CLEAN TECHNOLOGY FUND (CTF)
Global Energy Storage Program (GESP)

Africa Green Baseload Program

USD 50 million

July 2023

Cover Page CTF Project/Program Approval Request Global Energy Storage Program (GESP / DPSP-IV)				
1. **Country/Region**		Multinational	2. **CIF Project ID#**	[CIF AU will assign ID]
3. **Public or Private**		Public		
		Private	**X**	
4. **Project/Program Title**		Africa Green Baseload Program		
5. **Is this a private sector program composed of sub-projects?**		Yes	**X**	
		No		

6. **Financial Products, Terms and Amounts**

Financial Product		**USD**	**EUR**
Grant		0.00	
Fee on grant		0.00	
MPIS (for private sector only)		1.00	
Public sector loan	Harder terms	0.00	
	Softer terms	0.00	
Senior loan		35.00	
Senior loans in local currency hedged		0.00	
Subordinated debt / mezzanine instruments with income participation		0.00	
Second loss guarantees		0.00	
Equity		0.00	
Subordinated debt/mezzanine instruments with convertible features		15.00	
Convertible grants and contingent recovery grants		0.00	
Contingent recovery loans		0.00	
First loss guarantees		0.00	
Other (Equity and/or Debt)		0.00	
Total		**51.00**	

7. **Implementing MDB(s)**	African Development Bank (AfDB)
8. **National Implementing Agency**	N/A
9. **MDB Focal Point**	Leandro Azevedo (l.azevedo@afdb.org) TTLs: Maria Croizat-Viallet (m.croizat-viallet@afdb.org)

10. **Brief Description of Project/Program (including objectives and expected outcomes)**

The Africa Green Baseload Program (hereinafter, the Program) is structured as a concessional lending program with Global Energy Storage Program (GESP) funds to be deployed for co-financing energy storage projects across CIF eligible African countries with a strong development impact on climate change mitigation and a specific focus on maximizing the use of intermittent renewable energies. GESP funds will be deployed to sub-projects where sponsors and investors face challenges in sourcing sufficient levels of conventional financing to cover the upfront costs of

energy storage solutions. GESP funding will therefore be essential in filling the financing gap for energy storage needs in these projects, but more critically to support and mainstream the energy transition to greener and cleaner options in Africa.

11. **Consistency with CTF investment criteria**	
(1) Potential GHG emissions savings	Please see section 5.1
(2) Cost-effectiveness	Please see section 6.1
(3) Demonstration potential at scale	Please see section 7.1
(4) Development impact	Please see section 8.1
(5) Implementation potential	Please see section 9.1
Additional CTF investment criteria for private sector projects/ programs	
(6) Financial sustainability	Please see section 11.1
(7) Effective utilization of concessional finance	Please see section 12.1
(8) Mitigation of market distortions	Please see section 12.112.2
(9) Risks	Please see section 13.1

12. **For DPSP projects/programs in non-CTF countries, explain consistency with FIP, PPCR, or SREP Investment Criteria and/or national energy policy and strategy**

The program will target a combination of African CTF pilot-countries and other CIF eligible countries. Energy battery storage is crucial for Africa due to several reasons. First and foremost, many regions in Africa face challenges in accessing reliable electricity supply. Battery storage systems can help bridge the gap by storing excess energy generated during periods of low demand and releasing it during peak hours or when there are power outages. This ensures a more consistent and reliable energy supply, benefiting households, businesses, and industries.

13. **Stakeholder Engagement**

AfDB has conducted initial discussions with several project developers to discuss renewable energy opportunities coupled with storage solutions. As part of the environmental and social assessment of the sub-projects, consultations will be undertaken with local stakeholders, communities, and eventually projects' affected people. Where required, discussions will also be held with corresponding governments and development partners to ensure alignment and complementarity with regards to the development of the energy sector in the targeted countries.

14. **Gender Considerations**

The Program will mainstream gender equality principles at the sub-project level, in full compliance and alignment with the AfDB's Gender Strategy 2021-2025 and the Gender Marker System (GMS), where relevant. During appraisal of the sub-projects, a gender officer will be assigned to ensure that gender benefits are considered and that gender indicators are included in the strategic logical frameworks to monitor and report on gender equality results. An initial set on gender-responsive indicators could include the number of full-time equivalent jobs created for women and men, and the number of people, households and businesses provided with access to energy of which number and share of women, female-headed households and women-owned businesses. Technical assistance support to enhance gender equality and women empowerment will also be considered on a case-by-case basis with recourse to resources from AfDB's existing trust funds. For further information on the gender analysis for this Program, please see section 14.

15. **Indicators and Targets**

Project/Program Timeline	
Expected start date of implementation	Q1 2024
Expected end date of implementation	Q1 2029
Expected investment lifetime in years (for estimating lifetime targets)	20

CTF core Indicators	**Targets**
GHG emissions reduced or avoided over lifetime (tons of CO_2-eq)	9,759,060
Annual GHG emissions reduced or avoided (tons of CO_2-eq/year):	487,953
Installed Capacity of Renewable Energy (MW)	At least 262 of solar PV power
GESP-specific indicators	**Targets**
Energy rating (MWh)	At least 730
- Storage technology type: Electrochemical/Chemical batteries (grid or mini-grid scale)	730
- Storage technology type: Electrochemical/Chemical batteries (off-grid stationary batteries)	TBD
- Location in the energy value chain: electricity generation, transmission, and distribution purposes	730
- Distributed storage:	450
- Utility-scale applications:	280
- Location in the energy value chain: stationary electricity end use	TBD
Power rating (MW)	At least 160
- Storage technology type: Electrochemical/Chemical batteries (grid or mini-grid scale)	160
- Storage technology type: Electrochemical/Chemical batteries (off-grid stationary batteries)	TBD
- Location in the energy value chain: electricity generation, transmission, and distribution purposes	160
- Location in the energy value chain: stationary electricity end use	TBD
- Distributed storage:	90
- Utility-scale applications:	70
Identify relevant development impact indicator(s)	**Targets**
Number of Jobs Created (Men/Women)	TBD

16. **Co-financing**

Source	Please specify as appropriate	Amount (in million USD)
CTF/GESP	Concessional loan/subordinated debt	50
AfDB (own resources)	Senior loan	170
AfDB Special Funds	Concessional loan	40
Government	-	-
Private Sector	Equity	155
DFIs/Bilateral agencies	Equity/Senior concessional debt	125
Total		**540**

17. **Expected Date of MDB Approval**

All sub-projects planned under this program are expected to be approved between the last quarter of 2023 and 2024.

DETAILED DESCRIPTION OF THE PROGRAM

1. Program and Sector Context

1.1. Solar energy is the fastest-growing renewable energy source in Africa. The *Annual Solar Outlook 2023*[1] published by the Africa Solar Industry Association (AFSIA) confirmed that in 2022 the continent saw the installation of almost 1 GW of new solar photovoltaic (PV) capacity. Wind power also has the potential to expand rapidly, especially in North, East and Southern Africa, where the International Renewable Energy Agency (IRENA) estimates a potential of 461 GW wind power generation[2].

1.2. Without detracting from the merits of other renewable energy sources, Africa's energy systems will be increasingly powered by Variable Renewable Energy (VRE) sources, such as solar and wind, which can certainly secure the delivery of required energy services, but are, by definition, not firm nor dispatchable. As such, the road to significant VRE integration is challenging, as most African countries have deficient electrical infrastructures and are plagued by frequent power shortages and blackouts. With an optimal combination with storage solutions (i.e., thermal, battery, hydro, etc.), VRE technologies can deliver the same level of service afforded by fossil fuel generation technologies to meet the baseload needs of African energy systems.

1.3. Energy storage solutions can offer multiple benefits to African power systems, such as optimizing grid management by enhancing its stability and reliability and reducing peak demand, as well as accommodating increasing loads of VRE. These solutions can also play a critical role in moving towards a clear decarbonization path for the continent and supporting its energy transition. However, while the energy storage sector in Africa is progressing, there are still challenges to overcome, including high up-front costs, scarce financing, lack of or under-developed regulatory frameworks, lack of track record, and limited technical knowledge and capacity.

1.4. For instance, and despite a promising cost reduction potential between 50% and 66% depending on the battery energy storage technology, as expressed in the *Electricity Storage and Renewables: Costs and Markets to 2030*[3] report published by IRENA, energy storage technologies still represent a costly component compared to conventional generation sources, and they often receive inadequate compensation for the value they provide.

1.5. With respect to the regulatory frameworks and policies to promote the use of energy storage technologies, it is to be noted that commendable efforts are being made by African governments in recognizing the need for a renewable and decarbonized energy supply that addresses climate change and the commitments made under the Paris Agreement; however, some still fail to integrate energy storage as a vital component of the energy mix and to consider the offset between costs and pricing of the ancillary services provided by storage solutions. With adequate enabling environment undertakings, the deployment of energy storage technologies will increase and ultimately foster innovation and attract private sector investments in the sector.

1.6. Energy storage solutions are globally developing at a rapid pace, and the qualities of the systems are advancing. With more research and development, innovations, and investments expected to come in the sector, improvements in the efficiency, durability, and recyclability of energy storage technologies may become available, therefore encouraging a wait-and-see approach from governments, developers, and sponsors, and putting on hold the decision to invest and integrate energy storage in ongoing projects. In

[1] http://afsiasolar.com/data-center/outlook-report/
[2] https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2022/Jan/IRENA_Market_Africa_2022_Summary.pdf
[3] https://www.irena.org/publications/2017/oct/electricity-storage-and-renewables-costs-and-markets

addition to this, the lack of familiarity and limited technical knowledge with regards to energy storage solutions is also limiting its scalability and replicability in Africa.

1.7. While pumped-hydro storage has traditionally been the most widely used storage technology globally, its environmental and geographical limitations are already paving way for a more prominent use of new technologies like batteries and fuel cells.

1.8. All in all, and despite the challenges presented, it is expected that the energy storage sector continues its growth trajectory and significantly contributes to Africa's sustainable energy future with increasing awareness, technological advancements, cost reductions, and supportive policies.

1.9. Acknowledging the crucial role to be played by energy storage, the AfDB has to date supported some of its Regional Member Countries (RMCs) with highly concessional financing to develop energy storage solutions. This is the case of Eritrea, where the AfDB has recently approved a USD 50 million grant from the African Development Fund (ADF) and from the Transition Support Facility (TSF) to develop a 30 MW solar PV and 15 MW/30 MWh storage facility, which will increase the share of renewable energy in the national mix from 3% to 23%. Through the Sustainable Energy Fund for Africa (SEFA), AfDB is also supporting Mozambique with a USD 2.5 million grant to develop the country's Renewable Energy Integration Program aiming, among other priorities, to assist the national electricity company to undertake a feasibility study for Battery Energy Storage Systems (BESS) in various sites.

2. Overview of the Proposed Program

2.1. The objective of the Africa Green Baseload Program ("the Program") is to support the scale-up of renewable energy and maximize the use of VRE technologies to meet baseload needs, including through different storage solutions. The Program aims to (i) develop new storage capacity in eligible CIF African Pilot Countries; (ii) accelerate cost reduction of storage technologies; (iii) support the integration of VRE into grids; and (iv) expand energy access for millions of people, with a particular focus on reducing the unequal access to energy for women.

2.2. The Program requires USD 50 million in resources from the GESP to provide the much-needed concessional financing to a range of private sector projects seeking financial support to close the viability gap.

2.3. The AfDB has currently identified a range of opportunities at different stages of readiness which will develop new renewable energy capacity generation and/or integrate energy storage solutions. This indicative pipeline is comprised of the following opportunities:

- **Project 1 – Morocco:** the project consists of increasing the capacity of renewable energy (mainly through solar and wind sources) coupled with BESS for a Moroccan industrial company operating in the fertilizer sector. The company intends to deploy 225 MW of solar PV capacity by 2025 with approximately 450 MWh BESS[4]. The estimated cost of this intervention is estimated at USD 225 million. The project is part of the company's endeavors to (i) install water desalinization units with an annual capacity of 110,000 million cubic meters, of which around 60% will be distributed to the Moroccan population to address chronic water shortages due to successive drought years, (ii) reach full carbon neutrality towards 2040 through ensuring round-the-clock green energy to power their

[4] The company intends to increase its renewable energy capacity with an additional 500 MW and 1,000 MW respectively by 2026 and 2027, also coupled with BESS. However, this additional capacity would be deployed depending on the growth of energy demand and needs of the company.

industrial sites and to feed any excess to the national grid, and (iii) contribute positively to address Africa's food security and agriculture resilience.

- **Project 2 – Malawi**: the project aims to develop and deploy a 240 MWh lithium-ion BESS (60 MW x 4 hours) for which the sponsors are looking to secure up to USD 70 million in debt (construction equity is secured through a private equity Fund for which AfDB is an investor). The project is expected to reach financial close by end of 2023 for a total project cost of USD 100 million and will have important benefits to the country, such as enhancing its network stability through firming intermittent renewable generation and providing low-cost and clean peak power, as to avoid coming back to expensive and polluting diesel generators. As of end of 2022, Malawi had decommissioned 78 MW of grid-based diesel generators.

- **Project 3 - Kenya:** this project represents one of the first utility-scale projects in Kenya, where the developer is looking at developing a 37 MW solar PV plant coupled with a 10MW/40MWh BESS. The total project cost is expected to be around USD 65 million, of which USD 15 million for the BESS component. To date, there are no utility-scale solar PV with BESS projects operating in Kenya despite being considered in the Least Cost Power Development Plan (LCPDP) 2021-2023 presented by the Ministry of Energy. Therefore, this project will represent a real advancement for the country to lower the cost of power, manage and store the excess energy during off peak hours and increase intermittent capacity in the national grid, while also supporting its leadership on climate change.

2.4. In addition to the above projects, other opportunities are being considered. For example, AfDB is engaging on discussions with a pan-African[5] project finance facility that invests equity and debt into bankable solar mini-grid projects that incorporate battery solutions to hybridize the systems and reduce the reliance on back-up diesel generators (**Project 4**). The AfDB, through SEFA, is investing USD 10 million in the concessional mezzanine debt tranche of the fund, which achieved a first close of USD 25 million (with equity and mezzanine debt contributions) and is currently undertaking fundraising efforts to achieve a second close of USD 50 million towards mid-2024.

2.5. As indicated in Table 1 below, it is estimated that the proposed Program will deliver an additional renewable energy capacity of 262 MW of solar PV power with an additional storage energy capacity of 730 MWh from BESS (mainly lithium ion).

Table 1. Estimated new generation and energy storage capacity of the Program.

Project and Country	Country	New generation (in MW)	Storage power capacity (in MW)	Duration of energy storage discharge (in h)	Storage energy capacity (in MWh)
Project 1	Morocco	225	90	5	450
Project 2	Malawi	N/A	60	4	240
Project 3	Kenya	37	10	4	40
Project 4	Multinational	TBD	TBD	TBD	TBD
TOTAL		**262**	**160**	**4.5 (average)**	**730**

2.6. Following a preliminary assessment of the various projects, GESP funds would be critical in: (i) providing support to a nascent and incipient sector in Africa, such as energy storage, especially as some of these projects may be among the first ones in their respective countries (i.e., Kenya and Malawi); (ii) displacing and reducing the reliance of African countries on fossil-fuel based generating or back-up

[5] Should this opportunity be considered under the Program, excuse rights would be incorporated in the legal documents to ensure that no GESP funding is used for countries other than the CIF-pilot countries.

capacity, which have a detrimental impact on climate change; (iii) increasing the share of renewable energy sources, such as wind and solar, in the energy mix by helping with the integration of VRE; and (iv) enhancing the bankability of energy storage projects by providing below-market interest rates and more flexible terms than traditional loans.

2.7. For all the operations considered under the Program, GESP funds will be jointly deployed with those of AfDB taking the same risk position but considering the level of minimum concessionality and increased grace periods, sculpted repayment profiles and interest capitalization during grace period, with the ultimate objective of addressing specific barriers that are preventing these projects from reaching an adequate financial set-up.

2.8. It is expected that GESP funds will be split across the indicative pipeline presented in section 2.3 above, considering the best use of funds and their concessional nature. The principle of minimum concessionality will be assessed on a case-by-case basis to avoid market distortions, over-subsidization and catalyzation of additional investments that would not otherwise have occurred with market-based pricing. In addition, it is vital that the procurement procedures implemented by the sub-project companies in sourcing the construction, operations and maintenance contracts are done in a competitive manner ensuring value-for-money. Table 2 below shows the indicative distribution of GESP funds, as well as indicative contributions from AfDB[6], the private sector and other sources of financing such as Development Financial Institutions (DFIs) and bilateral agencies.

Table 2. Indicative financing for sub-projects under the Program (in USD million).

Project	Country	Estimated total cost	AfDB	GESP	Private	Other DFIs
Project 1	Morocco	225	150	20	55	TBD
Project 2	Malawi	100	20	10	40	30
Project 3	Kenya	65	30	5	20	10
Project 4	Multinational	150	10	15	40	85
TOTAL		**540**	**210**	**50**	**155**	**125**

2.9. In addition to the GESP funds, the Program will be complemented with support from SEFA – AfDBs' flagship concessional finance facility for catalyzing private investments in renewable energy and energy access – which is already providing technical assistance funding to RMCs to: (i) supporting national power system planning and optimization of VRE solutions; (ii) upstream policy advisory and capacity-development for VRE and supply-side storage integration; (iii) design and structuring of generation and storage procurement programs; and (iv) project preparation to pave the way for follow-on investments from AfDB and others. The close collaboration and coordination with SEFA will provide the Program with additional pipeline opportunities to be supported with GESP funds. Resources from other AfDB's Special Funds may also be considered.

2.10. The internal processing of CTF funds through AfDB's investment review and approval mechanisms will include ensuring adherence to AfDB's requirements in terms of environmental and social safeguards, as well as commercial viability of projects. AfDB will exercise the same degree of care with these funds as it exercises with respect to the administration of its own statutory resources.

[6] AfDB resources as referred to in Table 2 include AfDB's statutory resources as well as funding from AfDB's managed trust funds for which AfDB acts as an administrator (i.e., SEFA, the Canada-AfDB Climate Fund, etc.).

3. Key Benefits of the Program

3.1. Despite promising advancements in the energy storage sector in Africa, much more needs to be done. In alignment with the GESP principles and objectives, the Africa Green Baseload Program will aim to support the integration of additional renewable energy capacity in the energy mix of African countries by offering long-term and flexible financing instruments to energy storage projects as to close existing financing gaps and encourage an increased participation from the private sector.

3.2. While final selection of the financial terms will be done at the sub-project level and will reflect the minimum concessionality required for each sub-project, the indicative terms envisaged under the Program are as follows:

Table 3. Indicative financing terms of the GESP funding under the Program.

	GESP total allocation	Project amount	Tenor	Seniority	Pricing
Senior debt	Up to USD 35 million	Max. USD 20 million per project	Aligned with AfDB's tenor	Senior; pari-passu with AfDB	Minimum interest rate of 0.75%
Subordinated debt / mezzanine instruments	Up to USD 15 million	Max. USD 15 million per project	Aligned with AfDB's tenor	Rank above common equity but subordinated to other senior lenders	Minimum interest rate of 0.75%

3.3. Concessional financing with below-market terms from the GESP is particularly important for developing countries in Africa, where the cost of capital can be a significant barrier to investment in renewable energy and energy storage technologies. From the developers' perspective, the Program will therefore be crucial in securing funding for energy storage projects to fill the existing financing gap and to strengthen their bankability (i.e., concessional terms are less restrictive and put less pressure on the projects' debt service coverage ratios).

4. Market Transformation

4.1. While during the early stages of implementation of this Program the concessional funds from GESP will help overcome the investment barriers of energy storage in Africa, it is expected that in the long term the Program establishes a sufficient track record in the sector and that concessional funding is progressively phased out. As such, the Program is being proposed with a view to becoming the one-stop shop within AfDB for energy storage developments in Africa, coupled with concessional co-financing from GESP as well as from other AfDB-managed special resources (i.e., SEFA, the Canada-AfDB Climate Fund, etc.).

FIT WITH CTF INVESTMENT CRITERIA

5. Potential GHG Emissions Savings

5.1. With GESP funds of USD 50 million, the Program expects to leverage an additional USD 490 million in equity and debt from other investors. This provides a leverage ratio of roughly 1/10 for a total installed capacity of 262 MW of new solar PV generation (assuming a capacity factor of 30%[7]) and the generation of close to 688,536 MWh per year from green energy sources. Emission reductions for the

[7] The current projects being considered under the Program are solar PV plants, for which the average capacity factor can be estimated at 30%.

program are expected to equal 487,953 tCO_2 per year or 9,759,060 tCO_2 for the estimated 20-year lifetime of the projects. More detailed information on the assumptions made in these calculations can be found in Annex I.

6. Cost Effectiveness

6.1. With total GESP funds of USD 50 million and estimated emission reductions of 9,759,060 tCO_2 over the life of the project, the cost effectiveness of GESP funds is roughly USD 5.12 per tCO_2. Including all leveraged financing, with total funds of USD 540 million, the cost effectiveness will decrease to roughly USD 55.33 per tCO_2. More detailed information on these calculations can be found in Annex I.

7. Potential Replication and Scale-up

7.1. The potential replication and scale-up of this Program is based on the fact that energy storage is fundamental to integrating VRE at a large scale. Notably, solar and wind sources are extremely variable and difficult to anticipate (i.e., output of solar PV plants is disturbed by climatological events, such as rain, clouds, or dust storms, whereas wind tends to be erratic and unpredictable depending on the seasons). As such, bringing storage elements paired with VRE projects can help introduce the required power systems flexibility to cope with expected and unexpected energy demand and supply changes.

7.2. Under the Program, a few initial opportunities have been identified and will benefit from GESP funding on concessional terms. However, and with the support of AfDB's key initiatives and programs, such as SEFA which is working under its Green Baseload area of focus to precisely drive transformational support to increase the penetration of renewable energy in power systems, with a strong focus on power system stability, and to deliver alternatives to fossil-fuel baseload generation options, it is expected that additional projects will become eligible to benefit from GESP additional support and enter the pipeline in the near future.

8. Development Impact

8.1. The Program will lead to a direct increase in renewable and reliable electricity supply to African populations with the construction of 262 MW of new solar PV capacity, which will result in 688,536 MWh per year of additional energy, assuming a capacity factor of 30%. This additional capacity will benefit to a quite diverse range of actors, as the Program is to be initially implemented in Morocco, Malawi, and Kenya.

8.2. In the case of the project in Morocco, the GESP concessional funds will directly contribute to decarbonization of the Moroccan industry, by allowing new generation capacity of up to 225 MW of solar PV, which will displace other polluting sources of energy and reduce the reliance of the company over the national grid (which is mainly dominated by fossil fuels and gas, and only accounting for 10% of renewable energy in its energy mix)[8]. In addition to this, the company will install up to 90 MW of BESS, able to provide 450 MWh to ensure full continuity of energy services in their production chain.

8.3. Baseload power in Malawi is to date exclusively provided by hydroelectric power, which entails a concentration risk associated with power derived from a single resource and which is heavily affected by seasonal changes. Peak power in the country has been to date covered by diesel generators. With a view to reducing the reliance on highly polluting and expensive diesel generators, the country is therefore gearing

[8] https://www.irena.org/-/media/Files/IRENA/Agency/Statistics/Statistical_Profiles/Africa/Morocco_Africa_RE_SP.pdf

towards diversifying their energy mix by integrating solar PV generation, which needs storage solutions to properly cover the energy demand peak and avoid load shedding. As such, the Program will greatly contribute to providing energy access in a context where only 15% of the population[9] in Malawi has access to electricity.

8.4. Energy storage is important for Kenya since the country has been making significant investments in renewable energy, particularly in wind and solar power, which is currently estimated at 336 MW and 50 MW installed respectively per the LCPDP 2021-2030[10]. This has inadvertently resulted in excess energy being generated during off-peak hours and increased intermittent capacity in the national grid. As such, the stimulation of battery storage will be most welcome and encouraged[11] to balance the demand and supply. By storing excess renewable energy and avoiding the use of fossil fuel-based backup power sources, battery storage can help the country mitigate climate change impacts and lead to a reduction in carbon emissions. Energy battery storage can enhance Kenya's energy system reliability, sustainability, and accessibility while supporting its transition towards a low-carbon future.

8.5. The Program will furthermore contribute to reducing greenhouse gas emissions to the tune of close to 10 million tons per year. Additionally, the Program will contribute to job creation, with a particular focus on gender equality and ensuring that women are particularly benefitted from the Program through creation of employment opportunities for them. The job creation indicators will be further developed during appraisal stage of the respective sub-projects being considered under this Program.

9. Implementation Potential

9.1 This Program is expected to generate strong interest from energy storage developers in Africa which are currently connecting with AfDB's investment teams to ensure concessional finance for their energy storage needs. Initial assessment indicates a strong demand for this program and therefore the implementation potential is considered high. AfDB has already began due diligence on projects, and it is expected that approval of some of the projects, namely the one in Morocco, will occur before the end of 2023. AfDB is following leads in other African countries. In this regard, it is expected that the proposed financing under this program can be approved and deployed in a quick manner.

10. Additional Cost and Risk Premium

10.1 Calculating energy storage costs depends heavily on the operational profile of the technology chosen, however, these can represent between 20% and 50% of a project's total costs if combined with generation. In this regard, CTF financial support will be targeted to enhance project bankability without compromising affordability for off-takers and subsequently to end-users. Commercial banks are still reluctant to lend to BESS technologies due to perceived technology risks.

11. Financial Sustainability

11.1 The Program will establish track record in the African context. Over time, the demonstration potential of the Program can lead to substantial benefits associated with the establishment of track record and a better understanding of the risk-return profile of BESS technologies. Consequently, financing costs

[9] https://www.irena.org/-/media/Files/IRENA/Agency/Statistics/Statistical_Profiles/Africa/Malawi_Africa_RE_SP.pdf
[10] https://communications.bowmanslaw.com/REACTION/emsdocuments/LCPD%202021.pdf
[11] https://www.trade.gov/market-intelligence/kenya-energy-storage-system

are likely to decrease over time unlocking financing from governments, commercial banks, institutional investors, and project developers.

11.2 Various BESS projects across the world are still being financed with recourse to investment grants. However, given the preliminary discussions held with the targeted project developers as well as an assessment of the wider market, AfDB is confident that a combination of concessional senior debt and some high-risk financial products (e.g., equity and mezzanine debt) will suffice to secure the viability of the Program.

12. Effective Use of Concessional Finance and Mitigation of Market Distortions

12.1 Concessional finance is necessary for energy storage projects for several reasons:

(i) Cost-effectiveness: These technologies, especially at scale, are still expensive to implement. Concessional finance helps bridge the affordability gap while reducing upfront costs.

(ii) Risk mitigation: BESS technologies are relatively new which leads to high-risk perception. CTF concessional resources can reassure investors and lenders, making it easier to secure private sector financing and attract investments.

(iii) Long-term viability: Given the long-term nature of the targeted projects, the financial burden can be spread over time, making them more financially sustainable.

(iv) Technology transfer and capacity building: CTF investment can play a crucial role in contributing to the growth of domestic industries, job creation, and the development of a skilled workforce in the energy storage sector.

12.2 In the context of this program, AfDB will ensure that no market distortions are created and that the interest rate charged on any CTF loan instrument (or capped return on any equity investment) is set to a minimum value. The objective is to ensure that the financial covenants proposed under the financial agreements are realistic and achievable by the projects. This will be done through detailed sensitivity analysis of the projects' financial models and in close cooperation between lenders and their technical and financial advisors. The Enhanced DFI Blended Finance Principles will be applied at the project level.

13. Risks

13.1 Annex II presents a summary of the key risks involved in the proposed program, corresponding severity, and proposed mitigation measures.

14. Gender analysis

14.1 Through its Gender Strategy 2021 – 2025[12], AfDB has made clear its commitment to put gender equality as well as women and girls' empowerment at the forefront of its activities. The strategy remains instrumental in fostering inclusive and dynamic economies and establishing prosperous and healthy societies across Africa. All sub-projects under the Program will be subject to a detailed gender assessment and categorization under the AfDB's GMS to ensure that gender equality is considered and mainstreamed.

[12] https://www.afdb.org/en/documents/african-development-bank-group-gender-strategy-2021-2025

14.2 Furthermore, the strategy recognizes that energy for all will not be attained unless women's energy needs are better understood and addressed by both policy and action. It is well documented that energy poverty is more pronounced in women and girls and that an equal access to energy results in notable improvements in safety, health, nutrition and education of women and girls, overall contributing to fostering women's economic independence and therefore reducing gender-based violence. While noting that the energy industry remains highly dominated by male participants, efforts to integrate women in energy value chains are critical to bridge the energy access gap on the continent and ensure economic growth.

14.3 The Program will focus on implementing a gender-responsive approach through (i) expanding access to energy, including for women and girls and female-headed businesses in the targeted countries and/or geographical areas, especially in Malawi and Kenya where energy access rates are still far from reaching the total population (respectively 15% and 76%); and (ii) creating job opportunities for women in the energy value chain for all the sub-projects, but especially for Morocco, where the percentage of female labor force stalls at 23.5% in 2022.

PERFORMANCE INDICATORS

The performance indicators outlined below are derived from the CTF Results Measurement Framework and will be monitored and reported in accordance with CTF guidelines.

Table 4. Program Performance Indicators

Indicator	Current Baseline	Anticipated impact
CTF Core Indicators:		
GHG emissions avoided (tCO2e): • per annum • over the indicative 20-year life of sub-projects	 0 0	 487,953 9,759,060
Incremental financing leveraged (of all non-CTF parties, USD million)	0	490
Installed capacity of RE as a result of CTF interventions (MW)	0	262
GESP-specific Indicators:		
Energy rating (MWh)	0	730
Power capacity (MW)	0	160
Project-specific Indicators:		
Number of innovative energy storage sub-projects implemented (#)	0	4
Development Co-benefit Indicators (as applicable):		
Enhanced energy access (MWh/year)	0	1,214,136
Jobs created	0	TBD

Annex I: CTF Investment Criteria Calculations

SOURCE OF FUNDS	USD million	%
CTF (GESP)	50.00	9.2 %
AfDB	210.00	38.9 %
Private sector	155.00	28.7 %
Other DFIs	125	23.1 %
TOTAL	**540.00**	**100%**
Leverage	1/10	

EMISSION REDUCTIONS	
New Renewable Energy Installed Capacity (MW)	262
Additional (or saved) Power Generation (MWh/year)	688,536
Project Lifetime Generation (MWh)	13,770,720
Annual Emission Reductions (tCO2 eq.)	487,953
Project Life Emission Reductions (tCO2 eq./20 years)	9,759,060
CTF COST EFFECTIVENESS	
CTF Funds (USD million)	50.0
Cost Effectiveness of Total Funds (USD per tCO2 eq.)	5.12

PROGRAM COST EFECTIVENESS	
Total Funds (USD million)	540.0
Cost Effectiveness of Total Funds (USD per tCO2 eq.)	55.33

JOBS CREATED	
Direct	TBD
Indirect	TBD
TOTAL	TBD

Annex II: GESP Program Concept Template – Updated version as of July 2023

Project title	Africa Green Baseload Program ~~– Phase I~~
Country or region	Multinational (CIF pilot-countries only), with a preliminary focus on Morocco, Malawi, and Kenya
Type of storage asset	Initial focus on Electrochemical/Chemical Batteries (grid or mini-grid scale). Other energy storage technology options could be considered for future sub-projects under the program ~~Various energy storage technologies~~
Implementing MDB	AfDB
Brief description (including project objectives and innovation aspects)	Energy services in many parts of Africa are unreliable and of poor quality. Despite high tariffs, most utilities and off-takers struggle to even recover operating costs and very often post financial losses. As a result, networks suffer from weak management and under-investments in critical areas and are unable to provide sufficient generation to meet current and future demand. Service providers and utilities are struggling to establish reliable energy services to meet growing demands from industry and commercial sectors critical for economic growth while at the same time contribute to their countries' commitments under their Nationally Determined Contributions. While variable renewable energy (VRE) sources can be utilized for the delivery of reliable energy services, they are by definition not firm and dispatchable. However, with a correct use of the resources available in a given location and an optimal combination with storage solutions (thermal, battery, hydro, etc.), VRE technologies can deliver the same level of service generally afforded by fossil fuel generation technologies (i.e., power that is available for dispatch round the clock to meet the baseload needs of the system). The objective of the Africa Green Baseload Program ~~(GBL)~~ (the Program) is to support the scale-up of renewable energy and maximize the use of VRE technologies to meet baseload needs, including through storage solutions. The overarching concept of increasing penetration of renewable power in the African grids, through a combination of interventions encompassing generation, transmission, distribution, and storage. Where the use of VRE technologies does not result in an economically viable solution as part of a least economic cost plan study, then appropriate strategic intervention will be required from the governments, with support and reinforcement from development partners. The AfDB is engaging with developers willing to invest in VRE projects coupled with battery energy storage. While energy storage opportunities are expected to increase with the decreasing cost of both variable renewable energies and energy storage solutions, the proposed Program will focus for the time being on private sector projects located in Morocco, Malawi, and Kenya – all of them CIF-pilot countries. Other projects may be considered as AfDB engagement with private developers evolve. The Program will utilize CTF funds under the Global Energy Storage Program (GESP) to provide concessional co-financing to a range of private sector projects seeking financial support to deploy battery energy storage solutions across the continent. Despite a promising cost reduction potential between 50% and 66% depending on the battery energy storage technology, as expressed in the *Electricity Storage and Renewables: Costs and Markets to 2030* report published by the International Renewable Energy Agency, energy storage systems still represent a costly component of renewable energy projects. Support from concessional financing sources such as the GESP will be required to cover the substantial upfront costs for storage systems. ~~The GBL program will be organized around the following 5 core areas: (i) Supporting national power system planning and optimization of VRE solutions, (ii) Upstream policy advisory and capacity development for VRE and supply side storage integration, (iii) Design and structuring of generation (IPP) and storage procurement programs, (iv) project preparation to pave the way for follow-on investments from AfDB and others, and (v) deployment of concessional climate finance capital to close viability gaps.~~ ~~The GBL Program is being spearheaded by the Sustainable Energy Fund for Africa (SEFA) – AfDBs' flagship concessional finance facility for catalyzing private investments in renewable energy and energy access. SEFA will pledge around USD 50 million to address both the technical assistance needs~~

	~~(areas 1-4 above). In addition, SEFA may also consider the provision concessional resources (area 5) in project finance structures, matching the same amount and terms of SEFA, and duly calibrated to unlock significant contribution from AfDB (and other investors).~~ In line with the objectives of the GESP, the Program will overall contribute to help develop new storage capacity in Africa, accelerate cost reduction in battery storage, support and increase the integration of variable renewable energy into grids and ultimately expand reliable energy access to African populations. ~~The CTF contribution will be set-up as a parallel financing facility alongside SEFA and focus on area 5 only. The GBL programme will be implemented in coordination with other flagship initiatives at the AfDB that are relevant to the CTF DPSP IV including the Desert to Power initiative aiming at deploying solar power across the Sahel countries, while strengthening their power systems to absorb more renewable inputs. The combined contributions of SEFA/CTF should support the delivery of up to 5 projects representing around 250 MW of storage capacity. AfDB will strive to build a diverse portfolio across energy storage technologies and regions to maximize the demonstration potential of concessional investments.~~	
Expected CTF financing	**Financial instrument**	**Amount (USD M)**
	Senior Debt, Subordinated Debt/~~, Guarantees~~ mezzanine instruments ~~and Equity~~(final selection of instruments will be done at the project level to ensure the best use of concessional resources)	50.0
Expected leveraging and co-financing by source	**Source**	**Amount (USD M)**
	CTF/GESP	50
	AfDB (own resources)	1~~5~~750
	AfDB Special funds (i.e., SEFA, CACF, etc.)	40
	Private Sector	~~150~~155
	Other DFIs/bilateral agencies	125
	Total	**~~350~~540**
Expected results	**Indicator** **~~Storage input~~**	**Storage output**
	Energy rating (MWh) ~~TBC~~	~~TBC~~730
	Power capacity (MW) ~~250~~	~~250~~160
Expected dates of milestones	Submission to CTF Trust Fund Committee	~~December~~ July 202~~3~~0
	MDB Approval	~~January to December 2021~~2023-2025
Project status	Pipeline efforts are currently on-going with projects already identified in CTF-eligible countries such as Malawi, Kenya, ~~Mozambique, Uganda, Zambia, Lesotho~~ and ~~Niger~~Morocco. This intervention is expected to ~~open up a new business line for AfDB and~~ pave the way for gigawatt-scale investments across the entire continent and increase the share of renewable energy penetration in African power markets.	

Annex III: Risks Assessment

RISK	DESCRIPTION AND MITIGATION	SEVERITY
Financing Risks	Market and Revenue Risks: Energy storage projects rely on revenue streams from off-takers, usually from State-Owned Utilities. Fluctuations in energy prices, changes in regulatory policies, or uncertainties in market demand can impact the project's financial viability. In the proposed project in Morocco this will not be an issue as a corporate finance structure is being considered whereas for the projects in Malawi and Kenya, a sovereign guarantee backstopping the obligations of the off taker is likely to be considered. Cost Overruns: Construction and development costs may exceed initial estimates, leading to financial strain. Unforeseen challenges, such as site conditions, permitting delays, or supply chain disruptions, can contribute to cost overruns. EPC contracts with fixed lump-sum prices will be negotiated. Availability of Financing: Securing adequate financing can be challenging, particularly for larger-scale energy storage projects. Lenders or investors may have concerns regarding the project's risks, returns, or long-term financial performance. AfDB is engaged in discussions with various co-financiers for the targeted projects and is confident these can reach financial closure in a timely manner.	Medium
Construction Risks	Project Delays: Construction projects are subject to potential delays caused by weather conditions, labor shortages, equipment availability, or unforeseen technical challenges. Delays can increase costs and postpone revenue generation. This will be mitigated through the inclusion of compensatory provisions in the EPC contract. Engineering and Design Issues: Poor engineering or design choices can result in technical inefficiencies, operational limitations, or increased maintenance requirements. Robust engineering, design expertise, and quality control are crucial to minimize these risks. Independent technical advisors will review and vet the proposed engineering and design choices to mitigate this risk as much as possible. Safety and Environmental Risks: Construction activities can pose safety hazards to workers, neighboring communities, and the environment. Proper safety protocols, environmental impact assessments, and compliance with regulations are essential. All projects will be assessed and monitored in line with AfDB's Integrated Safeguards System.	Medium
Operation Risks	Performance and Efficiency: Energy storage systems may experience performance degradation over time, reducing their efficiency and storage capacity. Monitoring, maintenance, and periodic system evaluations are necessary to ensure optimal performance. The lenders, including AfDB and our independent technical advisor will review and vet the proposed infrastructure operations and maintenance and management, Operational and Maintenance Costs: Ongoing operation and maintenance costs should be carefully budgeted and managed. Regular inspections, repairs, and replacement of components are necessary to maintain the system's functionality and longevity. Technological Obsolescence: Rapid advancements in energy storage technologies may result in the system becoming outdated or less competitive over time. Regular technology assessments and potential upgrades will be considered during the life of the projects to mitigate this risk. In addition, long-term Power Purchase Agreements will also mitigate this risk. Market and Regulatory Changes: Changes in energy policies, grid regulations, or energy market dynamics can impact the revenue streams or market value of energy storage systems. Adapting to regulatory changes and maintaining flexibility in business models is essential. Given the important of the proposed projects to the national energy systems of the targeted countries, it is unlikely that any changes in regulations and laws would negatively impact the projects.	Medium