for CREE will be devoted to south-south learning and exchanges, in particular to Ghana and Kenya, with a view to drawing inspiration from the advances these countries have made in their electricity sectors. Two (02) Commissioners and four (04) experts from the EERC Executive Secretariat will take part in these exchanges of experience.
- v. Ministry: Capacity building will be based on the mastery of planning, control and management tools for renewable energy production infrastructures, and contract negotiations. One component will involve study trips to renewable energy production sites.
- vi. AER: Capacity building will focus mainly on mastering tools for sizing and designing renewable energy production infrastructures, as well as training staff in environmental monitoring and assessment, techno-economic and financial project analysis, project management and the use of test equipment for renewable energy and energy efficiency products.

Activity 3.3: Technical assistance to adapt the legal and regulatory framework governing the energy sector in Mali: This technical assistance aims to revise and adapt the texts, in particular the policy documents, strategies, institutional and regulatory frameworks governing the energy sector in Mali (Category A).

279. For the publication of documents and regulatory decisions, and to guarantee free access to information, CREE intends to have a functional and easily accessible website. It intends to take advantage of digitization to support its activities and increase the level of cooperation with the various stakeholders, notably operators, consumers and investors. This process could be initiated through the creation of a database within the CREE and the regular updating of its website.

8.8. Appendix 8: Concept Notes for Category A Projects

Bamako 225 kV Northern Loop

COVER PAGE				
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 type="checkbox"/> SREP	<input type="checkbox"/> REI
4. Project/Program Title:	Bamako 225 kV Northern Loop			
5. Type of CIF Investment:	<input type="checkbox"/> Public	<input type="checkbox"/> Private	<input type="checkbox"/> Mixed	
6. Funding Request in million USD equivalent:	SREP	Grant:	Non-Grant:	
	REI	Grant:	USD	
7. Implementing MDB(s):	African Development Bank			
8. National Implementing Agency:	National Energy Directorate (DNE) Energie du Mali (EDM-SA)			
9. MDB Focal Point and Project/Program Task Team Leader (TTL):	Headquarters- Focal Point: Gizaw Kidanua Abera k.gizaw@afdb.org Gareth B. Philips g.philips@afdb.org		TTL: Al Hassane Diallo A.H.DIALLO@AFDB.ORG Hamathe MANE h.mane@afdb.org	

10. Project/Program Description:

A. Introduction

The Climate Investment Fund, through the Renewable Energy Integration Program (REI), aims to accelerate transformational change in Mali and, thanks to climate financing, promote development trajectories that are inclusive and resilient to climate change. The REI Program also aims to make the electricity system flexible and adapted to the integration of a greater proportion of renewable energy production into the grid, and to improve off-grid access to renewable energy.

The aim is to contribute to the modernization of Mali's electrical infrastructure, by making it "smarter", thereby optimizing the entire energy chain from generation to final consumption. Completion of this project will enable EDM-SA to improve the quality of service provided to its customers, contribute to the control of electricity demand among large customers, particularly those connected to the medium-voltage network, and promote an increase in the share of renewable energies in the national energy mix.

The 225 kV loop around Bamako is a priority project in Mali's energy sector. Its completion will secure the supply of electricity to the city of Bamako through the injection of new generation (thermal power plants) and the use of energy from interconnections with neighboring countries (OMVS, Mali-Guinea, Mali-RCI). It will also enable the connection to the interconnected grid of the future Safo (42 MWp) and Kambila (33 MWp) solar power plants, combined with storage capacity. The southern section of the loop is currently under construction, and financing for the northern section has been secured. The activities planned in this concept note focus on actions to enhance the performance and profitability of loop operation, build the capacity of the main players, and strengthen legislative and regulatory aspects.

The project is supported by development partners including the AfDB, the World Bank, the Islamic Development Bank and the GCF. Technical assistance for the project will be provided by CIF-REI, the World Bank and the AfDB.

Rationale for CIF Financing: The project is in line with the CIF-REI Investment Plan (IP), developed under the aegis of the Government of Mali in an inclusive manner through the Ministry of Mines, Energy and Water (MMEE), and with national policies and strategies for the development of Mali's energy sector. These include the CREDD (Cadre Stratégique pour la Relance Economique et le Développement Durable - Strategic Framework for Economic Recovery and Sustainable Development), of which energy is one of the strategic axes, and policy and strategy documents as well as planning/programming documents for the energy sector (PEN, PDIO, etc.).

Country Context

The Republic of Mali covers an area of 1,246,814 km², 51% of which is desert. Mali is a landlocked Sahelian country in West Africa, more than 800 kilometers from the nearest coastline. Mali's population is estimated at 21.9 million, with an annual growth rate of 3.2%. Around 55% of the population lives in rural areas. The urbanization rate is 45% and rising steadily³¹. Population growth is a concern because it implies a sharp increase in the need for basic social services, which translates into additional pressure on energy production. It also means that a significant proportion of the Malian government's budget will have to be devoted to non-productive sectors.

B. Energy Sector Context

Mali's energy sector is characterized by high and growing energy demand, relatively low production capacity, costly state subsidies and heavy dependence on imported hydrocarbons.

³¹ <https://data.worldbank.org/indicator/SP.POP.TOTL?end=2021&locations=ML&start=1960&view=chart>

The national electrification rate is 52%, including 24% in rural areas where over 70% of the country's total population live. Final energy consumption is dominated by biomass (77%), followed by hydrocarbons (18%) and electricity (5%). Demand is fairly strong, growing by around 10%/year. The energy mix in 2021 is as follows: 58% thermal, 28% hydro, 18% imported and 3% PV.

The country's power transmission network comprises some 1,640 km of power lines at all voltage levels: 225 kV, 150 kV; 63 kV and 30 & 33 kV, and 14 substations. Losses are in the order of 15-20% (interconnected network and isolated centers). For a country as vast as Mali, the transmission network is very weak and does not offer sufficient possibilities for injecting future production. This is why the CIF-REI IP's approach is so important: to develop the transmission network, multiplying injection points and increasing transmission and supply capacities (priority projects of the CIF-REI IP), and to initiate a transmission network management policy by drawing up a Network Code. The completion of future interconnections (Mali-Guinea, reinforcement of the OMVS network, etc.) will also contribute to this development.

The sector is managed by the Prime Minister's Office, which oversees the regulatory body, the Water and Electricity Regulatory Commission, five ministerial departments, four central technical services, and four services under the Ministry of Mines, Energy and Water. These include the National Energy Directorate (DNE), whose mission is to draw up the elements of the national energy policy, and to coordinate and control the sector. The main players in Mali's electricity sector fall into four categories: state players, civil society organizations/NGOs, the private sector, and technical and financial partners (donors).

The vigorous development of RE in recent years is linked, among other things, to the political priority given to RE development and the implementation of the SREP in Mali. In 2015, we recorded 25 projects for hybrid power plants with associated or grid-connected mini-grids; the signing of seven agreements for PV power plants; the signing of 10 memorandums of understanding for PV power plants; the implementation of numerous projects for the distribution of solar lighting kits, solar lanterns and street lamps, as well as pico-solar equipment. In addition, two PV panel assembly units have been built by private operators. As of 2015, thirty-eight (38) RE development projects have been approved, and public and private funding for RE projects has risen from 500 million USD in 2015 to 1,458 million USD in 2020, representing a clear increase in public and private funding. The Special Investment Budget (BSI) has seen a marked increase in investment in renewable energy projects, from 7% to 55% between 2015 and 2020. From 2019 to 2021, agreements have been signed with private investors to install around 1 GWp of solar power plants.

In view of the targets set for solar energy production, both in terms of quantity of energy and number of production infrastructures by the private sector, sub-regional organizations or major international programs (Desert to Power/DtP), the challenges of making all this energy available to consumers are enormous. The integration of renewable energies into grids poses unique technical, financial and managerial challenges for transmission and distribution networks. To meet these challenges, CIF and its partners are proposing a program to support the large-scale integration of renewable energies. This program is based on concessional financing to accelerate investment in enabling technologies, infrastructure, electrification and demand management, as well as market design and improved system operation to promote larger-scale integration of renewable energies.

Project objectives and components

Project objective

The aim of the project is to contribute to the optimal operation of the 225 kV loop around Bamako. The main components focus on demand management, improving the regulatory framework for network management and building the capacity of key players.

The 225 kV Bamako Loop is of crucial importance to Mali. It supports the development of the capital by strengthening the transmission network. It will enable the connection to the interconnected grid of the Kambila and Safo solar power plants, with a total output of 90 MWp and associated storage capacity, as well as the reception of interconnection lines. This will have a positive impact on the quality of electricity service for domestic and industrial consumers.

Project components

The project comprises five components:

- **Component 1:** Construction of the 225 kV Northern Loop Line and associated substations (USD 175.43 million of which USD 40.4 million AfDB, USD 48.4 million BOAD, USD 45 million ISDB, USD 41.63 million Others).

This activity includes the investment costs and related activities for the construction of the bi-terminal 225 kV line with lattice steel towers and 570 mm² aster conductors from Kodialani to Kambila (Kati), Safo, Kénié, and Dialakorobougou, covering a distance of 103.3 km, as well as its substations. This line will complete the construction of the 225 kV loop around Bamako. It will enable the connection of the Safo solar power plant (42 MWp) and the Kambila solar power plant (33 MWp), along with their associated storage capacities. It will also facilitate various interconnections with neighboring countries and enhance security. The financing for this component will be provided by the AfDB (USD 40.4 million), BOAD (USD 48.4 million), ISDB (USD 45 million), and other financiers (USD 41.63 million)s . Due to its national significance and strategic geographical location, the construction of this line should prioritize gender sensitivity by employing a significant number of women and promoting local employment.

- **Component 2: Deployment of communicating medium-voltage meters and large consumers in the District of Bamako (USD 14 million of which AfDB-REI: USD 2 million; AfDB: USD 5 million; IsDB: USD 5 million; GCF: USD 2 million)**

This component covers the acquisition (number of meters to be defined with EDM-SA) and deployment of smart meters for customers connected to medium voltage and large consumers in the Bamako region (district). This deployment will enable EDM-SA to substantially improve the quality of service provided to this category of customers. This will help control their demand for electricity, and at the same time promote the integration of renewable energies into the energy mix. This deployment will contribute to the reinforcement of Bamako's 225 kV loop. The use of smart meters will help improve energy efficiency and control.

- **Component 3: Development of a Network Code (USD 0.3 million of which AfDB-REI: USD 0.1 million; AfDB: USD 0.2 million)**

The aim of this component is to draw up a document defining the conditions and criteria for the production, transmission, distribution, sub-regional and/or cross-border interconnection and marketing of electrical energy in Mali. It should enable Mali to face the future electricity market in the ECOWAS zone with greater serenity. The reliability of the network will depend not only on the quality of the equipment, but also on how it is used. This code will regulate access to the network. Reducing disruptions to the network for better integration of renewable energies. This activity will be steered mainly by the DNE, which is responsible for drawing up the elements of the national energy policy.

- **Component 4: Feasibility studies, including technical, economic, financial and ESIA studies to prepare future investment operations (USD 8.9 million of which AfDB-REI: USD 8.9 million)**

The financing of projects in this sector is often hampered by the absence of sufficiently detailed studies. This component will contribute to the provision of feasibility or other studies for priority projects, in anticipation

of the search for funding. The component specifically provides for feasibility studies to be carried out for priority projects, in particular the 225 kV Bamako (Kambila) - Kolokani - Diéma - Kayes line, in order to connect these localities to the interconnected grid and enable the construction of solar power plants identified in the region. In general, the component will contribute to the establishment of a portfolio of projects available at any time and ready to be financed.

- **Component 5: Capacity building of sector stakeholders (EDM-SA, DNE, CREE, Ministry) (USD 1 million of which AfDB-REI: USD 0.4 million; WB-REI: USD 0.5 million; GCF: USD 0.1 million)**

This component focuses on capacity-building for the sector's key players on issues relating to the evolution of the power system, the development of smart grids and the integration of renewable (intermittent) generation sources into the grid.

EDM-SA: Capacity building in planning, design and analysis of electrical networks, protection and automation of electrical networks, SCADA, operation and maintenance of smart electrical networks integrating renewable production sources.

AMADER: Capacity-building for public-private agents in the planning and implementation of solar power generation facilities; operation and integration of solar photovoltaic energy into the grid; maintenance and performance monitoring of solar photovoltaic power plants; financial, accounting and commercial management of PV/diesel mini-grids.

DNE/Ministry: Capacity building concerns the DNE and the Ministry and will be based on the mastery of planning, control and management tools for renewable energy production infrastructures, energy efficiency and control, mastery of procurement processes and contract negotiations.

CREE: Capacity building for CREE will be devoted to south-south learning and exchanges, in particular to Ghana and Kenya, with a view to drawing inspiration from the advances these countries have made in their electricity sectors. Two (02) Commissioners and four (04) experts from the EERC Executive Secretariat will take part in these exchanges of experience.

AER: Capacity building will focus primarily on mastering tools for sizing and designing renewable energy production infrastructures, as well as training staff in environmental monitoring and assessment, techno-economic and financial project analysis, project management and the use of test equipment for renewable energy and energy efficiency products.

- **Component 6: Technical assistance to adapt the legal and regulatory framework governing the energy sector in Mali (USD 0.5 million of which AfDB-REI: USD 0.4 million; GCF: USD 0.1 million)**

The aim of this "technical assistance" component is to provide support in the drafting of new texts or the revision or updating of old texts, in particular policy documents, strategies, institutional and regulatory frameworks governing the energy sector in Mali.

It will provide support for the publication or popularization of documents and regulatory decisions, to ensure free access to information. The CREE intends to have a functional and easily accessible website. It intends to take advantage of digitization to support its activities and increase the level of cooperation with the various stakeholders, notably operators, consumers and investors. This process could be initiated through the creation of a database within the CREE and the regular updating of its website.

11. Consistency with Investment Criteria:

- **Potential for transformational change**

The CIF-REI IP is a strategic guidance framework to support the policies and priorities of the Government of Mali in its efforts to achieve zero net emissions and inclusive, climate-resilient development paths. It will

mobilize an estimated \$300 million in private financing; increase the share of renewable energies in Mali's energy mix; take over and integrate into the grid a surplus of current renewable energy capacity which will reach a minimum of 599 MW³² that Mali plans to install by 2030 as well as future production, estimated at 980 GWh; improve the supply of electricity to industrial and domestic consumers; lowering the cost of producing energy from renewable sources and promoting climate-resilient energy infrastructure will directly improve access to clean energy sources in Mali.

By making sufficient energy available, the project will have an undeniable impact on people's lives. The availability of energy will lead to the development of income-generating activities through the creation of rural micro-businesses for the production and marketing of local products, as well as the creation of numerous jobs; the improvement of the health situation, the improvement of the schooling rate, etc.

- **Potential for reducing/avoiding GHG emissions**

Through its components, demand-side management and institutional, regulatory and legislative facilitations, the project will contribute to a significant increase in the share of renewable energies in the national energy mix, and the improvement of service to the population. This will help to avoid CO₂ emissions; in the long term, 690,000 tonnes of carbon equivalent will be avoided/reduced through the implementation of solar production made possible by the priority projects of the CIF-REI investment program.

- **Financial efficiency**

With the exception of the meter deployment component for MV customers and large consumers, the other components of the project take the form of support or assistance for the drafting or updating of new texts, as well as capacity building for the players involved.

- **Potential impact on development**

The implementation of the CIF-REI Investment Program can have a significant positive impact on the environment, the economy and society. New business opportunities could emerge to accompany the program and beyond, ensuring its sustainability and supporting the sector's development. The CIF-REI program could encourage the emergence of an electrical industry. A few industrial units already exist, but their impact is fairly limited. Implementation of the investment program, given the size of the infrastructure, the importance of the equipment and the expertise required, will lead to the emergence of local subcontractors and probably the local manufacture/production of many components.

The implementation of CIF-REI could lead to the emergence of numerous SME/SMIs driven by the private sector to meet the needs of the program's major infrastructure projects and beyond. This will create numerous jobs for young people and strengthen national expertise. Implementing the program over a long period of time will contribute to strengthening the expertise of local qualified personnel, as well as local engineering and consultancy firms.

The emergence of medium- and long-term partnerships between private Malian and foreign operators. Implementation of the program will encourage the emergence of such partnerships, given the very high technical level of certain technologies and the need for certain international companies to have local representatives. The availability of sufficient quantities of clean, low-cost electricity could facilitate the installation of new industrial units, particularly in the agro-industrial and mining sectors. The country could

³² This estimate is based on the possible completion of the following photovoltaic installations: PV Safo (50MW) ; Kambila (40 MW) ; Tiakadougou-Dialakoro (50 MW) ; Fana 1 (60 MW) ; Segou (33 MW) ; Sikasso (50 MW) ; Fana (Legendre) (50 MW) ; Sanankoroba (100 MW) ; Koutiala (25 MW) ; Tinkéle (48 MW); Bla (93 MW).

also play a role in the global energy transition by producing, for example, batteries for vehicles or other applications, as it has the necessary raw materials.

Improving the policy and regulatory framework, in particular the legal framework for renewable energy injection (feed-in tariffs, tax breaks, subsidies, public guarantees, grid code), will reduce the perception of risk by international investors, so that private sector investment in renewable energies will materialize.

12. Stakeholder Engagement:

The energy sector is managed by the Ministry of Mines, Energy and Water through a central department: National Energy Directorate (DNE), four public agencies of the Electricity Utility Operators (EDM-SA), independent power producers -SOPAM, Albatros, AKUO, etc.-, rural electrification operators and self-producers. Under the supervision of the Prime Minister's Office, the Water and Electricity Regulatory Commission (CREE) and the Public-Private Partnership Unit.

Civil society organizations/NGOs. NGOs (national and international), cooperatives, women's and socio-professional organizations, consumer associations, etc. play a very important role in the development of renewable energies in Mali. These organizations are involved in implementing projects (of modest size) in the field, often for the benefit of the underprivileged (in urban and rural areas); raising awareness/informing the population about the advantages of using RE, etc. These organizations remain an essential segment for the dissemination of RE and energy-saving equipment, replacing or complementing state intervention. They will be called upon to play an important role in implementing the program, particularly at the level of domestic consumers, but also in setting up productive uses of energy (women's associations, craftsmen, etc.).

Technical and Financial Partners (Donors) participate in the financing of projects and programs through public or private institutions. These are essentially: the World Bank, the African Development Bank, the International Finance Corporation, the United Nations Development Program, the European Union Delegation (not exhaustive).

Development partners (bilateral cooperation). Within the framework of bilateral cooperation, they finance projects and programs through public or private institutions. These include GIZ, KfW (Germany), USAID, Danish Cooperation (DANIDA), Agence Française de Développement (AFD), Belgian Cooperation, Dutch Cooperation and India (non-exhaustive list).

13. Gender Considerations:

Background

In Mali, women are often the hardest hit by the effects of climate change, due to their dependence on agriculture and water for their livelihoods and their limited access to resources and opportunities. In addition, women are often excluded from decisions relating to the use and management of natural resources, which limits their ability to participate in political processes. It is therefore important to ensure that development strategies take into account the different experiences and needs of women and men, and that they are equitably involved in the implementation of these efforts. This can include equitable access to resources and opportunities, as well as the active participation of women in decision-making processes. In addition to the income-generating activities that electricity can bring to women, the following actions are likely to bring about real positive change: (i) increasing the representation of women in jobs in the electricity sector; (ii) improving working conditions for women in the electricity sector; (iii) promoting equitable access for all to electrical services. The Malian legislator has already passed a law that reinforces the consideration of gender in all positions, including elective mandates.

Expected gender outcomes

From a "gender equity" perspective, the program will help to considerably improve the social and economic status of women by lightening the burden of firewood collection (thus freeing them up for other tasks), and

improving their access to energy for income-generating activities. The availability of modern energy services will enable children to do their homework and learn their lessons in the evenings, women to give birth in better conditions and be able to move around at night in better safety conditions, etc. A whole range of income-generating activities will also be possible (ice production, food processing, artisanal bakeries, etc.).

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

Core Indicators	Target
Increased availability of network services (#) and improvements (#)	2000 intelligent MV meters
Number of policies, regulations, codes or standards related to the integration of renewable energies that have been modified or adopted (#)	03
Installed capacity of variable renewable energy available to the grid (MW) -direct Indirect	599 MWp (2030)
Number of women and men, businesses and community services benefiting from improved access to electricity and/or other modern energy services - direct/indirect (#)	1,000,000 (52% women) 200 companies
Social inclusion and distributional impacts: Number of people trained in new trades in the renewable energy sector Number of private-sector players redeployed in rural areas	500
Number of companies, entrepreneurs, technologies and other innovative businesses demonstrating a strengthened, climate-sensitive business model	04 companies 50 active people

15. Co-Financing:

	Amount (in USD million):	Type of contribution:
AfDB-REI	11.8	
WB-REI	0.5	
AfDB	45.6	
IDB	50	
GCF	2.2	
BOAD	48.4	
Others	41.63	
Co-Financing Total:	USD 200.13M	
REI Financing	USD 12.3 M	

16. Expected Board/MDB Management approval date:

Q.4 2023- Q.1 2024

Line 225 kV Kayes – Yelimane transmission line project

1. Country/Region:	Mali	2.CIF Project ID#:	(Trustee will assign ID)
3. Source of Funding:	<input type="checkbox"/> FIP	<input type="checkbox"/> PCR	<input type="checkbox"/> SREP <input checked="" type="checkbox"/> REI
4. Project/Program Title:	<i>Line 225 kV Kayes – Yelimane transmission line project</i>		
5. Type of CIF Investment :	<input checked="" type="checkbox"/> Public	<input type="checkbox"/> Private	<input type="checkbox"/> Mixed
6. Funding Request in million USD equivalent:	<i>SREP Grant:</i>	<i>Non-Grant:</i>	
		USD	
	<i>REI Grant:</i>		
7. Implementing MDB(s):	African Development Bank		
8. National Implementing Agency:	National Energy Directorate (DNE) Energy of Mali (EDM-SA)		
9.MDB Focal Point and Project/Program Task Team Leader (TTL):	<i>Headquarters- Focal Point:</i>	<i>TTLs:</i>	
	Gizaw Kidanua Abera k.gizaw@afdb.org	Pierre Djaigbe p.djaigbe@afdb.org	
	Gareth B. Philips g.philips@afdb.org	Hamathe Mane hmane@afdb.org	
10.Project/Program Description :			

A. Introduction

The Climate Investment Fund, through the Renewable Energy Integration Program (REI), aims to accelerate transformative change in Mali and promote inclusive and climate-resilient development paths through climate finance. The REI Program seeks to make the electricity system flexible and suitable for the integration of a larger share of renewable energy production into the grid, as well as improve off-grid access to renewable energy.

1. The 225 kV Kayes-Yelimané transmission line project, targeted under the REI program, is part of the electrical interconnection between Mali and Mauritania. Its objective is to increase solar energy production capacity and enable electricity exchange between Mauritania and Mali, thereby improving access to modern and affordable electricity for the populations of both countries. The specific objectives of this interconnection project are to: (i) establish a high-voltage (225 kV) electrical connection over a distance of 1500 km with an energy transmission capacity of 600 MW between the two countries; (ii) construct solar power plants in both countries that will be connected to the 225 kV interconnection line; (iii) connect 100,000 new households to the electricity grids in the localities along the 225 kV line in both countries (80,000 households in Mauritania and 20,000 households in Mali); and (iv) contribute to the development of regional electricity trade.

The interconnection project receives support from various Development Partners, such as the AfDB, the World Bank, the European Investment Bank, the Delegation of the European Union, the West African Development Bank, the Islamic Development Bank, and the Green Climate Fund (GCF).

Rationale for CIF Financing: The project is in harmony with the CIF-REI Investment Plan (IP), developed under the aegis of the Government of Mali in an inclusive manner through the Ministry of Mines, Energy and Water (MMEE) and with national energy sector development policies and strategies in Mali. These are on the one hand the CREDD (Strategic Framework for Economic Recovery and Sustainable Development) of which energy is one of the strategic axes and on the other hand policy and strategy documents as well as planning/ energy sector programming (PEN, PDIO, etc.).

Country Context

The Republic of Mali covers an area of 1,246,814 km², 51% of which is desert land. Mali is a landlocked Sahelian country in West Africa and is more than 800 kilometers from the nearest sea coast. The population of Mali is estimated at 21.9 million inhabitants, with an annual growth of 3.2%. About 55% of the population live in rural areas. The rate of urbanization is 45% and constantly increasing. Population growth is a concern because it implies a sharp increase in the need for basic social services, which translates into additional pressure on energy production. This also implies that a significant part of the budget of the Government of Mali will have to be devoted to non-productive sectors.

B. Energy Sector Context

The energy sector in Mali is characterized by a high and growing demand for energy, a relatively low production capacity; it benefits from costly state subsidies and is highly dependent on hydrocarbon imports. The national electrification rate is 52%, including 24% in rural areas where more than 70% of the country's total population live. Final energy consumption is dominated by biomass (77%) followed by hydrocarbons (18%), electricity in the total energy consumption (5%). Demand is quite strong and is growing by around 10%/year. The energy mix in 2021 looks like this: 58% thermal, hydro 28%, import 18% and PV 3%. The electricity transmission network in the country has about 1640 km of power lines at all voltage levels of 225 kV, 150 kV; 63 kV and 30 & 33kV and 14 substations. Losses are around 15-20% (interconnected network and isolated centers). For a country as vast as Mali, the transmission network is very weak and does not offer enough possibilities for injecting future production. This is why the approach of the PI CIF-REI takes on its full importance in the development of the transmission network to multiply the injection points and increase the capacities of transport and supply of electrical energy (priority projects of the PI CIF-REI). REI) as well as the initiation of a transmission network management policy through the development of a Network Code.

The management of the sector falls under the responsibility of the Primature, which oversees the regulatory body, the Commission for the Regulation of Electricity and Water, as well as five ministerial departments, four central technical services, and four services under the supervision of the Ministry of Energy and Water Mines. Specifically, the National Directorate of Energy (DNE) is tasked with developing components of the National Energy Policy, as well as coordinating and monitoring the sector. The key stakeholders in the Malian electricity sector can be categorized into four groups: governmental entities, civil society organizations/NGOs, private sector actors, and technical and financial partners (donors).

The vigorous development of renewables in recent years is linked, among other things, to the political priority given to the development of renewables and the implementation of the SREP in Mali. In 2015, 25 hybrid power plant projects with associated mini-grids or connected to the grid were recorded; the signing of 07 Conventions for PV power plants; the signing of 10 Memoranda of Understanding for PV power plants; the implementation of numerous distribution projects for solar lighting kits, solar lanterns and street lamps as well as pico-solar equipment. In addition, 02 PV panel assembly units were made by private operators. From 2015, thirty-eight (38) renewable energy development projects have been approved and public and private funding allocated to renewable energy projects increased from USD 500 million in 2015 to USD 1,458 million in 2020, representing a clear increase in public and private funding. We note a notable increase in investments from the Special Investment Budget (BSI) in favor of renewable energy projects from 7% to 55% between 2015 and 2020. From 2019 to 2021, we recorded agreements for the installation of solar power plants of approximately 1 GWp for private investors.

With regard to the objectives planned for the production of energy of solar origin; both in quantity of energy and in number of production infrastructures by the private sector, sub-regional organizations or major international programs (Desert to Power/DtP), the challenges to be met in order to make all this energy available for consumers are huge. The integration of renewable energies into networks poses unique technical, financial and managerial challenges for transmission and distribution networks. To meet these challenges, the CIF and its partners are proposing the establishment of a support program for the large-scale integration of renewable energies. This program uses concessional financing to accelerate investments in enabling technologies,

Project objectives and components

Project objective

The 225 kV Kayes-Yelimané line will play an essential role in the creation of the electricity interconnection with Mauritania. In addition to this, it will allow on the one hand the connection of solar power stations and on the other hand the electrification of the rural localities which will be crossed by the line. This interconnection will facilitate the exchange of energy between the two countries, allowing Yelimané to benefit from a more reliable and sustainable source of energy thanks to its integration into the national electricity grid. This will help improve access to electricity in the region and promote the socio-economic development of the surrounding areas.

Project components

The project includes 1 component:

- **Component 1: Construction of the 225 kV line and associated substations (USD 90 million including ADB-REI: USD 10 million, ADB ADF-16: USD 40 million, BOAD: USD 30 million, IDB: USD 10 million)**

This component covers the construction of:

- 180120 km of dual line between Kayes and Yelimané;
- Extension of the Kayes substation;
- Construction of the Yelimané substation.

11. Consistency with Investment Criteria:

- **Potential for transformational change**

The CIF-REI PI is a strategic orientation framework in support of the policies and priorities of the Government of Mali in its efforts towards net-zero emissions and inclusive and climate-resilient development pathways. It will allow the mobilization of private financing estimated at 300 million dollars; increase the share of renewable energies in Mali's energy mix; to take over and integrate into the network a surplus of current renewable energy capacity which will reach a minimum of 599 MW that Mali plans to install by 2030 as well as future production, estimated at 980 GWh; to improve the supply of electricity to industrial and domestic consumers; reduce the cost of producing energy from renewable sources and promoting climate-resilient energy infrastructure will directly improve access to clean energy sources in Mali.

The project, by providing enough energy, will have an undeniable impact on the lives of the people. The availability of energy leads to the development of income-generating activities through the creation of rural micro-enterprises for the production and marketing of local products as well as the creation of numerous jobs; improving the health situation, improving the schooling rate, etc.

- **Potential for reducing/avoiding GHG emissions.**

The operation of the 225 kV electrical interconnection line to be built, with a transit capacity of 600 MW, will enable Mali to import approximately 600 GWh of electricity from renewable sources each year, at a competitive cost per compared to the current expensive one of 0.23 EUR/kWh, to reduce its power deficit (estimated at 250 MW in 2022) for at least the first five years of operation and then to increase the rate of access to national electricity.

The implementation of this plan, including the construction of the interconnection line between Mauritania and Mali, will ultimately make it possible to avoid or reduce 690,000 tonnes of carbon equivalent per year thanks to the implementation of the priority projects of the CIF-REI investment program.

- **Financial efficiency**

As part of the 225 kV Kayes-Yelimané line project, the resources will be used to finance the costs associated with the construction of the line as well as the substations.

- **Potential impact on development**

The implementation of the CIF-REI Investment Program can have a significant positive impact on the environment, the economy and society. New business opportunities could emerge to support the program and beyond to ensure its sustainability and support the development of the sector. The CIF-REI Program could promote the birth of an electrical industry. A few industrial units exist but their impact is quite low. The implementation of the investment program with the size of the infrastructure and the importance of the equipment and expertise required will lead to the emergence of local subcontractors and probably the on-site tailoring/production of many components.

The implementation of CIF-REI could lead to the emergence of many SMEs/SMIs led by the private sector for the needs of the major infrastructure projects of the program and beyond. This will lead to the creation of many jobs for young people and the strengthening of national expertise. The implementation of the program over a long period will contribute to strengthening the expertise of local qualified personnel as well as local design and expertise offices.

The emergence of medium and long-term partnerships between Malian and foreign private operators. The implementation of the program will promote the emergence of such partnerships given the very high level of technicality of certain technologies and the need for certain international companies to have representatives on site. The provision of a sufficient quantity of clean electrical energy at a lower cost could facilitate the installation of new industrial units, particularly in agro-industry and mining. The country could possibly play a role in the energy transition at the global level through the production of e.g. batteries for vehicles or others because the country has the necessary raw materials.

Improving the political and regulatory framework, in particular the legal framework for the injection of renewable energy (feed-in tariffs, tax relief, subsidies, public guarantees, grid code), will reduce the perception of risk by international investors, so that private sector investments in renewable energy will materialize.

12. Stakeholder Commitment:

The energy sector is managed by the Ministry of Mines, Energy and Water through a central service: National Directorate of Energy (DNE), 04 public agencies of Public Electricity Service Operators (EDM-SA), independent producers of electrical energy -SOPAM, Albatros, AKUO, etc.-, rural electrification operators and self-producers. Under the supervision of the Prime Minister, the Electricity and Water Regulation Commission (CREE) and the Public-Private Partnership Unit.

Civil Society Organizations/NGOs. NGOs (national and international), cooperatives, women's and socio-professional organizations, consumer associations, etc. play a very important role in the development of renewable energies in Mali. These organizations intervene in the implementation of projects (of modest sizes) in the field, often for the benefit of disadvantaged people (in urban and rural areas); sensitization/information of the populations on the advantages linked to the use of renewable energies, etc. These organizations remain an essential segment for the distribution of renewable energy and energy-efficient equipment and replace or complement state interventions. They will be called upon to play an important role in the implementation of the programme, in particular,

Technical and Financial Partners (Donors) participate in the financing of projects and programs through public or private institutions. These are essentially: the World Bank, the African Development Bank, the International Finance Corporation, the United Nations Development Program, the Delegation of the European Union (non-exhaustive).

Development partners (bilateral cooperation). They operate within the framework of cooperation bilateral in the financing of projects and programs through public or private institutions. In this respect, we should especially remember GIZ, KfW (Germany), USAID, Danish Cooperation (DANIDA), French Development Agency (AFD), Belgian Cooperation, Dutch Cooperation and India (not exhaustive).

13. Gender considerations :

Background

In Mali, women are often the most affected by the effects of climate change, due to their dependence on agriculture and water for their livelihoods and their limited access to resources and opportunities. In addition, women are often excluded from decisions relating to the use and management of natural resources, which limits their ability to participate in political processes. It is therefore important to ensure that development strategies take into account the different experiences and needs of women and men and that they are equitably involved in the implementation of these efforts. This can include equitable access to resources and opportunities, as well as women's active participation in decision-making processes. In addition to the income-generating activities that electricity can bring to women, the following actions are likely to bring real positive changes: (i) increase in the representation of women in jobs in the electricity sector; (ii) improvement of working conditions for women in the electricity sector; (iii) promotion of equitable access for all to electricity services. The Malian legislator has already passed a law that reinforces the consideration of gender for all positions, including elective mandates. (ii) improvement of working conditions for women in the electricity sector; (iii) promotion of equitable access for all to electricity services. The Malian legislator has already passed a law that reinforces the consideration of gender for all positions, including elective mandates. (ii) improvement of working conditions for women in the electricity sector; (iii) promotion of equitable access for all to electricity services. The Malian legislator has already passed a law that reinforces the consideration of gender for all positions, including elective mandates.

Expected gender outcomes

From a "gender equity" perspective, the program will contribute to considerably improving the social and economic status of women by lightening the tasks of collecting firewood (thus freeing them up for other tasks), and improving their access to energy for income-generating activities. The availability of modern energy services will allow children to do their homework and learn their lessons in the evening, women to give birth in better conditions and to be able to circulate at night in better security conditions, etc. A whole range of income-generating activities will also be possible (ice production, food processing, artisan bakeries, etc.).

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

Core Indicators	Target
People benefiting from access to electricity as a result of the project in Mali	140,000 (including 52% women)
Individuals with permanent employment as a result of the project (including women).	15 (including 30% women)
Number of meters installed in new households in Mali	20,000 (including 15% female-headed households)
Linear 225 kV transmission line with a transit capacity of 600 MW 200km built	

Number of 225 kV/30 kV substations built or extended	08
Line of medium voltage (MV) networks built	100km
Line of low voltage (LV) networks built	325km

15. Co-Financing:

	Amount (in USD million) :	Type of contribution :
ADB-REI	10	Grant
AfDB	40	Loan
BOAD	30	Loan
IDB	10	TBD
Total Co-Financing:	USD 90M	

16. Expected Board/MDB Management approval date:

Dec. 2023

Koutiala - San - Mopti Transmission Line Project

COVER PAGE				
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 type="checkbox"/> SREP	<input type="checkbox"/> REI
4. Project/Program Title:	Koutiala - San - Mopti Transmission Line Project			
5. Type of CIF Investment:	<input type="checkbox"/> Public	<input type="checkbox"/> Private	<input type="checkbox"/> Mixed	
6. Funding Request in million USD equivalent:	SREP	Grant:	Non-Grant: USD	
	REI	Grant:		
7. Implementing MDB(s):	African Development Bank			
8. National Implementing Agency:	National Energy Directorate (DNE) Energie du Mali (EDM-SA)			
9. MDB Focal Point and Project/Program Task Team Leader (TTL):	Headquarters- Focal Point: Gizaw Kidanua Abera k.gizaw@afdb.org		TTL: Al Hassane Diallo A.H.DIALLO@AFDB.ORG	
	Gareth B. Philips g.philips@afdb.org		Hamathe MANE h.mane@afdb.org	
10. Project/Program Description:				
<p>C. Introduction</p> <p>The Climate Investment Fund, through the Renewable Energy Integration Program (REI), aims to accelerate transformational change in Mali, and through climate financing, promote development trajectories that are inclusive and resilient to climate change. The REI Program also aims to make the electricity system flexible and adapted to the integration of a greater proportion of renewable energy production into the grid, and to improve off-grid access to renewable energy.</p> <p>The 225 kV Koutiala-San-Mopti transmission line is part of a strategy to develop the electricity sector, with the aim of reinforcing the security of electricity supply and increasing the availability of the national power grid. The 225 kV line, with a total length of around 300 km, will extend Mali's transmission network to the north. The project concerns the towns of Koutiala, San, Mopti and the major rural agglomerations located along the 225 kV line.</p> <p>The 225 kV Koutiala-San-Mopti transmission line is a priority project in Mali's energy sector. Its completion will enable the expansion of the interconnected grid and ensure the injection of new production (thermal power plants) and the use of energy from interconnections with neighboring countries (OMVS, Mali-Guinea, Mali-RCI). It will also enable future solar power plants to be connected to the interconnected grid.</p> <p>The construction of this line will have two major beneficial effects: (i) it will boost electricity transmission capacity, helping to achieve the government's objectives in terms of integrating renewable energies, and (ii) it will connect the isolated centers of San and Mopti, which currently operate on thermal power, to the interconnected grid, while electrifying the large rural agglomerations located along the line.</p>				

The project is supported by development partners including the African Development Bank (AfDB), BOAD, the Islamic Development Bank (IDB), the West African Development Bank (BOAD) and other partners. Technical assistance for the project will be provided by CIF-REI and the AfDB.

Feasibility studies and ESIA under way.

Rationale for CIF Financing: The project is in line with the CIF-REI Investment Plan (IP), drawn up under the aegis of the Government of Mali in an inclusive manner through the Ministry of Mines, Energy and Water (MMEE), and with national policies and strategies for the development of Mali's energy sector. These include the CREDD (Cadre Stratégique pour la Relance Economique et le Développement Durable - Strategic Framework for Economic Recovery and Sustainable Development), of which energy is one of the strategic axes, and policy and strategy documents as well as planning/programming documents for the energy sector (PEN, PDIO, etc.).

Country Context

The Republic of Mali covers an area of 1,246,814 km², 51% of which is desert. Mali is a landlocked Sahelian country in West Africa, more than 800 kilometers from the nearest coastline. Mali's population is estimated at 21.9 million, with an annual growth rate of 3.2%. Around 55% of the population lives in rural areas. The urbanization rate is 45% and rising steadily³³. Population growth is a concern because it implies a sharp increase in the need for basic social services, which translates into additional pressure on energy production. It also implies that a significant proportion of the Government of Mali's budget will have to be devoted to non-productive sectors.

D. Energy Sector Context

Mali's energy sector is characterized by high and growing energy demand, relatively low production capacity, costly state subsidies and heavy dependence on imported hydrocarbons.

The national electrification rate is 52%, including 24% in rural areas where over 70% of the country's total population live. Final energy consumption is dominated by biomass (77%), followed by hydrocarbons (18%) and electricity (5%). Demand is fairly strong, growing by around 10%/year. The energy mix in 2021 will be 58% thermal, 28% hydro, 18% imported and 3% PV.

The country's power transmission network comprises some 1,640 km of power lines at all voltage levels: 225 kV, 150 kV; 63 kV and 30 & 33 kV, and 14 substations. Losses are in the order of 15-20% (interconnected network and isolated centers). For a country as vast as Mali, the transmission network is very weak and offers insufficient possibilities for injecting future production. This is why the CIF-REI IP's approach is so important: to develop the transmission network, multiplying injection points and increasing transmission and supply capacities (priority projects of the CIF-REI IP), as well as initiating a transmission network management policy by drawing up a Network Code. The completion of future interconnections (Mali-Guinea, reinforcement of the OMVS network, etc.) and the expansion of the interconnected grid will contribute to this development.

The sector is managed by the Prime Minister's Office, which oversees the regulatory body, the Water and Electricity Regulatory Commission, five ministerial departments, four central technical services, and four services under the Ministry of Mines, Energy and Water. These include the National Energy Directorate (DNE), whose mission is to draw up the elements of the national energy policy, and to coordinate and monitor the sector. The main players in Mali's electricity sector fall into four categories: state players, civil society organizations/NGOs, the private sector, and technical and financial partners (donors).

The vigorous development of RE in recent years is linked, among other things, to the political priority given to RE development and the implementation of the SREP in Mali. In 2015, we recorded 25 projects for hybrid

³³ <https://data.worldbank.org/indicator/SP.POP.TOTL?end=2021&locations=ML&start=1960&view=chart>

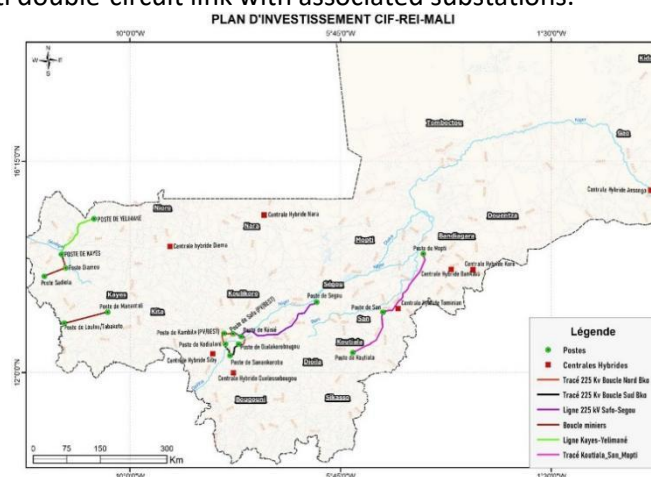
power plants with associated or grid-connected mini-grids; the signing of seven agreements for PV power plants; the signing of 10 memorandums of understanding for PV power plants; the implementation of numerous projects for the distribution of solar lighting kits, solar lanterns and street lamps, as well as pico-solar equipment. In addition, two PV panel assembly units have been built by private operators. As of 2015, 38 RE development projects have been approved, and public and private funding for RE projects has risen from 500 million USD in 2015 to 1,458 million USD in 2020, representing a clear increase in public and private funding. The Special Investment Budget (BSI) has seen a marked increase in investment in renewable energy projects, from 7% to 55% between 2015 and 2020. From 2019 to 2021, agreements have been signed with private investors to install around 1 GWP of solar power plants.

In view of the targets set for solar energy production, both in terms of quantity of energy and number of production infrastructures by the private sector, sub-regional organizations or major international programs (Desert to Power/DtP), the challenges of making all this energy available to consumers are enormous. The integration of renewable energies into grids poses unique technical, financial and managerial challenges for transmission and distribution networks. To meet these challenges, CIF and its partners are proposing a program to support the large-scale integration of renewable energies. This program is based on concessional financing to accelerate investment in enabling technologies, infrastructure, electrification and demand management, as well as market design and improved system operation to promote larger-scale integration of renewable energies.

Project objectives and components

Project objective

The aim of the project is to ensure the expansion of the national power transmission network in order to substantially improve the national electricity supply and contribute to the reduction of production costs linked to thermal generation (e.g. fuel costs for the two main sites involved (San and Mopti), cumulative fuel costs for the years 2020 and 2021 were 3.7 and 10.7 billion FCFA respectively). One of the major assets of the project is the provision of infrastructure for the evacuation/integration of the large current or future production of electricity from renewable solar sources. This will take the form of the construction of the 225 kV Koutiala-San-Mopti double-circuit link with associated substations.



Project components

The project comprises a single component:

- **Construction of the Koutiala-San-Mopti line and associated substations (USD 230 million, of which AfDB-REI: USD 30.3 million; AfDB: USD 50 million; IDB: USD 30 million; BOAD: 30; Others: USD 89.7 million)**

The component includes the investment costs and related activities associated with the construction of the 225 kV Koutiala-San-Mopti line. This line, with its three (03) substations, will ensure the connection of all future power plants to be built in these three administrative regions, which are among the most dynamic in Mali in economic and commercial terms. Prospects for agro-industrial development (agriculture, livestock, fishing, tourism, etc.) are extremely high. Completion of the line will entail the de facto closure of the San (6.9 MW and 15.9 GWh) and Mopti (21.9 MW and 56.28 GWh) thermal power plants, and the connection of numerous factories, notably cotton ginning and agro-industrial plants. Financing for the component will be provided by CIF-REI (USD 30.3 million), the African Development Bank (AfDB, USD 50 million), the West African Development Bank (BOAD, USD 30 million), the Islamic Development Bank (IDB, USD 30 million) and other partners (USD 89.7 million). The construction of this line, which is a major project on a national scale and given its strategic geographical location, must be extremely gender-sensitive, with a significant number of women hired, and local employment given priority.

11. Consistency with Investment Criteria:

- **Potential for transformational change**

The CIF-REI IP is a strategic guidance framework to support the policies and priorities of the Government of Mali in its efforts to achieve zero net emissions and inclusive, climate-resilient development paths. It will mobilize an estimated \$300 million in private financing; increase the share of renewable energies in Mali's energy mix; take over and integrate into the grid a surplus of current renewable energy capacity which will reach a minimum of 599 MW³⁴ that Mali plans to install by 2030 and future production, estimated at 980 GWh; improve the supply of electricity to industrial and domestic consumers; lowering the cost of producing energy from renewable sources and promoting climate-resilient energy infrastructure will directly improve access to clean energy sources in Mali.

The construction of the line will be the driving force behind economic growth in the area, and the permanent availability of sufficient low-cost energy will have an undeniable impact on people's lives and the socio-economic development of the whole area. The availability of energy will lead to the development of income-generating activities through the creation of rural micro-businesses for the production and marketing of local products, as well as the creation of numerous jobs; the improvement of the health situation and school enrolment rates; the improvement of the security situation and the creation of numerous jobs in the agricultural and tourism sectors.

- **Potential for reducing/avoiding GHG emissions**

The construction of the 225 kW line will contribute to a significant increase in the share of renewable energies in the national energy mix, as well as improving service to the population. The switchover of the San and Mopti thermal power plants (around 30 MW and 76 GWh) and the electrification of large rural centers from the line will avoid CO₂ emissions linked to thermal production. In addition, the connection of numerous industrial units and hotel/tourism establishments that currently run on generators will contribute to CO₂ reduction.

- **Financial efficiency**

Detailed technical and financial feasibility studies are under way and financed by BOAD.

- **Potential impact on development**

³⁴ This estimate is based on the possible completion of the following photovoltaic installations: PV Safo (50MW) ; Kambila (40 MW) ; Tiakadougou-Dialakoro (50 MW) ; Fana 1 (60 MW) ; Segou (33 MW) ; Sikasso (50 MW) ; Fana (legendre) (50 MW) ; Sanankoroba (100 MW) ; Koutiala (25 MW) ; Tinkéle (48 MW); Bla (93 MW).

The implementation of the CIF-REI Investment Program could have a significant positive impact on the environment, the economy and society. New business opportunities could emerge to accompany the program and beyond, ensuring its sustainability and supporting the development of the sector. The CIF-REI program could encourage the emergence of an electrical industry. A few industrial units already exist, but their impact is fairly limited. Implementation of the investment program, given the size of the infrastructure, the importance of the equipment and the expertise required, will lead to the emergence of local subcontractors and probably the local manufacture/production of many components.

In the short term, during the construction phase, the project could lead to the emergence of numerous local SMEs supported by the private sector to meet the needs of the program's major infrastructure projects and beyond. This will create numerous jobs for young people and strengthen national expertise. Implementing the program over a long period of time will contribute to strengthening the expertise of local qualified personnel, as well as local engineering and consultancy firms.

The emergence of medium- and long-term partnerships between private Malian and foreign operators. Implementation of the program will encourage the emergence of such partnerships, given the very high technical level of certain technologies and the need for certain international companies to have local representatives. The availability of a sufficient quantity of clean, low-cost electrical energy could facilitate the installation of new industrial units, particularly in the agro-industrial and mining sectors.

The 225 kV Koutiala-San-Mopti line is located in an area which, in addition to its agro-pastoral assets, is one of Mali's most important and internationally recognized tourist centers. The provision of clean, permanent energy will boost the tourism sector by improving the welcome and accommodation for tourists. The tourism sector creates numerous jobs and contributes to the enhancement of cultural heritage and arts-related professions.

12. Stakeholder Engagement:

The energy sector is managed by the Ministry of Mines, Energy and Water through a central department: National Energy Directorate (DNE), four public agencies of the Electricity Utility Operators (EDM-SA), independent power producers -SOPAM, Albatros, AKUO, etc.-, rural electrification operators and self-producers. Under the supervision of the Prime Minister's Office, the Water and Electricity Regulatory Commission (CREE) and the Public-Private Partnership Unit.

Civil society organizations/NGOs. NGOs (national and international), cooperatives, women's and socio-professional organizations, consumer associations, etc. play a very important role in the development of renewable energies in Mali. These organizations are involved in implementing projects (of modest size) in the field, often for the benefit of the underprivileged (in urban and rural areas); raising awareness/informing the population about the advantages of using RE, etc. These organizations remain an essential segment for the dissemination of RE and energy-saving equipment, replacing or complementing state intervention. They will be called upon to play an important role in implementing the program, particularly at the level of domestic consumers, but also in setting up productive uses of energy (women's associations, craftsmen, etc.).

Technical and Financial Partners (Donors) participate in the financing of projects and programs through public or private institutions. These are essentially: the World Bank, the African Development Bank, the International Finance Corporation, the United Nations Development Program, the European Union Delegation (not exhaustive). Development partners (bilateral cooperation). Within the framework of bilateral cooperation, these partners finance projects and programs through public or private institutions. These include GIZ, KfW (Germany), USAID, Danish Cooperation (DANIDA), Agence Française de Développement (AFD), Belgian Cooperation, Dutch Cooperation and India (not exhaustive).

13. Gender Considerations:

Background

In Mali, women are often the hardest hit by the effects of climate change, due to their dependence on agriculture and water for their livelihoods and their limited access to resources and opportunities. In addition, women are often excluded from decisions relating to the use and management of natural resources, which limits their ability to participate in political processes. It is therefore important to ensure that development strategies take into account the different experiences and needs of women and men, and that they are equitably involved in the implementation of these efforts. This can include equitable access to resources and opportunities, as well as the active participation of women in decision-making processes. In addition to the income-generating activities that electricity can bring to women, the following actions are likely to bring about real positive change: (i) increasing the representation of women in jobs in the electricity sector; (ii) improving working conditions for women in the electricity sector; (iii) promoting equitable access for all to electrical services. The Malian legislator has already passed a law that reinforces the consideration of gender in all positions, including elective mandates.

Expected gender outcomes

From a "gender equity" perspective, the program will considerably improve the social and economic status of women by lightening the burden of firewood collection (thus freeing them up for other tasks), and improving their access to energy for income-generating activities. The availability of modern energy services will enable children to do their homework in the evenings, women to give birth in better conditions and be able to move around at night in safer conditions, and so on. A whole range of income-generating activities will also be possible (ice production, food processing, artisanal bakeries, etc.). In addition, activities linked to the development of tourist, artistic and cultural activities will provide numerous jobs for women.

14. Co-Financing:

	Amount (in USD million):	Type of contribution:
AfDB-REI	5.0	
AfDB	50	
BOAD	30	
Others	137.1	
Co-Financing Total	USD 222.1 M	

15. Expected Board/MDB Management approval date:

2025

Safo and Kambila Solar Power Plants Concept Note

COVER PAGE				
1. Country/Region :	Mali	2. CIF project identification number :	(The administrator will assign an identification number)	
3. Source of financing :	<input type="checkbox"/> <i>FIP</i>	<input type="checkbox"/> <i>PPCR</i>	<input type="checkbox"/> <i>SREP</i>	<input type="checkbox"/> <i>REI</i>
4. Project/program title :	Desert to Power, Safo and Kambila Solar Power Project			
5. Type of CIF investment :	<input type="checkbox"/> <i>Public</i>	<input type="checkbox"/> <i>Private</i>	<input type="checkbox"/> <i>Mixed</i>	
6. Request for financing in millions of USD equivalent :	<i>SREP</i>	<i>Grant: USD 2 million</i>	<i>Unsubsidized : 15 million USD</i>	
	<i>REI</i>	<i>Grant: USD 0.32 million</i>		
7. Implementing multilateral development organization(s) :	African Development Bank			
8. National implementation agency :	Energie du Mali (EDM-SA) Mali Renewable Energy Agency (AER-MALI)			
9. MDB focal point and project/program team leader (TTL) :	<i>Headquarters - Focal point :</i> Gizaw Kidanua Abera k.gizaw@afdb.org Gareth B. Philips g.philips@afdb.org		<i>TTL :</i> Hamathe MANE h.mane@afdb.org Eric Pregnon e.pregnon@afdb.org	
10. Project/program description :				
<p>E. Introduction</p> <p>CIF funds, through the Renewable Energy Integration Program (REI) and the Renewable Energy Scaling Program (SREP), will be key to providing the necessary financing for new technologies in the country, with the ultimate goal of increasing the renewable energy mix in Mali's national grid and strengthening the government's capacity to manage and implement grids with significant variable renewable energy. The ultimate goal is to increase the renewable energy mix in Mali's national grid and strengthen the government's capacity to manage and implement grids with a significant share of variable renewable energy. The Safo and Kambila project will include a strong assistance component that will increase the technical and financial capacity of the national utility, Energie du Mali (EDM-SA). The project consists of two solar power plants linked by a 225 kV transmission loop in the vicinity of Safo and Kambila, which are located 20 and 26 km respectively from the capital Bamako.</p> <p>The project, proposed as part of the "Desert to Power" initiative, brings together a number of development partners, including the West African Development Bank (BOAD), the Islamic Development Bank (IDB) and the OPEC Fund for International Development, which will finance the solar power plants and transmission grid alongside the African Development Bank (AfDB), which will provide overall technical support for the project, and the financing of energy storage, which will be supported by SREP funding. Technical assistance will be provided by CIF-SREP, CIF-REI and AfDB funds.</p>				

All preparatory studies, including technical, financial, economic, environmental and social studies, were carried out by AFD.

Justification for CIF funding: The proposed project is perfectly aligned with the SREP investment plan in Mali and will contribute to the achievement of its objective by supporting the *"large-scale development of renewable energies, to effectively contribute to poverty reduction and sustainable development in Mali for the benefit of its population"*.³⁵ The project is also well aligned with the objectives of the CIF renewable energy integration program by introducing storage for grid stability, which will facilitate the integration of a greater share of variable renewable energy into Mali's national grid. In addition, CIF-REI funding will help to address the deluge of poor-quality solar equipment by financing laboratories to evaluate imported solar panels and other components, and by supporting the local manufacture of solar components and equipment.

F. National context

Mali is a landlocked country in the Sahelian belt of West Africa. It covers an area of 1,241,248 km², 51% of which is desert and 4% arable land. Mali is part of the Sahelian region, which comprises the mainly flat plains that stretch between the Sahara desert to the north and the savannahs to the south. It is the largest economy in the G5 Sahel. Power generation capacity in Sahelian countries is 35 W per capita, which is only a third of the average for sub-Saharan Africa and 4% of the world average.

G. Background to the energy sector

78% of Mali's energy supply currently comes from biomass, mainly in the form of wood and charcoal for domestic use. Access to clean, affordable and reliable energy would enhance women's economic autonomy and security (through street lighting at night), as well as general well-being at community level by improving the productive use of electricity (which can be used to enhance food security and access to water). In the climate mitigation scenarios for 2020-2030, the energy sector is the biggest contributor to climate mitigation in the country, with an estimated mitigation potential of 31% of total emissions reduction potential. Mali's per capita CO₂ emissions are 0.05 tCO₂eq.

Access to energy in Mali is higher than in the other G5 Sahel countries (50%). Yet only 25% of the widely dispersed rural population has access to energy. Installed capacity is 605 MW, including imports from Côte d'Ivoire. Excluding imports, renewable energy sources account for 38.5% of production. As part of Mali's energy policy document³⁶, revised in 2018, the country plans to make the most of its national energy resources (hydroelectricity, solar, biomass, wind) by increasing the share of renewable energies (including medium and large-scale hydroelectricity) in the energy mix. Mali also has ambitious national targets to increase the renewable energy mix to 59% in 2025, 64% in 2030 and 70% in 2036.

Production in GWh	2020	
Hydraulics	782.35	30%
Thermal	983.20	38%
Inter-state imports	769.06	30%
Solar	60.41	2%
Total	2 595.02	

Table 1: Power generation in Mali, source: EDM-SA

If the necessary funding is secured, Mali could become a regional player, able to export surplus solar production and exchange energy with Guinea, Côte d'Ivoire and Nigeria (via the Burkina/North Core extension)

³⁵ [SREP investment plan in Mali](#)

³⁶ Document : [Mali's national energy policy](#) and the [National Renewable Energy Action Plan \(PANER\) of Mali](#)

and significantly reduce its cost of production. Mali could be very well integrated into the WAPP market thanks to the various interconnections, but it is important that supply contracts are signed to make full use of import capacity (particularly from Guinea). Regional solar parks and participation in OMVS projects (hydropower) will complete a balanced (and green) installed capacity. Without the necessary investments in solar energy and additional interconnection capacity, the country would have to continue using heavy fuel oil (HFO). This scenario would cost the country around US\$700 million and add 3.6 million tonnes of CO₂ equ.

The National Energy Directorate (DNE), within the Ministry of Energy and Water (MEE), is responsible for formulating, promoting, coordinating, monitoring and evaluating national energy policy. Energie du Mali (EDM-SA) is a vertically integrated private utility operating under a public service concession agreement for the supply of electricity in urban areas. Formerly a fully state-owned enterprise, the Government of Mali (GdM) retains a 40% stake. The company has a monopoly on transmission and distribution, while generation is open to private producers such as SOPAM-SA and Albatros Energie. EDM-SA is currently the sole purchaser of electricity generated by these IPPs. Recent information suggests that the government intends to separate the generation and distribution activities into two separate companies.

The sectoral challenges and risks of the proposed operation can be summarized into technical and financial challenges. The technical challenges relate to the difficulty of integrating a large amount of variable renewable energy into the energy mix. To address this, preparatory studies include a renewable energy integration study, which will be complemented by a larger study being prepared through technical assistance provided by the Sustainable Energy Fund for Africa (SEFA) as part of "Desert to Power" activities in Mali. The financial challenges and risks are linked to the poor financial results of the electricity company EDM-SA. The company recorded a total loss of \$100 million in 2016, due to high production costs, the absence of tariff adjustments and significant technical and commercial losses. As a result, payments to suppliers (including imports from Côte d'Ivoire) have been delayed, and EDM-SA does not have the capacity to invest adequately in network extension and maintenance of network infrastructure.

H. Project objectives and components

Project objective

The Desert to Power Safo and Kambila project aims to improve reliability and inclusiveness by diversifying Mali's energy mix to include a greater share of renewable energy in order to increase electricity supply around Bamako, Mali's capital, and provide energy access to more households through solar-generated electricity backed by storage. This objective will be achieved through two solar power plants located in Safo (50 MWp) and Kambila (40 MWp), each associated with energy storage units (42 MW for Safo and 33 MW for Kambila) that will facilitate the integration of solar energy into the grid. In addition, capacity building through technical assistance will enhance the capabilities of the beneficiaries (EDM-SA), thus ensuring the sustainability of the project. It is proposed that the two power plants be built under a turnkey engineering, procurement and construction (EPC) contract, and then operated directly by EDM-SA. They will secure the electricity supply to the north of Bamako, reduce CO₂ emissions from the power system and better control energy production costs.

Project components

It is proposed to develop the project in three components:

- **Component 1: Construction of solar power plants (100 million euros):** Component 1 covers the investment costs and related activities associated with the construction of two (02) solar power plants in the districts of Kambila and Safo, located in the Bamako region of Mali. The Kambila solar power plant, with an estimated peak capacity of 40 MW, will be built on a site not far from the existing Kambila HTB substation. The Safo solar power plant, with an estimated peak capacity of 50 MW, will be connected to the new HTB, which will bear the same name as the plant. Funding for this component

will be provided by the West African Development Bank (BOAD, 30 million euros), the Islamic Development Bank (IDB, 25 million euros) and the OPEC Fund for International Development (OPEC Fund, 25 million euros). A gender-sensitive approach will be applied in the construction of the power plants by hiring a percentage of women and including gender-sensitive facilities on the work site to ensure their safety.

- **Component 2: Energy storage systems (ESS) for grid stability and other investments (EUR 16.3 million; USD 15 million³⁷)**: This component will include investments in energy storage systems to ensure grid stability, frequency regulation and the provision of firm capacity for evening peak hours. The energy storage systems will be connected to a 225 kV transmission loop around Bamako. The construction of this transmission loop was the subject of a separate project, initially financed by the AFD to the tune of 55 million euros and by the EIB to the tune of 50 million euros.³⁸ This key project is currently being prepared for approval by the African Development Bank and BOAD. This component will also cover other investments in Mali's renewable energy sector.
- **Component 2.1 - Energy storage systems (30 million euros)**: The energy storage systems (ESS), for both sites (Safo and Kambila), will be financed by the African Development Bank (10 million euros), the CIF-SREP (15 million USD) and the Islamic Development Bank (3 million euros).
- **Component 2.2 - Construction and equipping of two test laboratories for quality control of solar equipment (0.3 million euros)**: The project to build two laboratories in Bamako is in line with Mali's renewable energy development strategy, in particular the development of renewable energy potential and the quality of equipment on the Malian market. This project is one of the priority projects identified by the Malian Renewable Energy Agency as part of the development of the renewable energy sub-sector.
- **Component 3: Technical assistance to EDM-SA and the Government of Mali (USD 2 million)**: This component will focus on :
 - Strengthening EDM's ability to operate and maintain the efficiency of power plants and the EPC process while applying a gender-sensitive approach.
 - Project management and coordination costs.
 - Technical studies to prepare for next-generation investments and other activities to strengthen Mali's capacity to prepare and implement gender-sensitive renewable energy projects.

11. Consistency with Investment Criteria :

- **Increase in installed capacity of renewable energy sources**

The project will directly increase the country's installed renewable energy capacity by 90 MW, with an estimated combined annual production of 158.4 GWh or 158,400 MWh/year over a 25-year period, for a total output of 3,960,000 MWh.

Production simulation for year 1 (P50)

	Kambila	Safo	Total
Production GWh/year	69.86	88.5	158.4
Specific production (kWh/kW/year)	1,736.1	1,755.8	3,491.9
Performance report	79.7	80.7	

³⁷ To be requested in EUR equivalent.

³⁸Link to project information: <https://www.afd.fr/fr/carte-des-projets/boucle-haute-tension-nord-autour-de-bamako>

- **Potential for transformational change**

The CIF's SREP program has helped transform Mali's energy landscape, with a significant increase in investment in renewable energy and lessons learned that will transform the renewable energy sector. The Desert to Power initiative will build on this progress to mobilize investment in Mali and other Sahelian countries. The implementation of this project as part of Mali's SREP investment plan also paves the way for further expansion through the CIF's renewable energy integration program, for which Mali has been selected as a beneficiary country.

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 provision of goods and services (consumer goods, grain purchases, housing, etc.), for both women and men. In addition, the project will foster Mali's industrial development by increasing employment opportunities for young people and women. The country's populations will benefit most from their new access to electricity when they can use it to strengthen their existing economic activities and start up new ones. This will improve their ability to pay and ensure reliable long-term demand. The project will ultimately contribute to the creation of around 1,500 new green jobs.

- **GHG emission reduction/avoidance potential**

By integrating this renewable technology into the country's overall energy system, and assuming that the alternative would be to build thermal power generation capacity, the project is expected to deliver greater environmental, economic and social benefits, including: (a) an estimated 99,626 tCO₂ / year over a 25-year period of greenhouse gas emissions will be avoided. In addition, the project will also help reduce pollution caused by diesel generators, kerosene lamps, candles and dry cells that would otherwise have been kept for lighting or communication; (b) health benefits (for example, through the supply of electricity that will support health centers, enabling lighting and the operation of key equipment); (c) the creation of green jobs and other employment opportunities, mainly linked to the construction, operation and maintenance of solar power plants; and (d) the improvement of women's socio-economic status through access to energy services and income-generating opportunities.

- **Opportunity to make a significant contribution to the principles of just transition**

In Mali, rural households rely mainly on firewood for cooking and kerosene lamps for lighting, with 98.7% of the rural population in the lowest consumption segment. Increasing the penetration of renewable energies is a necessity to meet electricity demand while reducing greenhouse gas emissions, and ultimately to promote sustainable development. The supply of energy from renewable sources will take advantage of competitive solar energy prices, battery storage and the possibility of exploiting Mali's significant solar potential.

- **Financial efficiency**

The economic and financial feasibility of the project is confirmed by the feasibility study carried out on the project. The financial analysis methodology took into account both the country's perspective and that of EDM-SA, which will be in charge of building and operating the solar power plants. A cash flow analysis was also carried out from Mali's perspective. The analysis covers a 25-year period from the estimated start of construction in 2023. The results of the financial analysis indicate a positive net present value (NPV) of €94.95 million, using a real discount rate of 10.0%. The financial internal rate of return is 20.16% in real terms.

- **Potential impact on development**

The Sahel region is rich in resources but poor in energy. Energy infrastructure is an essential component of economic development and quality of life, but the Sahel lags far behind other developing regions in most aspects of infrastructure quality. In Mali, the potential for economic, social and environmental development is only enhanced by renewable energies. The project will contribute to the expansion of the electrical infrastructure for economic and social development using renewable energy, which will help economic recovery after COVID-19. The project will also improve access to energy, which will have a positive impact on education (for example, by supplying electricity to schools and households, lighting enables children to study in the evenings).

In addition to the power plant, the project involves extending the grid from the project site to the nearest substation. This substation will increase the voltage of the electricity so that it can be integrated into the national transmission infrastructure before reaching the relevant consumption centers. The power plants will supply electricity to around 280,000 people (based on a consumption of 567 kWh of electricity per person per year).

The project will accelerate the use of modern energy in rural and peri-urban areas. As women are the main players in the production, processing and trading of firewood, this project will strengthen their economic autonomy. Interventions in these areas are likely to change their work habits, giving them more time to devote to other productive and educational activities. Women will have the opportunity to develop small food processing businesses and add value to agricultural products. In addition, educational opportunities will increase and women will have more economic opportunities.

12. Stakeholder Engagement :

The energy sector in Mali is divided into three areas: concession areas operated by the national utility EDM-SA, either connected to the national grid or located in isolated centers; small producers in rural areas; and self-producers. The national grid and isolated centers are owned and operated by EDM-SA, while small and large self-producers manage their own infrastructure.

Broad stakeholder engagement within the government of Mali and with other key stakeholders in the energy sector (civil society groups, local communities and surrounding beneficiaries) will be supported by the Desert to Power (DtP) initiative. This project is also identified in Mali's DtP roadmap, which has been designed to align with the priorities of Mali's SREP and IRE. The governance of the DtP initiative also includes technical partners such as Power Africa, IRENA, IEA, Res4Africa, MASEN, NREL, and others, who will be involved in supporting the implementation of the technical assistance component of this project.

This project also benefited from the consultation process that led to the finalization of Mali's renewable energy integration program.

13. Gender Considerations :

Context

Mali is an agro-sylvo-pastoral country with a population of around 18 million (51% of whom are women). Access to non-solid fuels for cooking is extremely limited (around 1%). The energy balance of total energy demand establishes biomass/bioenergy use at 65%, mainly by women, the most vulnerable group. The government of Mali has adopted a national gender policy that includes a major component aimed at improving women's access to appropriate technologies that are less costly and consume less wood energy.

This poor access to energy and non-solid fuels for cooking (mainly for women) is a national challenge, particularly for improving women's quality of life (lighter households, security, work and higher incomes). Other challenges include: reducing the rate of biomass use in the energy balance; increasing the rate of rural and urban electrification; increasing the quota of renewable energy in electrical energy production; improving women's access to modern energy services and technologies or equipment, including vocational training for better use of such equipment; and systematizing gender mainstreaming in all energy programs and projects.

Expected gender-related results

The gender dimension will be integrated throughout the project between the three components. Given that women are under-represented in the energy sector in Mali, the concrete results expected are to involve women in the construction of the two solar power plants at Kambila and Safo, as well as in the construction phase of the electrical infrastructure and ancillary equipment such as the storage system to connect the listed solar power plants to the 225 kV loop around Bamako. Technical assistance activities will focus on building the capacity of EDM staff to enable them to operate and maintain the power plants effectively.

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

Basic indicators	Target
Annual electricity production (solar) in MWh	158,400
Increase in public and private investment (in millions of USD)	110 million euros
Number of women and men, businesses and community services benefiting from improved access to electricity thanks to CIF interventions (men/women)	280,000 (137,200 men / 142,800 women)
GHG emissions avoided in tonnes of CO ₂ equivalent (annual / lifetime)	99,626 tCO ₂ / year 2.49 million tCO ₂ / lifetime
Installed generating capacity (MWp) from renewable energies	90
Power of energy storage systems (MW)	Safo (42); Kambila (33)
Energy value of energy storage systems (MWh)	Safo (42); Kambila (33)

15. Co-Financing :

	Amount (in millions of euros) :	Type of contribution :
West African Development Bank (BOAD)	30	Loans
Islamic Development Bank (IDB)	25	Loans
OPEC Fund for International Development	25	Loans
African Development Bank (AfDB)	10	Concessional loans
Total co-financing :	90 MILLION EUROS	

16. Expected date of approval by BDM Board of Directors/Management :

February 28, 2024³⁹

³⁹ The project was originally scheduled for completion in the 4th quarter of 2023. However, given the political situation in Mali, the project has been put on hold pending the finalization of new financing agreements for the Boucle Nord 225 kV transmission line that will evacuate the two power plants. All studies (technical, financial, environmental and social) and other preparatory activities have already been completed for this project.

I. Context

1. The proposed project is additional follow-up financing for Mali's power grid reinforcement and access extension project (Yelen Sira) (P176633). The Yelen Sira project, which is expected to be approved by the World Bank (WB) Board of Directors by the end of June 2023, builds on current interventions by various donors in the sector, to strengthen interconnected national transmission and distribution networks to increase transit capacity, system reliability and efficiency. It will also support the development of revised sustainable business models for mini-grids and off-grid networks, which can be scaled up as resources become available, improving access to sustainable, reliable and affordable energy.
2. Preparations for Yelen Sira began in 2021 but were interrupted for over a year due to socio-political uncertainties in the country. Preparation resumed with a pre-appraisal mission led by a WB team in April 2023. While project preparation was interrupted, global inflationary pressures following the avian flu pandemic and Russia's invasion of Ukraine led to a significant escalation in costs. As a result, the initial scope of the project was reduced and optimized to align it with the available budget of USD 201 million, while ensuring a comprehensive design. A thorough reassessment of project costs showed that additional funding of over 80 million USD would be required to complete all the activities identified within the initial project scope. Activities under this AF would cover (i) targeted reinforcement of the grid around Bamako to enable the transit of low-cost hydro and solar power, (ii) solar park grid infrastructure to integrate large-scale solar photovoltaic production, (iii) extension of access in rural areas through green mini-grids and individual solar systems, and (iv) implementation support combined with institutional capacity building regarding the integration/promotion of solar photovoltaic energy. This concept note is part of the WB's efforts to mobilize the necessary funding for these activities.

II. Objectives

3. The objectives of AF Yelen Sira would be to (i) complete the reinforcement and improvement of Bamako's interconnected grid, (ii) facilitate the integration of solar photovoltaics by providing a reliable grid infrastructure for the connection of large-scale solar photovoltaic parks, and (iii) promote a green mini-grid and high-quality solar photovoltaic systems for rural electrification.

III. Project description

4. The proposed project will mainly finance four types of activity: (i) targeted reinforcement of the power grid around Bamako to enable the transit of low-cost hydro and solar power, (ii) solar park grid infrastructure to integrate large-scale solar photovoltaic production, (iii) extension of access in rural areas through green mini-grids and individual solar systems, and (iv) implementation support combined with institutional capacity building concerning the integration/promotion of solar photovoltaic energy.

Table 1. Project description

#	Components	Implementing entity	Estimated cost (millions of USD)	Description
1	Integration of photovoltaic solar energy and reinforcement of grid infrastructure		57	

1.1	Construction of a grid infrastructure to connect and inject the solar power plant's output into the grid.	EDM	42	The subcomponent will finance the critical grid infrastructure that will enable the integration of the solar power plant's output into the grid, consisting of (a) the construction of on-site HV substations (225 kV or 150 kV), including extended busbars and new bays, to evacuate the energy generated; (b) HV evacuation lines (150 kV or 225 kV) to inject generated power into the grid; and (c) extension of existing HV/MV substations (225/33 kV or 150/33 kV) for connection to the interconnected grid, which will include double busbars and power transformers. The private sector will finance solar farms, including solar panels and battery storage for each site, to optimize the dispatch of VRE to the grid. This investment in the grid will enable the integration of 165 MWp of PV with storage distributed between the Sanankoroba (65 MWp) and Bougouni (100 MWp) sites. Part of the funds received from CIF-REI should finance this sub-component (see section VI on the financing plan for more details).
1.2	Improvement and extension of transmission/distribution networks in Bamako		15	Investments under this sub-component will cover the rehabilitation of the Sirakoro 150 kV substation, the construction of a new 30/15 kV substation at Sabalibougou and the densification/extension of the distribution network in certain areas of Bamako (Niamakoro-Sabalibougou and Kalaban-Sabalibougou).
2	Green mini-grid and off-grid electrification of selected rural localities		24	
2.1	Mini-grid electrification of selected communities, businesses and public facilities under PPP agreements	AMAD ER	21.5	This project will support the hybridization (with photovoltaics) of an existing mini-grid and the construction of 15 new hybrid green mini-grids to improve access to electricity in rural areas of the country.
2.2	Off-grid solar electrification of households, productive activities and public institutions		2.5	In the field of off-grid systems, the project proposes to finance more than 100 individual solar systems and 40 productive uses in rural areas to provide basic services and support local economic development.
3	Implementation support and institutional capacity building		7	
3.1	Support for the implementation of component 1 (EDM) and institutional capacity building	EDM and AMAD ER	3.5	This will support the implementation/supervision of project activities as well as targeted capacity building in the sector with regard to the integration of solar photovoltaic energy. Part of the funds received from CIF-REI should finance this sub-component (see section VI on the financing plan for more details).
3.2	Support for implementation of component 2		3.5	

	(AMADER) and institutional capacity building			
	Total		88	

IV. Expected results/impact

5. According to initial estimates, the project should have a significant impact on development:
- New connections in rural areas thanks to green mini-grids → 50,000
 - Increase in grid-integrated renewable energy capacity (in megawatts) → 165
 - Activated battery storage capacity (Megawatt hours (MWh)) → up to 180 MWh
 - Hybrid mini-networks built (number) → 15
 - Net greenhouse gas emissions (CRI, metric tons/year) → up to 3,000,000

V. FIC investment criteria met

6. The table below shows how the proposed operation meets the CIF's investment criteria.

Table 2. Alignment with CIF investment criteria

Criteria	Alignment description
Transformer changeover	Building on current interventions by various donors in the sector, the proposed operation would strengthen interconnected national transmission and distribution networks to increase transit capacity, reliability and system efficiency. It will also support the development of revised sustainable business models for mini-grids and off-grid networks, which can be expanded as resources become available, thereby improving access to sustainable, reliable and affordable energy. This project is an important piece in the puzzle of investments needed to unlock the Bamako region's transit capacity; other donors, notably the World Bank with the MESIP underway, BOAD and AfDB, are building on the other pieces which are all necessary to contribute to the first stage of EDM-SA's financial and operational restoration.
Emissions reduction potential	The project is also expected to reduce greenhouse gas emissions. GHG emission reductions are estimated at around 3,000,000 tCO ₂
Contributing to a just transition	This operation will bring over 165 MW of photovoltaic solar capacity onto the grid. It will also enable the installation of up to 180 MWh of BESS to facilitate the management of this new solar energy. In addition, the modernization of the grid inside Bamako will enable EDM to take better advantage of its hydroelectric and solar photovoltaic potential, while reducing its dependence on costly and polluting fuel-fired power plants.
Financial efficiency/ Concessionality	The project would benefit from highly concessional IDA credits (both performance-based allocation and shorter-term loans under the scaling-up window). It could also benefit from concessional financing from other sources (notably trust funds), depending on availability and alignment of scope.
Impact on development	The project should enable over 50,000 people living in rural areas, including some of the country's most vulnerable regions, to access new or improved electricity services. It will also enable EDM to benefit from clean, low-cost energy from solar photovoltaic parks.

VI. Financing plan

7. The proposed financing plan, based on current cost estimates, is presented in the table below.

Table 3. Breakdown of financing plan

#	Components	Implementing entity	Total		
			IDA/Other	CIF-REI	Total
1	Integration of photovoltaic solar energy and reinforcement of grid infrastructure		35	22	57
1.1	Construction of a grid infrastructure to connect and inject the solar power plant's output into the grid	EDM	20	22	42
1.2	Improvement and extension of transmission/distribution networks in Bamako		15		15
2	Green mini-grid and off-grid electrification of selected rural localities		24	0	24
2.1	Mini-grid electrification of selected communities, businesses and public facilities under PPP agreements	AMADER	21.5		21.5
2.2	Off-grid solar electrification of households, productive activities and public institutions		2.5		2.5
3	Implementation support		4	3	7
3.1	Support for the implementation of component 1 (EDM) and institutional capacity building	EDM and AMADER	2	1.5	3.5
3.2	Support for implementation of component 2 (AMADER) and institutional capacity building		2	1.5	3.5
	Total		63	25	88

VII. Project preparation schedule (including approval year)

8. As far as the preparation schedule is concerned, Yelen Sira AF is scheduled to start by the end of the fourth quarter of 2023, subject to approval by World Bank management. Given that most of the required appraisals have already been carried out during Yelen Sira project preparation, the timeframe for Board approval is expected to be shorter than usual. The present AF should be approved by the Board of Directors in 2024.